(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
7 October 2010 (07.10.2010)

PCT

(10) International Publication Number
WO 2010/115116 A1

(51) International Patent Classification:
A61B 17/11 (2006.01)

(21) International Application Number:
PCT/US2010/029801

(22) International Filing Date:
2 April 2010 (02.04.2010)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/166,453 3 April 2009 (03.04.2009) US

(71) Applicant *(for all designated States except US)*: **WILSON-COOK MEDICAL, INC.** [US/US]; 4900 Bethania Station Road, Winston-Salem, NC 27105 (US).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: **AGUIRRE, Andres, F.** [CO/US]; 2912 Ethan Pointe Dr., Apt. 10311, Burlington, NC 27215 (US). **RUCKER, Brian, K.** [US/US]; 1148 Luke Street, King, NC 27021 (US). **CHMURA, Kevin** [US/US]; 1440 Chesterfield Road, Lewisville, NC 27023 (US).

(74) Agent: **GOEDERTIER, Katie, B.**; Brinks Hofer Gilson & Lione, P.O. Box 10087, Chicago, IL 60610 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

WO 2010/115116 A1

(54) Title: DELIVERY SYSTEM FOR MAGNETIC ANASTOMOSIS DEVICE

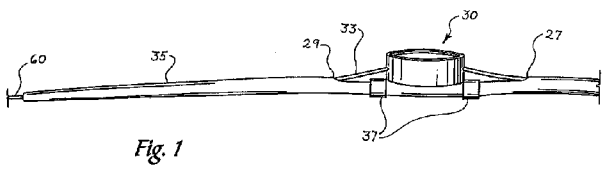

Fig. 1

(57) Abstract: A magnet delivery system for forming an anastomosis that comprises a wire guide; a catheter having a delivery portion for advancement into a jejunal space, the delivery portion having a lumen extending at least partially therethrough, a first port and a second port through which the wire guide is disposed; a magnet comprising a lumen therethrough wherein the magnet is removably secured to the delivery portion of the catheter between the first and second ports by disposing the wire guide through the lumen of the magnet, the first port, and the second port.

DELIVERY SYSTEM FOR MAGNETIC ANASTOMOSIS DEVICE

FIELD OF THE INVENTION

[0001] The present invention relates to delivery devices useful in delivering magnetic anastomosis devices.

BACKGROUND OF THE INVENTION

[0002] Magnetic anastomosis devices (MADs) are currently used to create a channel between two viscera for the purpose of redirecting bodily fluids. For example, intestinal contents or bile may be redirected in patients who have developed an obstruction of the bowel or bile duct due to such conditions as tumor, ulcer, inflammatory strictures, or trauma. A magnetic anastomosis device is disclosed in U.S. Patent No. 5,690,656, the disclosure of which is incorporated herein by reference in its entirety. Generally, the MAD includes first and second magnet assemblies comprising magnetic cores that are surrounded by thin metal rims. Due to the magnetic attraction between the two magnetic cores, the walls of two adjacent viscera may be sandwiched and compressed between the magnet assemblies, resulting in ischemic necrosis of the walls to produce an anastamosis between the two viscera. The viscera treated by MADs include the gall bladder, the common bile duct, the stomach, the duodenum, and the jejunum of the small intestine.

[0003] Historically, MADs have been delivered through surgical intervention such as laparotomy, which of course is invasive and carries its own risks. The exemplary self-centering MAD of U.S. Patent No. 5,690,656 permits delivery of the device over a wire guide and through the oral cavity, and typically under fluoroscopy. Alternatively, delivery can be accomplished by simply swallowing the magnet assemblies of the MAD and using massage under fluoroscopy to center the two magnet assemblies. Finally, delivery of the magnet assemblies has occasionally been performed endoscopically with grasping forceps, which can be time consuming and difficult. Removal of the MAD is typically accomplished by allowing the magnet assemblies to pass through the gastrointestinal track naturally, or more typically, with a follow-up endoscopic procedure using grasping forceps. Unfortunately, the relatively large size of the magnet assemblies can make delivery and retrieval complicated. In fact, balloon dilation of bodily lumens is often required in order to

deliver the magnet assemblies to the desired location. Likewise, the size of bodily lumens is often the limiting factor in the size of the magnet assemblies that can be delivered and deployed.

[0004] Certain MAD procedures utilizing a jejunal magnet require the magnet to be passed down the esophagus to the stomach, and then through the pylorus and into the jejunum. Because of the curved nature of the passages leading to the jejunum, the magnet often becomes dislodged from the delivery system during advancement and placement thereof. Passing the jejunal magnet through the pylorus may be further complicated by patients with gastric outlet obstruction.

BRIEF SUMMARY OF THE INVENTION

[0005] Herein provided is a magnet delivery system for forming an anastomosis in a visceral space. The delivery system comprises a wire guide, a catheter, and a magnet. The catheter has a delivery portion for advancement into a space. This delivery portion has a lumen extending at least partially therethrough, a first port, and a second port in communication with the lumen and through which the wire guide is disposed. The magnet defines a lumen through which the wire guide is disposed. The magnet is removably secured to the delivery portion of the catheter between the first and second ports by disposing the wire guide through the lumen of the magnet, the first port, and the second port.

[0006] Also provided is a method for delivering a jejunal magnet for forming an anastomosis between two bodily walls. The delivery system provided herein is introduced into a bodily organ, such as any of the viscera. The magnet, which is on the delivery portion of the catheter, is positioned adjacent the wall of a first organ. To deliver the magnet, the wire guide is withdrawn from the lumen of the magnet.

[0007] Also provided is a system having a delivery portion further comprising a third port, a fourth port, and a second magnet that also defines a lumen therethrough. The second magnet is located between the third and fourth ports. The wire guide is placed through the lumen of the second magnet such that it can be withdrawn later to deliver the second magnet. There can be a single wire or separate wires. Such systems may allow the delivery of multiple magnets during a minimum number of procedures.

[0008] The delivery system can be used in tandem with a second magnet delivery system as previously described. This second magnet delivery system may be used

to position a second magnet adjacent the wall of a second organ such that it will be attracted to the first magnet placed adjacent to the wall of the first organ.

[0009] Also provided is a method for delivering a first magnet defining a lumen formed therethrough. The method includes positioning the first magnet on a delivery portion of a catheter. The delivery portion of the catheter having a first catheter lumen extending at least partially therethrough, a first port and a second port in communication with the first catheter lumen. A first wire guide is disposed through the first catheter lumen, the first port and the second port, and the through the lumen of the first magnet to removably secure the first magnet to the delivery portion of the catheter between the first and second ports. The first wire guide is then withdrawn from the lumen of the first magnet to deliver the first magnet.

[0010] In a further aspect the method includes delivering a second magnet defining a lumen formed therethrough. The delivery portion of the catheter further comprises a third port and a fourth port. The first wire guide is disposed through the first catheter lumen, the third port and the fourth port, and through the lumen of the second magnet to removably secure the second magnet to the delivery portion of the catheter between the third and fourth ports. The first wire guide is then withdrawn from the lumen of the second magnet to deliver the second magnet.

