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(54) **MEDICAL DEVICES AND METHODS FOR SUTURING TISSUE**

MEDIZINISCHE VORRICHTUNGEN UND VERFAHREN FÜR GEWEBENAHT

DISPOSITIFS MÉDICAUX ET MÉTHODES POUR LA SUTURE DE TISSU

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Description

FIELD

[0001] The present invention relates generally to medical systems, devices and procedures for suturing tissue, such as for endoscopically suturing perforations in tissue.

BACKGROUND

[0002] Openings or perforations in the walls of internal organs and vessels may be naturally occurring, or formed intentionally or unintentionally. These openings may be used to gain access to adjacent structures of the body, such techniques being commonly referred to as transluminal procedures. For example, culdoscopy was developed over 70 years ago, and involves transvaginally accessing the peritoneal cavity by forming an opening in the *cul de sac.* This access to the peritoneal cavity allows medical professionals to visually inspect numerous anatomical structures, as well as perform various procedures such as biopsies or other operations, such as tubal ligation. Many transluminal procedures for gaining access to various body cavities using other bodily lumens have also been developed. Natural orifices such as the mouth, nose, ear, anus or vagina may provide access to such bodily lumens and cavities. The bodily lumen(s) of the gastrointestinal tract are often endoscopically explored and can be utilized to provide access to the peritoneal cavity and other body cavities, all in a minimally invasive manner.

[0003] Compared to traditional open surgery or laparoscopic surgery, transluminal procedures are less invasive by eliminating abdominal incisions (or other exterior incisions) and incision related complications, while also reducing postoperative recovery time, reducing pain, and improving cosmetic appearance. At the same time, there remain challenges to transluminal procedures, including providing a suitable conduit to the openings and body cavities, robust medical devices that are maneuverable via the conduit and operable within the body cavity, sterility of the conduit, maintaining insufflation of the body cavity, proper closure of the opening, and prevention of infection. For example, when an opening is formed in a bodily wall of the gastrointestinal tract, such as in the stomach or intestines, spillage of the stomach contents, intestinal contents or other bodily fluids into the adjacent body cavity can occur. Travel of bacteria laden fluids outside of the gastrointestinal tract may cause unwanted and sometimes deadly infection.

[0004] In order to permanently close naturally occurring, intentionally or unintentionally formed perforations and allow the tissue to properly heal, numerous medical devices and methods have been developed employing sutures, adhesives, clips, tissue anchors and the like. One such class of devices aims to endoscopically close perforations, such as those within the gastrointestinal tract. Accordingly, various medical devices have been proposed that attach to the endoscope to facilitate perforation closure. Some of these medical devices employ suction to orient the tissue for suturing or anchor placement, while others require the use of tissue graspers or other devices to orient the tissue.

[0005] A medical device comprising the features of the preamble of claim 1 is disclosed in WO2007/030753.

BRIEF SUMMARY

[0006] The present invention is defined in the appended claims and provides a medical device for suturing a perforation in tissue, that may be used endoscopically and/or laparoscopically, and that offers simple, reliable and controllable placement of sutures around a perforation for complete closure thereof. The medical device is constructed in accordance with the teachings of the present invention and comprises the features of claim 1.

[0007] According to more detailed aspects of the medical device, the first and second passageways follow a curved path, and the needle is curved. The needle follows a needle path between the first and second arms, the needle path being curved and corresponding to the curvature of the needle. Preferably, the curved paths of the first and second passageways are semi-circular, and the needle is semi-circular. It is also preferable that the needle has a cross-sectional shape that is polygonal, and similarly the first and second passageways have a polygonal cross-sectional shape, although non-polygonal cross-sections may also be employed. For example, the needle may have a triangular cross-sectional shape.

[0008] According to further detailed aspects, the first end of the first arm preferably includes a first slot extending through the first arm to the first passageway, the first slot sized to receive the suture. Similarly, the second end of the second arm may include a second slot extending through the second arm to the second passageway, the second slot sized to receiving the suture. Preferably, the first and second slots each span a length greater than or equal to one half of the length of the needle. When the tubular body and elongate medical device define a longitudinal axis, the first and second arms are preferably spaced laterally apart on opposite sides of the longitudinal axis. The first and second control members are elongated, and further include a first engagement member located at a distal end of the first control member and a second engagement member located at a distal end of the second control member. The first and second engagement members define first and second needle pockets sized to receive the first and second ends of the needle, respectively. The first and second engagement members each include outer surfaces that preferably taper inwardly in a distal direction.

[0009] In accordance with the teachings of the present disclosure, a method for suturing tissue is provided. The method includes providing an endoscope having a working channel extending therethrough and a tissue grasper sized to extend through the working channel. A medical

device, such as those described above, are connected to the endoscope. A first area of tissue is grasped and located between the first and second arms. The first control member is moved distally to pass needle from the first passageway in the first arm, through the first area of tissue, and into the second passageway of the second arm. A second area of tissue is grasped and located between the first and second arms. The second control member is distally moved to pass needle from the second passageway in the second arm, through the second area of tissue, and into the first passageway of the first arm.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] 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:

FIG. 1 is a plan view of a medical device constructed in accordance with the teachings of the present invention;

; FIG. 2 is a perspective view of an end cap forming a portion of the medical device depicted in FIG. 1;

FIG. 3 is a another plan view of the medical device depicted in FIG. 1;

FIG. 4 is a plan view of a needle forming a portion of the medical device depicted in FIG. 1;

FIG. 5 is an enlarged cross-sectional view taken about the line 5-5 of FIG. 4;

FIG. 6 is a cross-sectional view of a control member forming a portion of the medical device depicted in FIG. 1;

FIG. 7 is a cross-sectional view of the medical device depicted in FIG. 1 and illustrating operation of the device;

FIG. 8 is a cross-sectional view of the medical device depicted in FIG. 1 and illustrating operation of the device;

FIG. 9 is a cross-sectional view of the medical device depicted in FIG. 1 and illustrating operation of the device;

FIG. 10 is a cross-sectional view of the medical device depicted in FIG. 1 and illustrating operation of the device;

FIG. 11 is a plan view of tissue having a perforation being sutured using the medical device depicted in FIGS. 1-10; and

FIG. 12 is a cross-sectional view showing closure of the perforation in tissue depicted in FIG. 11.