[0011] As described herein, the magnet is firmly attached to the delivery catheter and the likelihood of the magnet becoming dislodged during the procedure is minimized. The system described herein makes it possible to push the magnet through a gastric outlet obstruction.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] The accompanying drawings incorporated in and forming a part of the specification illustrate several aspects of the present invention, and together with the description serve to explain the principles of the invention. In the drawings:

[0013] Figure 1 is a perspective view of the delivery system described herein;

[0014] Figure 2 is an overhead view of the delivery system;

[0015] Figure 3 is a perspective view of two delivery systems with complementary jejunal magnets;

[0016] Figure 4 is an overhead view of a dual delivery system;

[0017] Figures 5, 6, and 7 schematically depict the use of two magnet assemblies for forming a magnetic anastamosis device in accordance with the present description;

[0018] Figure 7a is a cross-sectional view of two magnets compressing the walls of two internal bodily organs to facilitate a new anastamosis;

[0019] Figures 8a and 8b are perspective views of a delivery system for delivering a magnetic anastomosis device constructed in accordance with further teachings of the present description; and

[0020] Figures 9 is an overhead view of a delivery system for delivering a magnetic anastomosis device constructed in accordance with further teachings of the present description.

DETAILED DESCRIPTION OF THE INVENTION

[0021] The term "prosthesis" means any replacement for a body part or for a function of that body part or any device that enhances or adds functionality to a physiological system.

[0022] The term "catheter" generally means a medical device comprising an elongate shaft having a lumen extending at least partially therethrough, including balloon catheters, guide catheters, and delivery catheters. An example of a catheter includes the Cook Medical Fusion™ Biliary Dilation Catheter (FS-BDC).

[0023] The magnet delivery system uses a catheter 35 and a wire guide 33 to deliver a jejunal magnet 30. As seen in Figure 1, the catheter 35 has two ports, a first port 27 and a second port 29 in communication with the lumen of the catheter and through which the wire guide 33 is placed. Suitable wire guides can include the Cook Medical Tracer Hybrid® Wire Guides (HYB-48015). The proximal 27 and distal 29 ports are sufficiently spaced apart to accommodate the magnet 30 between them. The ports 27, 29 are about 35 mm to about 70 mm apart or any combination or subcombination of ranges therein. In the particular embodiment illustrated, the ports 27, 29 can be spaced about 60 mm apart. The first and second ports 27, 29 are formed through the catheter 35 wall and are spaced proximally from the distal end of the catheter 35 so as to be distinguished from the entry or exit openings of the catheter at the very proximal or distal ends thereof. The ports 27, 29 are preferably longitudinally aligned. The preferred distance between the ports will depend on the diameter and size of the magnets. Magnet sizes will range across standard sizes

used in the field. These ports 27, 29 are located in the distal part of the catheter 35 and are appropriately spaced to accommodate magnets of various sizes in diameter. Magnets between about 10 mm and 20 mm in diameter or any combination or subcombination of ranges therein may be accommodated, although a magnet about 14 mm in diameter is illustrated. For other magnet sizes the location of the ports in the wire guide lumen may be modified as required.

[0024] The magnet 30 shown has a general disc shape (i.e. having an axial height which is less than the outer diameter). Magnets that may be used in this delivery system can be circular, cubular, cyclindrical, polygonal, oval or ovoid, square, or the like. Numerous other shapes of the magnets may be readily envisioned by those skilled in the art. For example, referring to Figures 8a, 8b and 9, the magnet may include an elongate magnet as described in U.S. Provisional Application No. 61/291,202, entitled "Elongate Magnet for a Magnetic Anastomosis Device," the entire contents of which are incorporated herein by reference. The magnet 30 may include a protective coating which may be formed of various materials such as polymers like Teflon® or Paralene® for protection of the magnetic core from the corrosive effects of digestive acids or other bodily fluids depending upon the bodily structure involved.

[0025] The magnet 30 has a lumen therethrough to accommodate the wire guide 33. The magnet 30 also comprises an annular edge 39 along the magnet's perimeter. The edge 39 is slightly raised above the center of the magnet 30 such that it forms a basin 32 to accommodate or mate with a second magnet (as described below). In particular, when the magnet 30 is delivered, this edge 39 contacts the wall of the viscera and helps to initiate the ischemic necrosis of the tissue captured between the magnet 30 and a mated second magnet. A radiopaque marker 37 is placed on the catheter in the vicinity of the magnet to mark the magnet location when viewed through fluoroscopy. A radiopaque marker can be placed underneath the magnet 30 on the catheter 35 to mark the location of the magnet when viewing the delivery system from the side.

[0026] The wire guide 33 holds the magnet 30 in place on the distal end of the catheter 35. In Figures 1 and 2, the wire guide 33 is shown protruding from the first port 27, going through the lumen of the magnet 30, and re-entering the catheter 35 at the second port 29. The catheter 35 may include radiopaque markers 37 that

permit tracking of the delivery system for accurate positioning of the magnet 30. It may be preferred that a radiopaque marker 37 be placed immediately distal to the magnet 30. The catheter 35 may be used alone or in conjunction with other wire guide cannulae for navigation of the bodily lumens and delivery of a magnet.

[0027] Figure 3 shows two delivery systems where a second magnet 31 is affixed to a second catheter 45. The second magnet 31 has an annular recess 40 that is capable of mating with the annular edge 39 of the first magnet 30. Figure 7a shows the walls 52, 62 of two viscera being compressed between magnets 30, 31. The edge 39 compresses the walls against the second magnet 31 to assist the ischemic necrosis. The second magnet 31 can also have an annular edge with a smaller diameter than the first magnet 30. When implanted and mated with the first magnet 30, the second magnet 31 can fit within the annular edge 39 of the first magnet 30.

[0028] Figure 4 shows a system for the delivery of two magnets 30, 31. Such a system may be used as an efficient means of delivering multiple magnets. Although two magnets 30, 31 are shown, more than two magnets can be coupled to a catheter in the fashion described herein. The catheter has four holes in total: first 57 and second 67 proximal ports and first 59 and second 69 distal ports. First magnet 30 is held between first port 57 and second port 59 with wire guide 33. The second magnet 31 is constrained between first port 67 and second port 69 with wire guide 33. The first magnet 30 comprises an annular edge 39 with a basin 32. The annular recess 40 on the second magnet 31 mates with the annular edge 39 of the first magnet 30 when both magnets 30, 31 are implanted. Two sets of radiopaque markers can be used with a second radiopaque marker located distal to the second magnet 31. In general, the radiopaque markers can be located on the delivery portion sufficient to guide an operator during the placement procedure. Methods for delivering both magnets using such a system are described further below.