DETAILED DESCRIPTION

[0011] The terms "proximal" and "distal" as used herein are intended to have a reference point relative to the user. Specifically, throughout the specification, the terms "distal" and "distally" shall denote a position, direction, or orientation that is generally away from the user, and the terms "proximal" and "proximally" shall denote a position, direction, or orientation that is generally towards the user.

[0012] Turning now to the figures, FIG. 1 depicts a plan view of a medical device 20 for suturing tissue, constructed in accordance with the teachings of the present invention. The medical device 20 is adapted for use with an endoscope 22. The endoscope 22 has a distal end 24 and a working channel 26 extending therethrough. The medical device 20 generally includes an endcap 30 that is configured to be attached to the distal end 22 of the endoscope 22, as depicted in FIG. 1.

[0013] As best seen in FIGS. 1-3, the endcap 30 includes a tubular body 32 defining an interior space 48. The interior space 48 defined by the tubular body 32 and endcap 30 is sized to be frictionally fit on the distal end 24 of the endoscope 22, although other connection means for detachably connecting the endcap 30 to the endoscope 22 would be employed including sleeves, rings, mechanical fasteners, adhesives or other connecting means for attaching an endcap to an endoscope as is well known in the art.

[0014] The endcap also includes a first arm 34 first projecting from the tubular body 32 to a first free end, while similarly a second arm 36 projects from the tubular body 32 to a second free end. A needle 38 is adapted to be passed between the free ends of the first and second arms 34, 36 for suturing the tissue, as will be explained in further detail hereinbelow. First and second sheaths 40, 42 are connected to a proximal end of the tubular body 32 of the endcap proximate the first and second arms 34, 36, respectively. The first and second sheaths 40, 42 slidably receive first and second control members 44, 46 which extend through the sheaths 40, 42 and into the first and second arms 34, 36 for passing the needle 38 back-and-forth between the tissue for suturing the same, for example to close a perforation in the tissue.

[0015] While the medical device 20 has been described as an endcap connected to an endoscope 22, it will be recognized by those skilled in the art that the endoscope can be integrally formed with the medical device. For example, tubular body 32, arms 34, 36, sheaths 40, 42 and the control members 44, 46 slidably contained therein could all be integrally formed in a scope. Likewise, the working channels of an endoscope, or certain lumens of a multi-lumen catheter, could be used to slidably house the control members and link them to the arts 34, 36. These and similar variations will be apparent to those skilled in the art.

[0016] As best seen in FIGS. 2 and 3, the endcap 30 includes a first passageway 50 and a second passageway 52 formed in the first and second arms 34, 36 and the tubular body 32. A distal portion of the first and second passageways 50, 52 (generally the portion corresponding with the first and second arms 34, 36) are curved and have a corresponding curvature. Accordingly, a curved path 54 is formed between the first and second passageways 50, 52, along which the needle 38 may be passed.

In detail, first arm 34 projects to a distal free end defining an end surface 60 and a first port 64 of the first passageway 50. Likewise, the second arm 36 projects to a second free end defining a second end surface 62 defining a second port 66 leading to the second passageway 52. As best seen in FIGS. 2 and 3, the first and second passageways 50, 52 may taper outwardly adjacent their respect ports 64, 66 to facilitate passing the needle therebetween. The distance between the first end surface 60 and first port 64, and second end surface 62 and second port 66, can be measured as a straight line distance D or can be measured as the arcuate path d, and corresponds to the portion of the needle path 54 extending between the first and second arms 34, 36.

[0017] As best seen in FIGS. 4 and 5, the needle 38 is curved between its first end 70 and second end 72. The first and second ends 70, 72 are preferably sharpened to pierce tissue. Between the first and second ends 70, 72, a suture 76 is attached to the needle, for example by passing the suture 76 through a bore in the needle 38 and tying a knot 78. Suitable materials for the needle 38 generally include metals such as stainless steel, alloys such as nitinol, plastics such as polyvinylchloride, polyimide, polyamide, polyetherketone and others known to those skilled in the art. The suture 36 may be connected via a hole or otherwise, using various means such as by tying, knots, adhesives, mechanical connectors (adjustable loops, clamps, etc.), bonding techniques such as plastic welding, melting, heat bonding and the like. Similarly, either the needle 38 or the suture 76 may be mechanically deformed, such as by crimping or using other techniques, to interconnect the suture 76 and needle 38. One end of the suture 76 is attached to the needle 28, while the other end extends proximally along the endoscope or through its working channel.

[0018] It can be seen from FIG. 4 that the needle 38 follows a curved path 78 which corresponds with the curved needle path 54 formed by the first and second passageways 50, 52 in the first and second arms 34, 36 and the space therebetween. Preferably, the needle has a length which can be measured either as an overall straight line length L, or by the arc length l defined by the curvature of the needle 38. While the passageways 50, 52, needle path 54, and needle 38 may have various curvatures, they are preferably all semi-circular in nature. Preferably, the length of the needle (L or l) is greater than the distance (D or d) between the first and second ports 64, 66 defined in the first and second end surfaces 60, 62 of the first and second arms 34, 36. The first and second passageways 50, 52 are sized to slidably receive the needle 38, and thus when the needle 38 is passed between the first and second arms 34, 36, the length of the needle 38 ensures that one or both ends 70, 72 of the needle are always contained within the first or second passageways 50, 52. In this manner, the needle 38 cannot fall out of the medical device 20 or otherwise deviate from the needle path 54 extending between the first and second arms 34, 36. Preferably, the needle 38 is constructed of a rigid material such as a metal (e.g., stainless steel, alloys such as nitinol) or plastics such as polyvinylchloride, polyimide, polyamide, polyetherketone and others known to those skilled in the art. Preferably L is greater than D and more preferably the length L is at least 20% greater than the distance D. Likewise, the length L is preferably greater than the distance d.