[0029] It will be recognized by those skilled in the art that the magnetic anastamosis device employing the magnet assemblies described herein not only preserves the benefits of improving the time of the procedure to place the magnet, but further provides a small delivery configuration which may be easily located within the body for accurate delivery. The delivery systems described herein also provide for insertion of the magnets through natural orifices. As such, there is also a method for delivering the magnet assembly to a position for forming an anastamosis between

two viscera. Figure 5 shows the relative positions of several viscera in the abdominal cavity, including the gall bladder 10, the common bile duct 12, the stomach 14, the duodenum 16, and the jejunum 18 of the small intestine. Although not shown, the delivery system described herein may also be used to implant anastomosis-forming magnets in the colon for possible use in gastric bypass procedures. The delivery system described herein can be used, for example, to create an anastomosis between the stomach 14 and the jejunum 18 of the small intestine. The delivery system can also be used as a part of procedure where forceps are used to place one of the magnets.

[0030] The method for delivering a jejunal magnet to form an anastomosis comprises introducing the delivery system 65 into an endoluminal vessel. Figure 5 shows the system 65 being advanced to the jejunum 18. The delivery of magnet 31 follows once the wire guide 60 has been positioned adjacent the wall of a first viscus. In Figure 5, the first viscus is the jejunum 18. The magnet 31 is placed on catheter 35 as shown in Figure 1 and held in place on the catheter 35 by the wire guide 33. The wire guide 33 is loaded through the catheter 35, passing through second port 29 in the catheter 35 lumen, through the lumen of the magnet 30, and then reentering the catheter 35 lumen through first port 27. Using the radiopaque markers 37 as a guide, the catheter 35 is advanced such that the magnet 31 is placed adjacent to the wall of the jejunum 18 as shown in Figure 6.

[0031] The delivery system 65 with magnet 31 remains in position as a second delivery system 70 is introduced into the stomach 14 as shown in Figure 6. Magnet 30 is positioned adjacent the wall of the stomach 14 that borders the jejunum 18 near the location of magnet 31. Magnets 30, 31 are released so that the magnetic forces attract the magnets together, compressing the walls 52, 62 together of the jejunum 18 and the stomach 14 as seen in Figure 7. To release magnet 31, the operator removes the wire guide 33 and then the catheter 35.

[0032] The attraction forces exerted between the magnets 30, 31 is strong enough so that in the event that the catheter 35 is caught between the two magnets 30, 31 after the placement of magnet 30, the catheter 35 may be removed and the magnets 30, 31 will remain together. The radiopaque markers 37 can be used as a guide to help position the magnet 31 in the correct orientation under fluoroscopy. A

radiopaque marker 37 may be located at the proximal edge of the magnet as exemplified in Figure 1.

[0033] Once the necrosis of the walls of the stomach and the jejunum is complete, an anastomosis is formed. The magnets 30, 31 can then pass through the body naturally or can be removed by means such as laparotic removal, endoscopic removal, or other procedure.

[0034] The delivery system shown in Figure 4 can be used to deliver two magnets using one catheter. Magnet 31 can be delivered first to a first location to be treated by retracting the guidewire 33 sufficiently to release the magnet 31. The delivery portion of the catheter can then be positioned in a second location where magnet 30 can be released by further retracting the guidewire 33 from the lumen of the magnet 30. The magnets 30, 31 can be maneuvered to mate with one another by massage under fluoroscopy or by grasping forceps through laparoscopic surgery. Once mated, the ischemic necrosis process can begin on the walls of the two viscera being treated.

[0035] Figures 8a and 8b depict an alternative embodiment of a delivery system 165 in accordance with the teachings of the present description and having a description similar to that of Figure 1, and in which similar components are denoted by similar reference numerals increased by 100. The delivery system 165 uses a catheter 135 with ports 127 and 129 and a wire guide 133 to deliver a magnet 130. In this embodiment, the wire guide 133 includes a loop 134 at a distal end thereof. The loop 134 extends beyond a distal end of the catheter 135.

[0036] As shown in Figure 8b, the loop 134 slides over a second wire guide 143 during delivery of the magnet 130. For example, in one method of delivery, the wire guide 143 is positioned in the target site. The catheter 135 is then backloaded onto the wire guide 143 via the loop 134. In other words, the loop 134 slidably receives the wire guide 143 and the catheter 135 is pushed relative thereto until the target site is reached. The magnet 130 is then placed adjacent a bodily wall. Another magnet is delivered in the same fashion to another target site to mate with the magnet 130 to compress the bodily walls therebetween. Once the magnets mate, the wire guide 143 is removed followed by removal of the wire guide 133. Thereafter, the catheter 135 is removed.

[0037] In this embodiment, an elongate magnet 130, as described in U.S. Provisional Application No. 61/291,202, is shown. The elongate magnet 130 may or may not include the suture 136 shown extending through the lumen of the magnet 130 which may aid in positioning of the magnet 130. The delivery system 165 is advantageous for delivering larger, elongate magnets 130. The delivery systems described above may be used to deliver the elongate magnet 130. However, since the elongate magnet 130 is larger than the magnets 30, 31 disclosed in the earlier described embodiments, a greater force would be needed to advance the elongate magnet 130 over the wire guide 33 due to the larger area of friction between the elongate magnet 130 and the catheter 35. With the embodiment shown in Figures 8a and 8b, the extra force is eliminated as the magnet 130 moves with the catheter 135 as it slides along the external wire guide 143.

[0038] Figure 9 depicts another embodiment of a delivery system 265 in accordance with the teachings of the present description and having a description similar to that of Figure 1, and in which similar components are denoted by similar reference numerals increased by 200. The delivery system 265 uses a catheter 235 and a wire guide 233 to deliver a magnet 230. In this embodiment, the distal loop 234 of the wire guide 233 slidably receives a second wire guide 243, similar to Figures 8a and 8b, thus providing reduced force needing during delivery of the magnet 230. In this embodiment, however, a dual lumen outer sheath 238 slidably receives the catheter 235 in one lumen and the wire guide 233 in a second lumen. The outer sheath 238 includes ports 227 and 229.

[0039] During delivery of the magnet 230 with the delivery system 265 of Figure 9, a larger portion of the catheter 235 remains closer to the wire guide 243 rather than merely the distal end as is the case with the system 165 of Figures 8a and 8b. This improves the trackability of the catheter 235 and reduces the likelihood that the catheter will bow in the stomach.

[0040] Alternatively, instead of being housed within an outer sheath, the catheter 235 may include two lumens; one for the wire guide 233 to hold the magnet and the other for the main wire guide 243. The distal loop 234 slides over the main guide wire 243 during delivery of the magnet 230.

[0041] It will be recognized by those skilled in the art that the methods described above generally include placing the magnetic devices within a body adjacent two

bodily walls to compress the bodily tissue between the magnetic devices and create a channel therethrough. It will be recognized that the devices and methods may be used on any layer of material (e.g. fabrics, cloth, polymers, elastomers, plastics and rubber) that may or may not be associated with a human or animal body and a bodily lumen. For example, the devices and methods disclosed herein can find use in laboratory and industrial settings for joining one or more layers of material that may or may not find application to the human or animal body, and likewise forming an opening in the layers of material that are not bodily tissue. Some examples include sewing or stitching and related manufacturing, working with synthetic tissues, connecting polymeric sheets, animal studies, and post-mortem activities.