[0019] To further facilitate passing of the needle 38 between the first and second arms 34, 36 of the medical device 20, the needle 38 preferably has a polygonal cross-sectional shape, for example the triangular shape shown in FIG. 5. Similarly, the first and second passageways 50, 52 include a corresponding polygonal cross-section to slidably receive the needle 38. Accordingly, the needle 38 will generally not twist or rotate within the passageways 50, 52 and likewise the orientation of the suture 76 connected to the needle 38 is maintained. In this manner, the distal portions of the first and second arms 34, 36 may include slots 56, 58 which extend through the arms 34, 36 and communicate with the first and second passageways 50, 52. As such, the suture 76 may exit the arms 34, 36 via the slots 56, 58 when the needle 38 is substantially contained within the first and second arms 34, 36. The length of the slots 56, 58 is preferably about equal to or greater than one half of the length (L or l) of the needle 38. It will also be recognized that some or all of the suture 76 could also be contained within the first and second passageways 50, 52.

[0020] With reference back to FIGS. 1, 3 and 6, the medical device 20 also preferably includes control members 44, 46 extending through sheaths 40, 42, which are used to pass the needle 38 back and forth between the arms 34, 36. The control members 44, 46 have been depicted in FIG. 6 and generally include a drive wire having sufficient rigidity and strength for longitudinal force transmission, as is generally known in the endoscopic and laparoscopic fields for devices having elongate drive wires. The drive wires may be monofilament or multifilament wires, the latter of which may be wound, braided, woven, wrapped, or otherwise joined to form a wire. See, e.g., U.S. Patent No. 5,330,482.

[0021] The distal end of the control members 44, 46 include an engagement member 80 at their distal ends, the engagement member 80 defining a pocket 82 at the distal end surface which is shaped to receive the sharpened end 70, 72 of the needle 38. Preferably an outer surface of the engagement members 80 are angled and taper inwardly (in the distal direction) to facilitate passing the needle 38 in the control member 44, 46 through the tissue.

[0022] The engagement members 80 may also be formed as grasping devices to grasp onto the needle 38 within the passageways 50, 52. Many such mechanical grasping devices are known in the art, e.g. grasping forceps, clamps, snares, and grasping wires, and similarly electrical, electro-mechanical, and magnetic grasping devices may also be employed. As one example, the engagement members 80 may be comprised as mag-

nets, and the ends of the needle 38 formed of a metal (ferro-magnetic), magnets, or otherwise be magnetized to be firmly retained by the control members 44, 46. With a passive or actuatable grasping device, the needle 38 may be securely retained within one of the passageways 50, 52 while the operator/physician maneuvers the endoscope 22 and/or medical device 20 relative to the tissue T between passes of the needle 38.

[0023] As best seen in FIG. 7, the control members 44, 46 extend through their respective sheaths 40, 42 and through the first and second passageways 50, 52 formed in the tubular body 32 and the first and second arms 34, 36. As shown in FIG. 7, the engagement member 80 of the second control member 46 abuts the second end 72 of the needle 38 which is substantially contained within the second arm 36. According to a method of suturing tissue, in accordance with the teachings of the present disclosure, a tissue grasper 90 is passed through the working channel 26 of the endoscope 22 and used to grasp the tissue. As one example, this may be done when the tissue T has a perforation or opening O therein which needs to be closed. A grasper 90 has been shown in simplified form in FIGS. 7-10, but may be any now known or future device for grasping tissue, including forceps, piercing devices such as cork-screws or forks, graspers, clamps, pinchers, suction devices, anchors or the like.

[0024] As shown in FIG. 7, the tissue T is grasped with the grasping device 90 and drawn into the interior space 48 and between the first and second arms 34, 36 of the medical device 20. Although the needle 38 is shown having a first end 70 slightly exiting the port 66, it may be entirely contained within the second passageway 52, of the second arm 36.

[0025] As shown in FIG. 8, the second control member 46 is advanced distally to pass the needle from the second passageway 52, through a first area of the tissue T, and into the first passageway 50 of the first arm 34 via the first port 64. Notably, as the needle 38 passes through the tissue T, so does the suture 76 attached thereto. As shown in FIG. 9, once the needle 38 has been fully passed through the tissue T, the grasped tissue T can be released and the second control member 46 retracted proximally into the passageway 52. Then, as also shown in FIG. 9, a second area of tissue T may be grasped and drawn into the interior space 48 and between the first and second arms 34, 36. Then, the first control member 44 may be advanced distally to pass the needle from the first passageway 54, through the second area of the tissue T and back into the second passageway 52 of the second arm 36 via the second port 66.

[0026] As best seen in FIG. 10, with these two passes the suture 78 has been placed through two areas of the tissue T around the opening O. The needle 38 may be contained within either of the passageways 50, 52 when moving the medical device 20 between different areas of the tissue, or during introduction or removal of the entire device from the patient. It will also be recognized that medical device 20 of the present invention may be used to weave a suture back and forth around the periphery of an opening O and tissue T so that the free ends of the suture be synched to close the opening O in a purse string fashion.

[0027] In this manner, the suture 78 may be weaved through the tissue T and around the opening O by repeating the above-described steps, as shown in FIG. 11. The suture 36 may follow a generally annular path round the periphery of the opening O, or may criss-cross back and forth from opposing sides of the opening O. In either case, the medical device 20 is withdrawn from the patient, thereby withdrawing the needle 38 and one end of the suture 76. Accordingly, both ends of the suture 76 will be available to the medical professional and may be used to draw the opening O closed, as shown in FIG. 12. Generally, the suture 76 has been passed through the tissue T in a purse-string fashion, whereby pulling proximally on the ends of the suture 76 will naturally cause the opening O to close. The ends of the suture 76 may be tied utilizing endoscopic tying techniques including passing knots, or a suture lock 98 may be employed as is known in the art. Exemplary suture locks are described in U.S Patent Application Nos. US2008/0300629 filed May 22, 2008 and US2009/0069847 filed August 13, 2008.