[0042] The foregoing description of has been presented for purposes of illustration and description. It is not intended to be exhaustive or to limit the delivery systems and methods disclosed. Numerous modifications or variations are possible in light of the above teachings. The delivery systems and methods disclosed were chosen and described to provide the best illustration of the principles of the delivery systems and methods and their practical application to thereby enable one of ordinary skill in the art to utilize the delivery systems and methods in various embodiments and with various modifications as are suited to the particular use contemplated. All such modifications and variations are within the scope of the delivery systems and methods as determined by the appended claims when interpreted in accordance with the breadth to which they are fairly, legally, and equitably entitled.

CLAIMS

1. A magnet delivery system for forming an anastomosis, the delivery system comprising:

a first wire guide;

a catheter having a delivery portion for advancement into a visceral space, the delivery portion having a first catheter lumen extending at least partially therethrough, the delivery portion having a first port and a second port in communication with the first catheter lumen and through which the wire guide is disposed; and

a first magnet defining a lumen therethrough, wherein the first magnet is removably secured to the delivery portion of the catheter between the first and second ports by disposing the wire guide through the lumen of the first magnet, the first port and the second port.

2. The magnet delivery system of claim 1 where the first magnet has a disc shape.

3. The magnet delivery system of claim 1 where the first magnet further comprises one of an annular edge and an annular recess.

4. The magnet delivery system of claim 1 where the first magnet includes an elongate jacket enclosing two magnetic members positioned along a longitudinal axis of the elongate jacket.

5. The magnet delivery system of claim 1 where the delivery portion of the catheter further comprises a third port, a fourth port, and a second magnet comprising a lumen therethrough, the second magnet being removably secured to the delivery portion of the catheter between the third and fourth ports, wherein the first wire guide is placed through the lumen of the second magnet, the third port, and the fourth port.

6. The magnet delivery system of claim 5 where the first magnet further comprises an annular edge and the second magnet further comprises an annular recess.

7. The magnet delivery system of claim 1 where the catheter includes a tubular wall, where the first and second ports are formed through the tubular wall, where the first and second ports are longitudinally aligned, and where the first and second ports are spaced proximally from a distal end of the catheter.

8. The magnet delivery system of claim 1 where the first wire guide includes a loop at a distal end thereof, the delivery system further comprising a second wire guide, wherein the loop of the first wire guide is configured to extend beyond a distal end of the catheter to slidably receive the second wire guide.

9. The magnet delivery system of claim 8 where the catheter includes a second catheter lumen, the first wire guide being disposed within the first catheter lumen and the second wire guide being disposed within the second catheter lumen.

10. The magnet delivery system of claim 8, further comprising an outer sheath having a first sheath lumen and a second sheath lumen, the catheter being disposed within the first lumen and the first wire guide being disposed within the first catheter lumen, and the second wire guide being disposed within the second sheath lumen.

11. A method for delivering a first magnet defining a lumen formed therethrough, the method comprising:

positioning the first magnet on a delivery portion of a catheter, the delivery portion of the catheter having a first catheter lumen extending at least partially therethrough, a first port and a second port in communication with the first catheter lumen;

disposing a first wire guide through the first catheter lumen, the first port and the second port, and the through the lumen of the first magnet to removably

secure the first magnet to the delivery portion of the catheter between the first and second ports; and

withdrawing the first wire guide from the lumen of the first magnet to deliver the first magnet.

12. The method of claim 11, further comprising:

delivering a second magnet defining a lumen formed therethrough, the delivery portion further comprising a third port and a fourth port, wherein delivery of the second magnet includes,

disposing the first wire guide through the first catheter lumen, the third port and the fourth port, and through the lumen of the second magnet to removably secure the second magnet to the delivery portion of the catheter between the third and fourth ports; and

withdrawing the first wire guide from the lumen of the second magnet to deliver the second magnet.

13. The method of claim 11 where the first wire guide includes a loop at a distal end thereof, the method further comprising before the step of withdrawing the first wire guide:

extending the loop of the first wire guide beyond a distal end of the catheter; and

sliding the loop of the first wire guide over a second wire guide.

14. The method of claim 13 where the second wire guide is disposed outside of the catheter.

15. The method of claim 13 where an outer sheath including a first and a second sheath lumen receives the catheter within the first sheath lumen and the second wire guide within the second sheath lumen, the first wire guide being disposed within the second catheter lumen.

16. The method of claim 13 where the catheter includes a second catheter lumen, the first wire guide being disposed within the first catheter lumen and the second wire guide being disposed within the second catheter lumen.

17. The method of claim 12 where at least one of the first magnet and the second magnet has a shape in the form of one of a disc shape and an elongate shape.

18. The method of claim 17 where the elongate shape includes an elongate jacket enclosing two magnetic members positioned along a longitudinal axis of the elongate jacket.

19. The method of claim 11 further comprising a radiopaque marker at the delivery portion of the catheter, the method further comprising positioning the first magnet using the radiopaque marker.

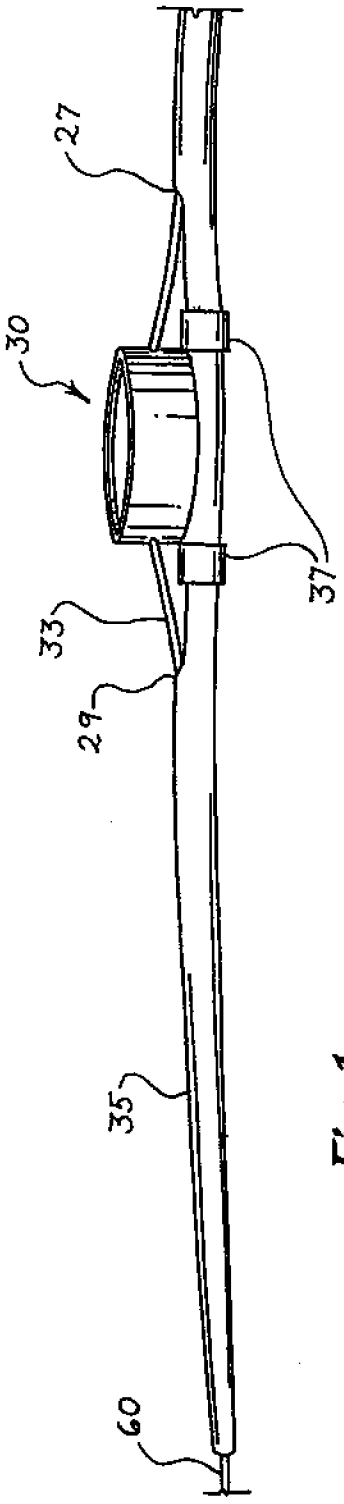

Fig. 1

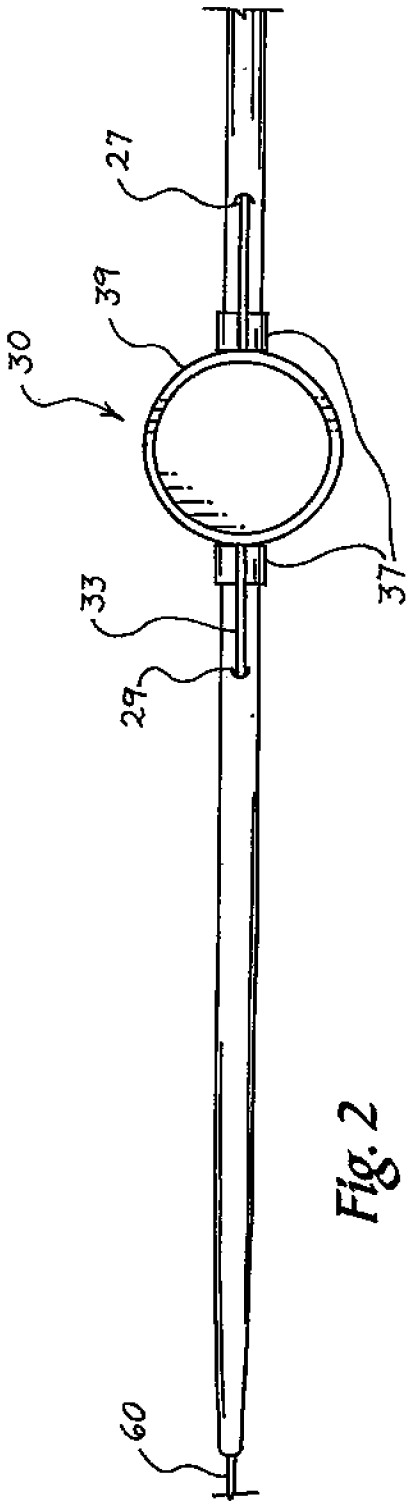

Fig. 2

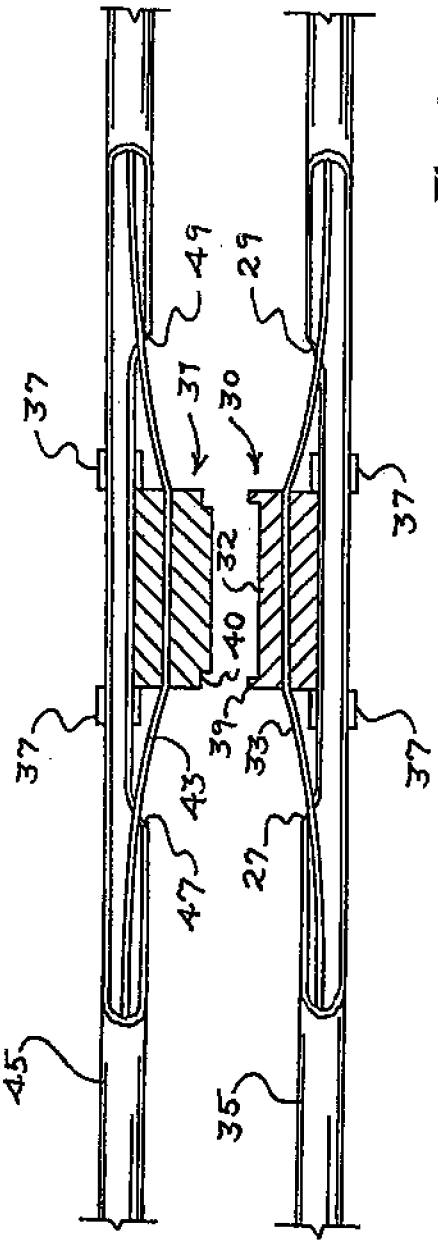
37
49
29
31
30
37
32
40
37
39
33
37
43
47
27
45
35

Fig. 3

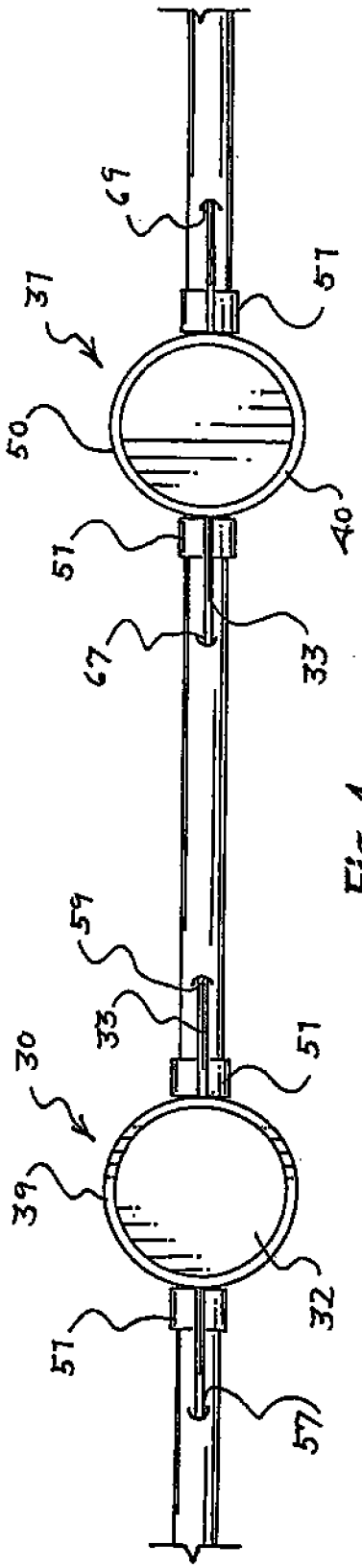
69
57
37
50
40
51
67
33
59
33
51
30
39
32
57
57