[0028] Based on the foregoing it will be recognized by those skilled in the art that the medical systems, devices and methods of the present disclosure facilitate improved closure of perforations. The medical systems and devices are simple to operate, and the methods may be performed endoscopically and/or laparoscopically without removing the medical device 20 every time a pass is made through the tissue. The devices and methods offer reliable and controllable placement of suture(s) around a perforation for complete and reliable closure thereof.

[0029] It will also be recognized by those skilled in the art that, while the methods described above generally include placing the suturing tools in tissue through an internal bodily lumen, it will be recognized that the systems, 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 systems, devices and methods can find use in laboratory and industrial settings for placing devices through one or more layers of material that may or may not find application to the human or animal body, and likewise closing holes or perforations in layers of material that are not bodily tissue. Some examples include sewing or stitching and related manufacturing, working with synthetic tissues, connecting or repairing polymeric sheets, animal studies, veterinary applications, and post-mortem activities.

[0030] The foregoing description of various embodiments of the invention has been presented for purposes of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise embodiments disclosed. Numerous modifications or variations are possible within the scope of the appended claims. In

one variation, the distal grip system could be pivotally attached to the endcap and the needle driven through an arc via an actuating mechanism operated at a proximal end of the device. Appropriate guides, supports and the proximal grip system may be designed to pass the needle back and forth between the distal grip system. The embodiments discussed were chosen and described to provide the best illustration of the principles of the invention and its practical application to thereby enable one of ordinary skill in the art to utilize the invention 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 invention as determined by the appended claims.

Claims

1. A medical device for suturing tissue (T), the medical device comprising:

an endcap (30) having

- a tubular body (32) defining an interior space (48) and a longitudinal axis,
- a first arm (34) projecting from the tubular body (32) to a first free end, and
- second arm (36) projecting from the tubular body (32) to a second free end, wherein the first (34) and second (36) arms are spaced laterally apart on opposite sides of the longitudinal axis;

the first arm (34) defining a first passageway (50) having a first port (64) at the first free end, the second arm (36) defining a second passageway (52) having a second port (66) at the second free end, the first (64) and second (66) ports spaced apart a fixed distance (d, D);
a needle (38) having first (70) and second (72) ends shaped to pierce tissue (T), the needle (38) sized to be slidably received within the first (50) and second (52) passageways of the first (34) and second (36) arms, the needle (38) extending over a length (ℓ, L) between the first (70) and second (72) ends, the length (ℓ, L) of the needle (38) being greater than the fixed distance (d, D) between the first (64) and second (66) ports;
a suture (76) attached to the needle (38) between the first (70) and second (72) ends of the needle (38);
a first control member (44) slidably received within the first passageway (50) of the first arm (34) and positioned to engage the first end (70) of the needle (38), distal movement of the first control member (44) moving the needle (38) distally through the first passageway (50); and
a second control member (46) slidably received within the second passageway (52) of the second arm (36) and positioned to engage the second end (72) of the needle (38), distal movement of the second control member (46) moving the needle (38) distally through the second passageway (52);
characterized in that
the medical device further comprises an endoscope (22) having a distal end (24) to which the endcap (30) is connected; and
the first (44) and second (46) control members are elongated and run alongside the endoscope (22).

2. The medical device of claim 1, wherein the first (50) and second (52) passageways follow a curved path (54), and wherein the needle (38) is curved.

3. The medical device of claim 2, wherein the needle (38) follows a needle path between the first (34) and second (36) arms, the needle path being curved and corresponding to the curvature of the needle (38).

4. The medical device of claim 2, wherein the curved paths (54) of the first (50) and second (52) passageways are semi-circular, and wherein the needle (38) is semi-circular.

5. The medical device of claim 1, wherein the needle (38) has a cross-sectional shape that is polygonal, and wherein the first (50) and second (52) passageways have a polygonal cross-sectional shape.

6. The medical device of claim 5, wherein the needle (38) has a triangular cross-sectional shape.

7. The medical device of claim 1, wherein the first end of the first arm (34) includes a first slot (56) extending through the first arm (34) to the first passageway (50), the first slot (56) sized to receive the suture (76), and wherein the second end of the second arm (36) includes a second slot (58) extending through the second arm (36) to the second passageway (52), the second slot (58) sized to receive the suture (76).

8. The medical device of claim 7, wherein the first (56) and second (58) slots each span a length greater than or equal to one half of the length (ℓ, L) of the needle (38).

9. The medical device of claim 1, further comprising a first engagement member (80) located at a distal end of the first control member (44) and a second engagement member (80) located at a distal end of the second control member (46), the first and second engagement members (80) defining first and second needle pockets (82) sized to receive the first (70) and second (72) ends of the needle (38), respective-

ly.

10. The medical device of claim 9, wherein the first and second engagement members (80) each include outer surfaces that taper inwardly in a distal direction.

11. The medical device of claim 1, wherein the interior space (48) and both ports (64, 66) can be visualized with the endoscope (22).

12. The medical device of claim 1, wherein the first (50) and second (52) passageways extend longitudinally through the tubular body (32) to a proximal end of the tubular body (32).

13. The medical device of claim 1, further comprising first (40) and second (42) sheaths slidably receiving the first (44) and second (46) control members, respectively, the first (40) and second (42) sheaths connected to the proximal end of the tubular body (32) and in communication with the first (50) and second (52) passageways, respectively.

14. The medical device of claim 1, wherein the endoscope (22) has a working channel (26) extending therethrough, and further comprising a tissue grasper (90) sized to extend through the working channel (26) and configured to grasp tissue (T) and draw the tissue (T) into the interior space (48) of the tubular body (32) and between the first (34) and second (36) arms.

15. The medical device of claim 1, wherein the first (44) and second (46) control members comprise elongated drive wires.

Patentansprüche

1. Medizinische Vorrichtung zum Nähen von Gewebe (T) mit:

einer Endkappe (30), die aufweist

- einen rohrförmigen Körper (32), der einen inneren Raum (48) und eine Längsachse definiert,
- einen ersten Arm (34), der vom rohrförmigen Körper (32) zu einem ersten freien Ende hin abragt, und
- einen zweiten Arm (36), der vom rohrförmigen Körper (32) zu einem zweiten freien Ende hin abragt,

wobei der erste (34) und zweite (36) Arm seitlich voneinander beabstandet auf gegenüberliegenden Seiten der Längsachse angeordnet sind;
wobei der erste Arm (34) einen ersten Durchgang (50) mit einer ersten Öffnung (64) am ersten freien Ende definiert und der zweite Arm (36) einen zweiten Durchgang (52) mit einer zweiten Öffnung (66) am zweiten freien Ende definiert, wobei die erste (64) und die zweite (66) Öffnung beabstandet in einem festen Abstand (d, D) angeordnet sind;
einer Nadel (38) mit einem ersten (70) und zweiten (72) Ende, die geformt sind, um Gewebe (T) zu durchstechen, wobei die Nadel (38) groß genug ist, um in dem ersten (50) und zweiten (52) Durchgang des ersten (34) und zweiten (36) Arms verschiebbar aufgenommen zu werden, wobei die Nadel (38) sich über eine Länge (I, L) zwischen dem ersten (70) und zweiten (72) Ende erstreckt, wobei die Länge (I, L) der Nadel (38) größer ist als der feste Abstand (d, D) zwischen der ersten (64) und zweiten (66) Öffnung;
einem Faden (76), der an der Nadel (38) zwischen dem ersten (70) und zweiten (72) Ende der Nadel (38) befestigt ist;
einem ersten Steuerelement (44), das verschiebbar innerhalb des ersten Durchgangs (50) des ersten Arms (34) aufgenommen ist und angeordnet ist, um das erste Ende (70) der Nadel (38) zu ergreifen, wobei die distale Bewegung des ersten Steuerelements (44) die Nadel (38) distal durch den ersten Durchgang (50) bewegt; und
einem zweiten Steuerelement (46), das verschiebbar innerhalb des zweiten Durchgangs (52) des zweiten Arms (36) aufgenommen ist und angeordnet ist, um das zweite Ende (72) der Nadel (38) zu ergreifen, wobei die distale Bewegung des zweiten Steuerelements (46) die Nadel (38) distal durch den zweiten Durchgang (52) bewegt;
dadurch gekennzeichnet, dass
die medizinische Vorrichtung weiterhin ein Endoskop (22) mit einem distalen Ende (24) umfasst, mit dem die Endkappe (30) verbunden ist; und
das erste (44) und zweite (46) Steuerelement länglich sind und entlang des Endoskops (22) verlaufen.

2. Medizinische Vorrichtung nach Anspruch 1, wobei der erste (50) und zweite (52) Durchgang einer gekrümmten Bahn (54) folgen und wobei die Nadel (38) gekrümmt ist.

3. Medizinische Vorrichtung nach Anspruch 2, wobei die Nadel (38) einer Nadelbahn zwischen dem ersten (34) und zweiten (36) Arm folgt, wobei die Nadelbahn entsprechend der Krümmung der Nadel (38) gekrümmt ist.

4. Medizinische Vorrichtung nach Anspruch 2, wobei

die gekrümmten Bahnen (54) des ersten (50) und zweiten (52) Durchgangs halbkreisförmig sind und wobei die Nadel (38) halbkreisförmig ist.

5. Medizinische Vorrichtung nach Anspruch 1, wobei die Nadel (38) einen polygonalen Querschnitt aufweist und wobei der erste (50) und zweite (52) Durchgang einen polygonalen Querschnitt aufweisen.

6. Medizinische Vorrichtung nach Anspruch 5, wobei die Nadel (38) einen dreieckigen Querschnitt aufweist.

7. Medizinische Vorrichtung nach Anspruch 1, wobei das erste Ende des ersten Arms (34) eine Aussparung (56) aufweist, die sich durch den ersten Arm (34) zum ersten Durchgang (50) erstreckt, wobei die erste Aussparung (56) groß genug ist, um den Faden (76) aufzunehmen, und wobei das zweite Ende des zweiten Arms (36) eine zweite Aussparung (58) aufweist, die sich durch den zweiten Arm (36) zum zweiten Durchgang (52) erstreckt, wobei die zweite Aussparung (58) groß genug ist, um den Faden (76) aufzunehmen.

8. Medizinische Vorrichtung nach Anspruch 7, wobei die erste (56) und zweite (58) Aussparung sich jeweils über eine Länge größer oder gleich der halben Länge (I, L) der Nadel (38) erstrecken.

9. Medizinische Vorrichtung nach Anspruch 1, weiterhin mit einem ersten Eingriffselement (80), das am distalen Ende des ersten Steuerelements (44) angeordnet ist, und einem zweiten Eingriffselement (80), das am distalen Ende des zweiten Steuerelements (46) angeordnet ist, wobei die ersten und zweiten Eingriffselemente (80) erste und zweite Nadeltaschen (82) definieren, die groß genug sind, um jeweils das erste (70) und zweite (72) Ende der Nadel (38) aufzunehmen.

10. Medizinische Vorrichtung nach Anspruch 9, wobei die ersten und zweiten Eingriffselemente (80) jeweils äußere Oberflächen aufweisen, die in eine distale Richtung konisch nach innen zulaufen.

11. Medizinische Vorrichtung nach Anspruch 1, wobei der innere Raum (48) und beide Öffnungen (64, 66) mit dem Endoskop (22) visualisierbar sind.