Fig. 4

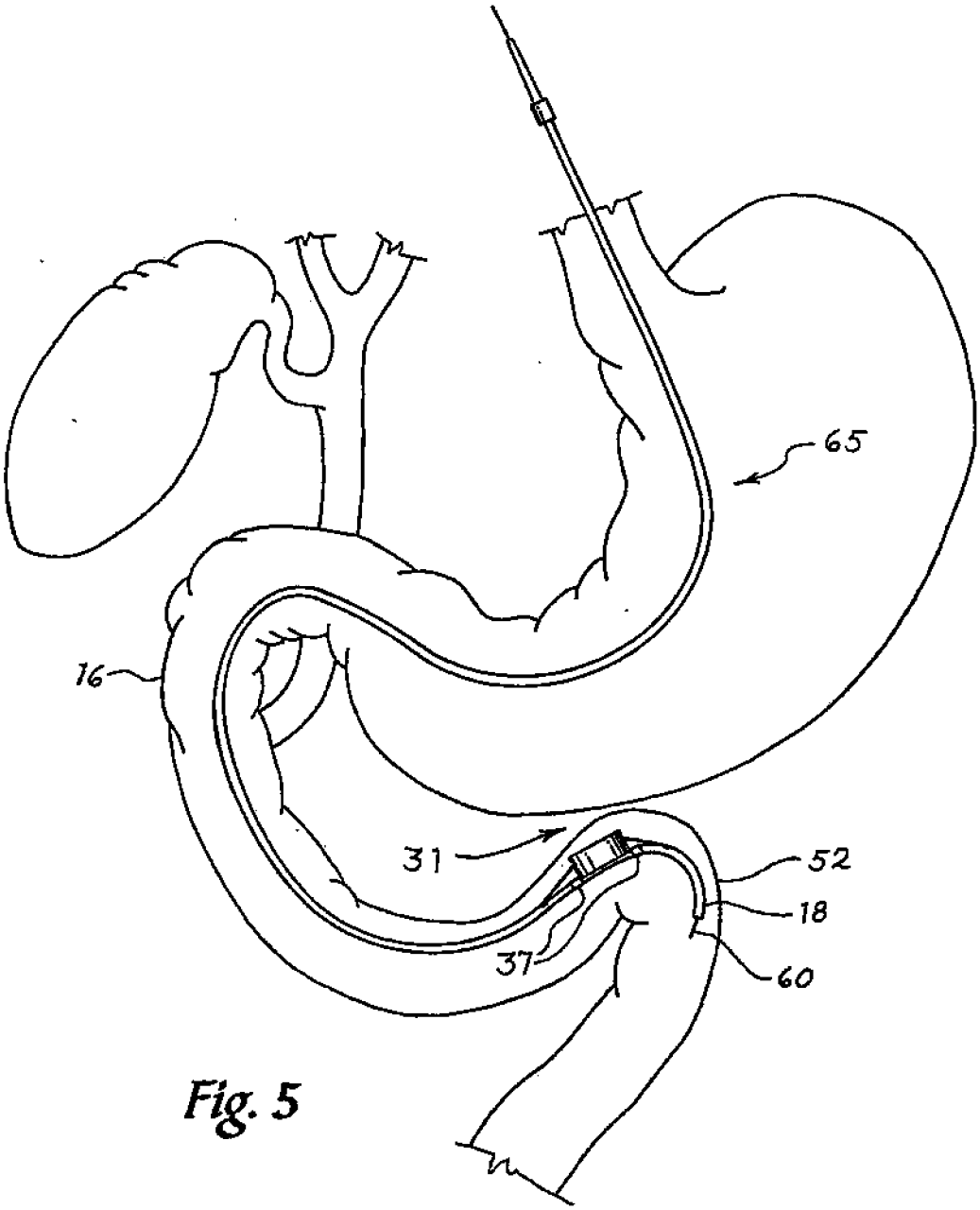

Fig. 5

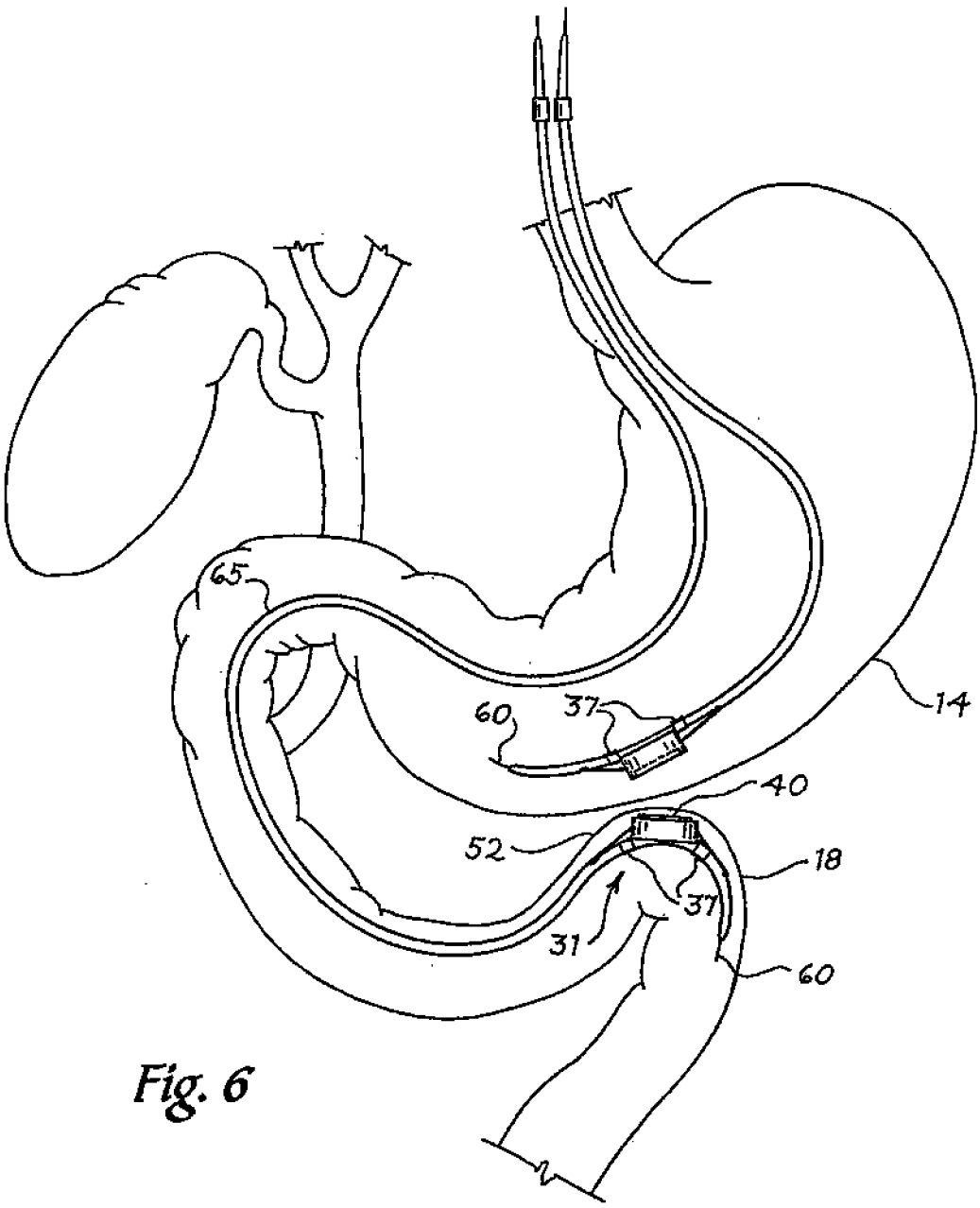

Fig. 6

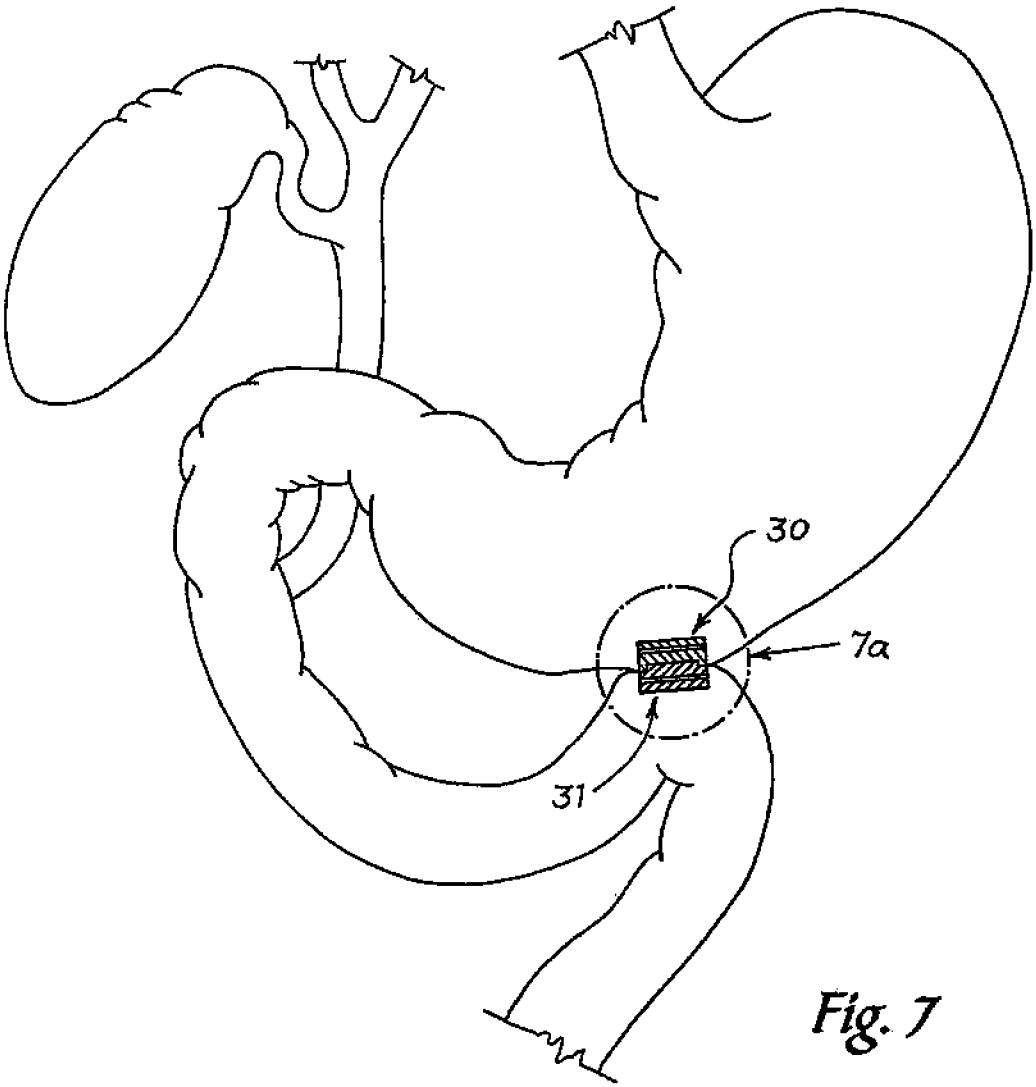

Fig. 7

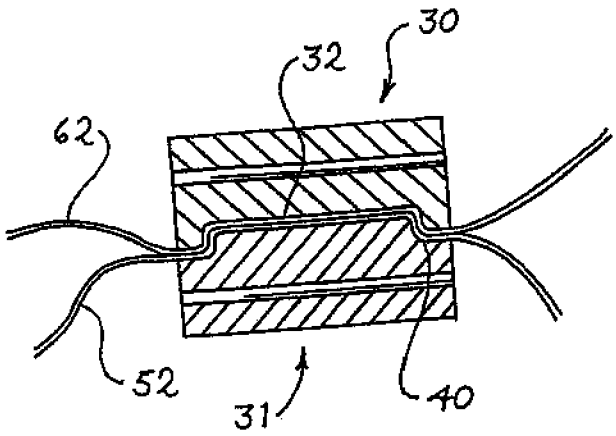

Fig. 7a

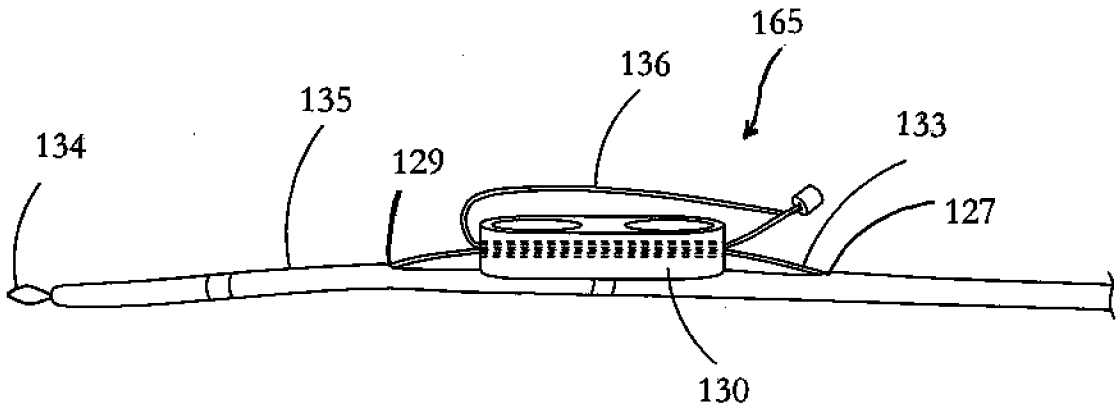

Fig. 8a

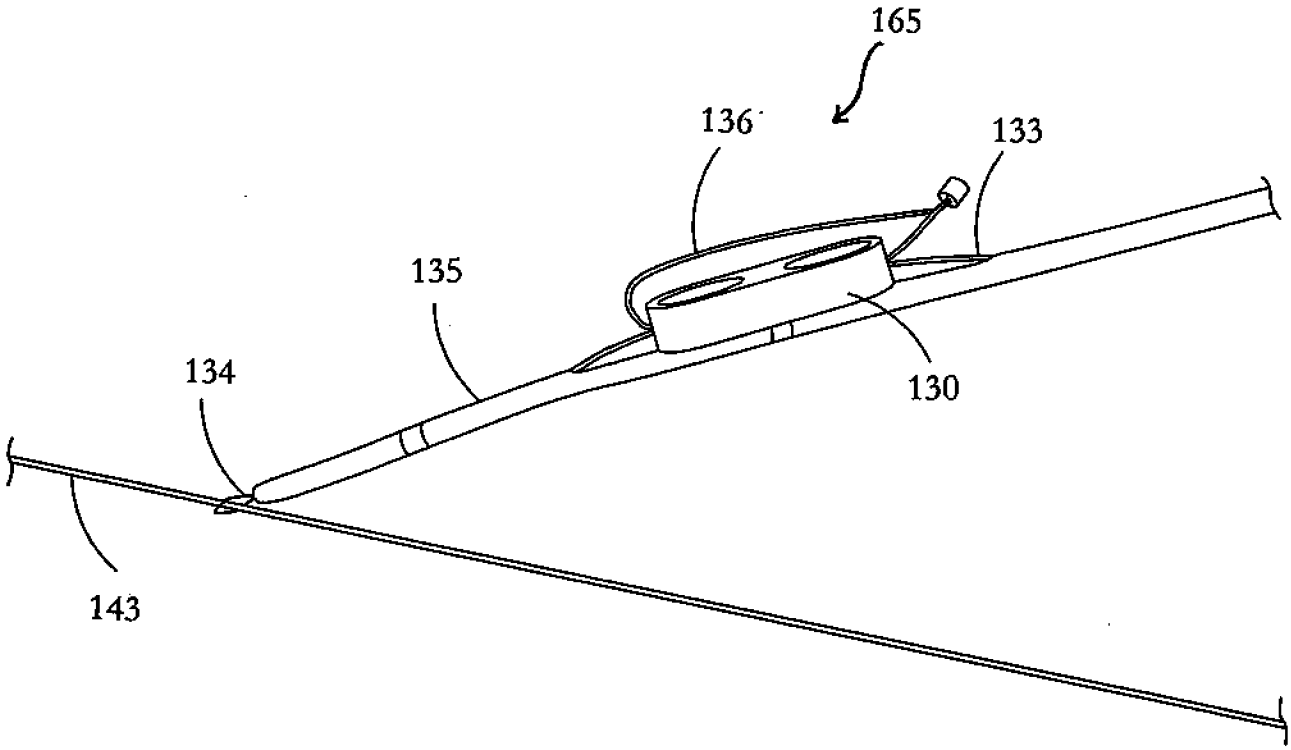

Fig. 8b

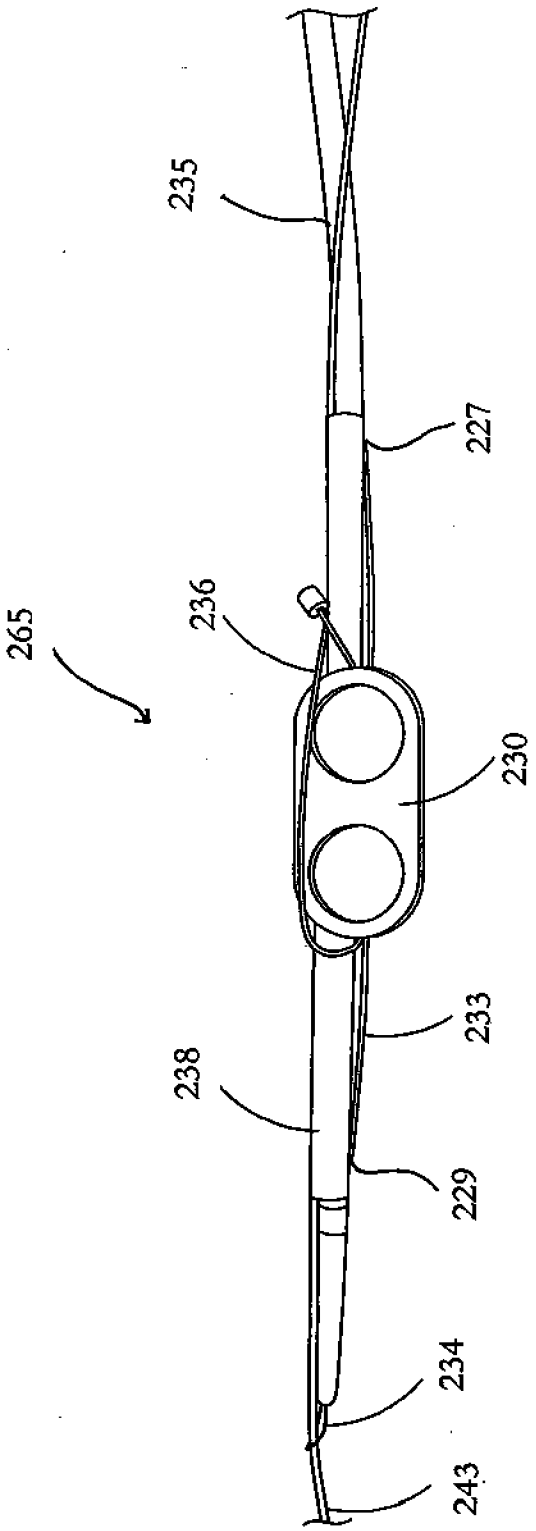

Fig. 9

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2010/029801

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61B17/11
ADD.

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)
A61B

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2008/061024 A2 (WILSON-COOK MEDICAL, INC.) 22 May 2008 (2008-05-22) abstract; figures paragraphs [0022] - [0025]	1
A	US 5 690 656 A (COPE ET AL.) 25 November 1997 (1997-11-25) abstract; figures	1
A	US 2004/107004 A1 (LEVINE ET AL.) 3 June 2004 (2004-06-03) abstract; figures 1,5, 12-14B paragraphs [0056], [0057], [0067], [0087] - [0095]	1