12. Medizinische Vorrichtung nach Anspruch 1, wobei sich der erste (50) und zweite (52) Durchgang in Längsrichtung durch den rohrförmigen Körper (32) zu einem proximalen Ende des rohrförmigen Körpers (32) erstrecken.

13. Medizinische Vorrichtung nach Anspruch 1, weiterhin mit ersten (40) und zweiten (42) Mänteln, die jeweils das erste (44) und zweite (46) Steuerelement verschiebbar aufnehmen, wobei der erste (40) und zweite (42) Mantel mit dem proximalen Ende des rohrförmigen Körpers (32) verbunden sind und jeweils mit dem ersten (50) und zweiten (52) Durchgang in Verbindung stehen.

14. Medizinische Vorrichtung nach Anspruch 1, wobei das Endoskop (22) einen Arbeitskanal (26) aufweist, der sich durch es hindurch erstreckt, und weiterhin einen Gewebegreifer (90) aufweist, der groß genug ist, um sich durch den Arbeitskanal (26) zu erstrecken, und der dazu geeignet ist, Gewebe (T) zu greifen und das Gewebe (T) in den inneren Raum (48) des rohrförmigen Körpers (32) und zwischen den ersten (34) und den zweiten (36) Arm zu ziehen.

15. Medizinische Vorrichtung nach Anspruch 1, wobei das erste (44) und zweite (46) Steuerelement längliche Steuerdrähte umfassen.

Revendications

1. Dispositif médical destiné à la suture de tissu (T), le dispositif médical comportant :

un capuchon d'extrémité (30) présentant un corps (32) tubulaire délimitant un espace (48) intérieur et un axe longitudinal ;
un premier bras (34) faisant saillie depuis le corps (32) tubulaire vers une première extrémité libre, et
un second bras (36) faisant saillie depuis le corps (32) tubulaire vers une seconde extrémité libre, les premier (34) et second (36) bras étant espacés latéralement sur des côtés opposés de l'axe longitudinal ;
le premier bras (34) délimitant une première voie de passage (50) présentant un premier orifice (64) au niveau de la première extrémité libre, le second bras (36) délimitant une seconde voie de passage (52) présentant un second orifice (66) au niveau de la seconde extrémité libre, les premier (64) et second (66) orifices étant espacés d'une distance (d, D) fixe ;
une aiguille (38) présentant des première (70) et seconde (72) extrémités formées pour perforer du tissu (T), l'aiguille (38) étant dimensionnée pour être reçue coulissante à l'intérieur des première (50) et seconde (52) voies de passage des premier (34) et second (36) bras, l'aiguille (38) s'étendant sur une longueur (ℓ, L) entre les première (70) et seconde (72) extrémités, la longueur (ℓ, L) de l'aiguille (38) étant supérieure à la distance (d, D) fixe entre les premier (64) et second (66) orifices ;
une suture (76) fixée à l'aiguille (38) entre les

première (70) et seconde (72) extrémités de l'aiguille (38) ;

un premier organe (44) de commande reçu coulissant à l'intérieur de la première voie de passage (50) du premier bras (34) et positionné pour mettre en prise la première extrémité (70) de l'aiguille (38), le déplacement distal du premier organe (44) de commande déplaçant l'aiguille (38) distalement dans la première voie de passage (50) ; et

un second organe (46) de commande reçu coulissant à l'intérieur de la seconde voie de passage (52) du second bras (36) et positionné de manière à mettre en prise la seconde extrémité (72) de l'aiguille (38), le déplacement distal du second organe (46) de commande déplaçant l'aiguille (38) distalement dans la seconde voie de passage (52) ;

caractérisé en ce que

le dispositif médical comporte en outre un endoscope (22) présentant une extrémité (24) distale à laquelle est relié le capuchon d'extrémité (30) ; et

les premier (44) et second (46) organes de commande sont allongés et s'étendent le long de l'endoscope (22).

2. Dispositif médical selon la revendication 1, les première (50) et seconde (52) voies de passage suivant un chemin (54) courbe, et l'aiguille (38) étant courbe.

3. Dispositif médical selon la revendication 2, l'aiguille (38) suivant un chemin d'aiguille entre les premier (34) et second (36) bras, le chemin d'aiguille étant courbe et correspondant à la courbure de l'aiguille (38).

4. Dispositif médical selon la revendication 2, les chemins (54) courbes des première (50) et seconde (52) voies de passage étant semi-circulaires, et l'aiguille (38) étant semi-circulaire.

5. Dispositif médical selon la revendication 1, l'aiguille (38) ayant une forme en coupe transversale qui est polygonale, et les première (50) et seconde (52) voies de passage ayant une forme en coupe transversale qui est polygonale.

6. Dispositif médical selon la revendication 5, l'aiguille (38) ayant une forme en coupe transversale qui est triangulaire.

7. Dispositif médical selon la revendication 1, la première extrémité du premier bras (34) comprenant une première fente (56) s'étendant dans le premier bras (34) vers la première voie de passage (50), la première fente (56) étant dimensionnée pour recevoir la suture (76), et la seconde extrémité du second bras (36) comprenant une seconde fente (58) s'étendant dans le second bras (36) vers la seconde voie de passage (52), la seconde fente (58) étant dimensionnée pour recevoir la suture (76).

8. Dispositif médical selon la revendication 7, les première (56) et seconde (58) fentes couvrant chacune une longueur supérieure ou égale à la moitié de la longueur (ℓ, L) de l'aiguille (38).

9. Dispositif médical selon la revendication 1, comportant en outre un premier organe (80) de mise en prise situé au niveau d'une extrémité distale du premier organe (44) de commande et un second organe (80) de mise en prise situé au niveau d'une extrémité distale du second organe (46) de commande, les premier et second organes (80) de mise en prise délimitant des première et seconde poches (82) d'aiguille dimensionnées pour recevoir respectivement les première (70) et seconde (72) extrémités de l'aiguille (38).

10. Dispositif médical selon la revendication 9, les premier et second organes (80) de mise en prise comprenant chacun des surfaces externes qui diminuent progressivement vers l'intérieur dans une direction distale.