A	US 6 273 917 B1 (INOUE) 14 August 2001 (2001-08-14) abstract; figures 39-49,58 column 17, line 53 - column 18, line 13	1

☐ Further documents are listed in the continuation of Box C.

☒ See patent family 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.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
8 June 2010	16/06/2010

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Fax: (+31–70) 340–3016	Giménez Burgos, R

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2010/029801

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. [X] Claims Nos.: 11-19
because they relate to subject matter not required to be searched by this Authority, namely:

Rule 39.1(iv) PCT - Method for treatment of the human or animal body by surgery

2. [ ] Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. [ ] Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. [ ] As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. [ ] As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment o additional fees.

3. [ ] As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. [ ] No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

[ ] The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

[ ] The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

[ ] No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2010/029801

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2008061024 A2	22-05-2008	AU 2007319364 A1	22-05-2008
		CA 2669100 A1	22-05-2008
		EP 2086426 A2	12-08-2009
		JP 2010509001 T	25-03-2010
		US 2008114384 A1	15-05-2008
US 5690656 A	25-11-1997	AU 706895 B2	01-07-1999
		AU 5069196 A	09-01-1997
		CA 2174038 A1	28-12-1996
		DE 69604457 D1	04-11-1999
		EP 0754434 A1	22-01-1997
		JP 3751360 B2	01-03-2006
		JP 9010218 A	14-01-1997
US 2004107004 A1	03-06-2004	US 2005075622 A1	07-04-2005
		US 2005080395 A1	14-04-2005
		US 2005080431 A1	14-04-2005
		US 2005080491 A1	14-04-2005
US 6273917 B1	14-08-2001	EP 0985424 A1	15-03-2000
		WO 9949927 A1	07-10-1999
		JP 3756197 B2	15-03-2006