11. Dispositif médical selon la revendication 1, l'espace (48) intérieur et les deux orifices (64, 66) pouvant être visualisés avec l'endoscope (22).

12. Dispositif médical selon la revendication 1, les première (50) et seconde (52) voies de passage s'étendant longitudinalement dans le corps (32) tubulaire vers une extrémité proximale du corps (32) tubulaire.

13. Dispositif médical selon la revendication 1, comportant en outre des première (40) et seconde (42) gaines recevant respectivement de manière coulissante les premier (44) et second (46) organes de commande, les première (40) et seconde (42) gaines étant reliées à l'extrémité proximale du corps (32) tubulaire et en communication avec respectivement les première (50) et seconde (52) voies de passage.

14. Dispositif médical selon la revendication 1, l'endoscope (22) présentant un canal (26) de travail s'étendant à travers ce dernier, et comportant en outre un élément de préhension (90) de tissu dimensionné pour s'étendre dans le canal (26) de travail et configuré pour prendre le tissu (T) et tirer le tissu (T) dans l'espace (48) intérieur du corps (32) tubulaire et entre les premier (34) et second (36) bras.

15. Dispositif médical selon la revendication 1, les premier (44) et second (46) organes de commande comportant des fils métalliques d'entraînement allongés.

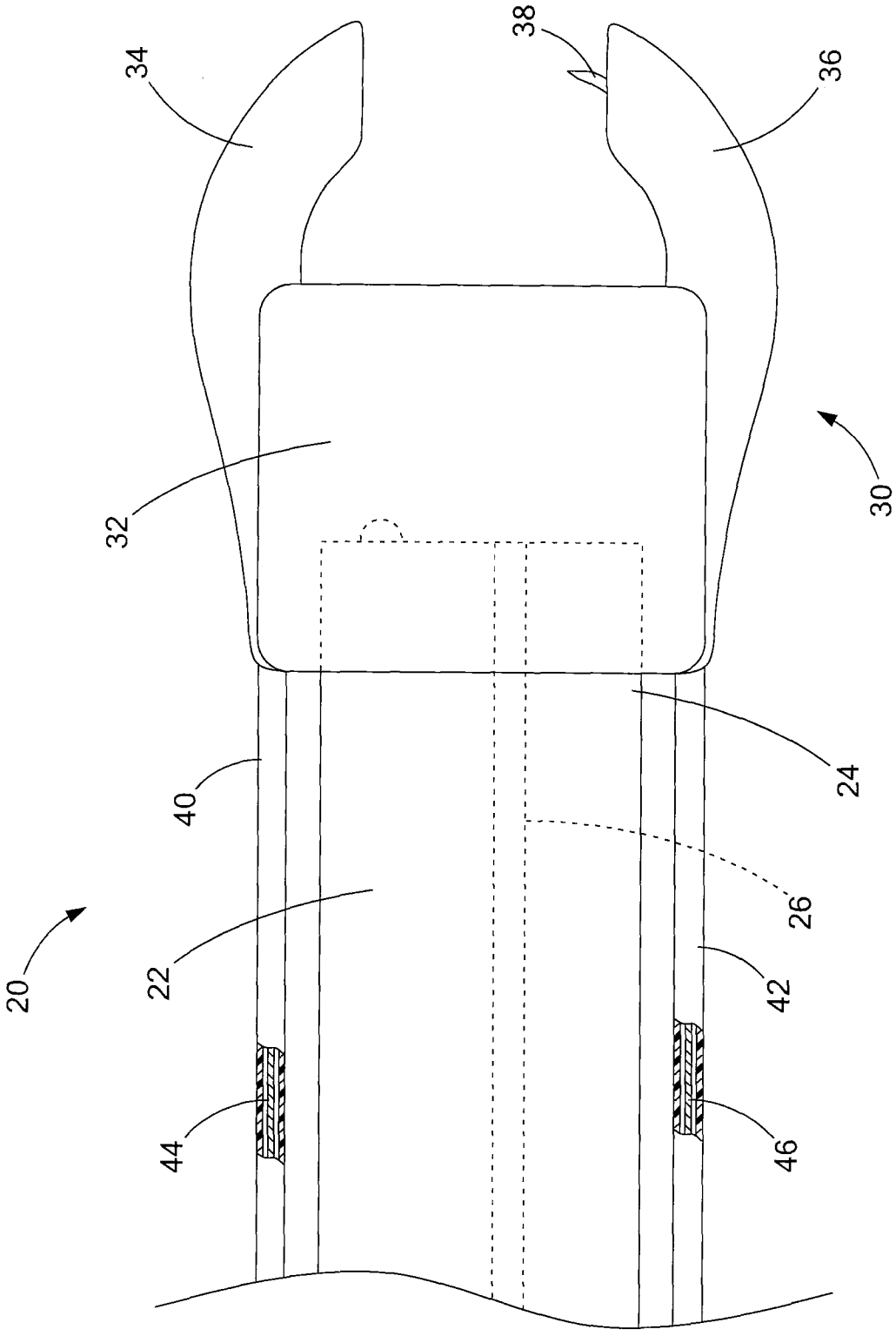

FIG. 1

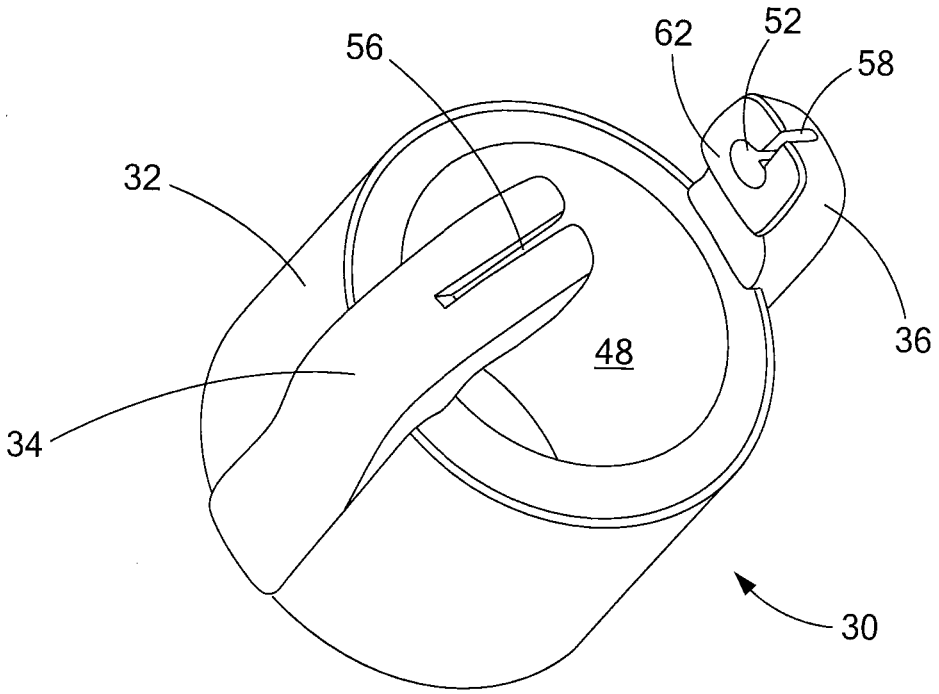

FIG. 2

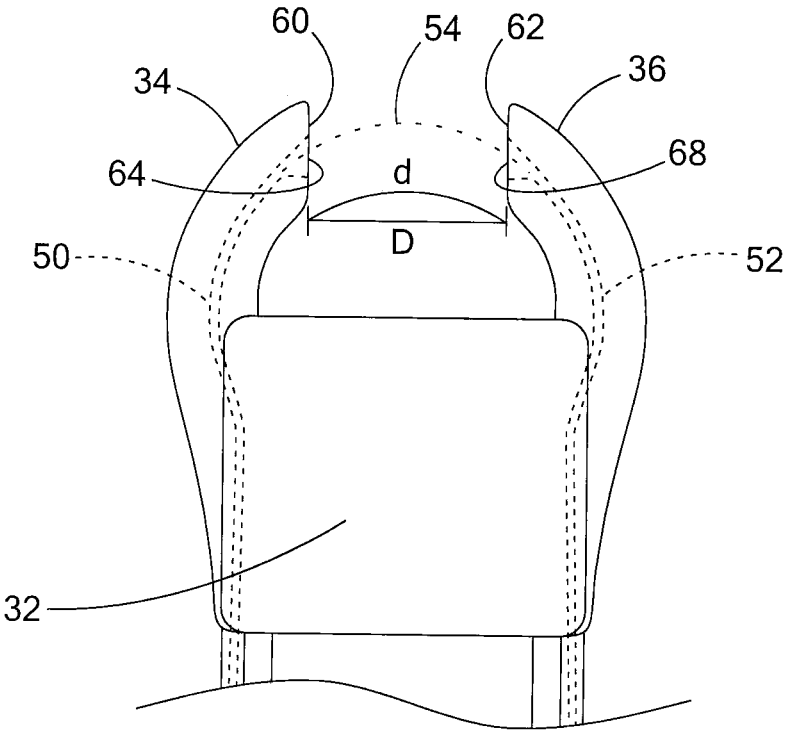

FIG. 3

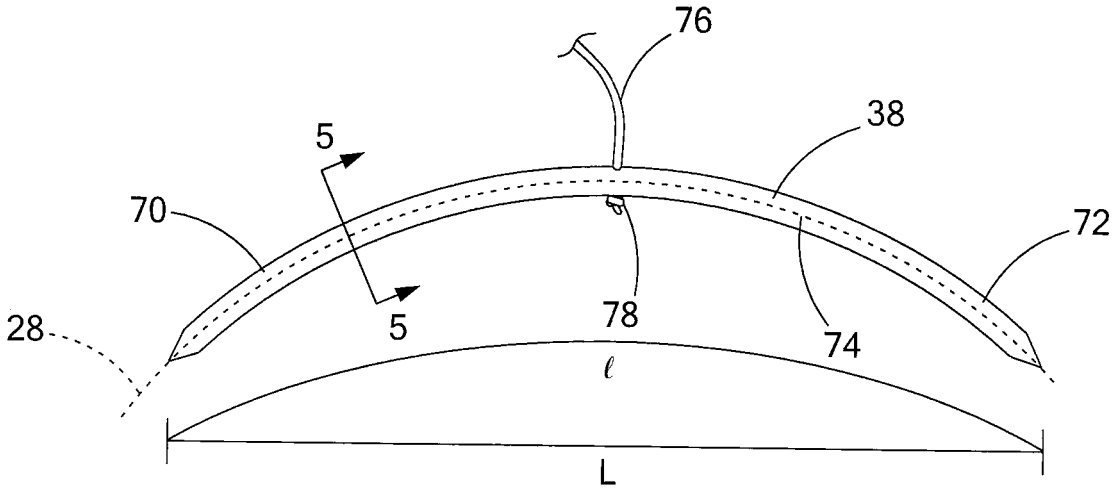

FIG. 4

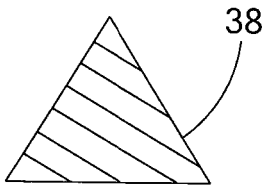

FIG. 5

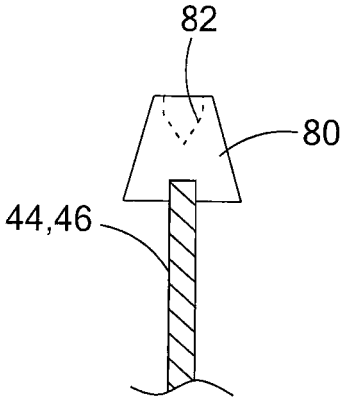

FIG. 6

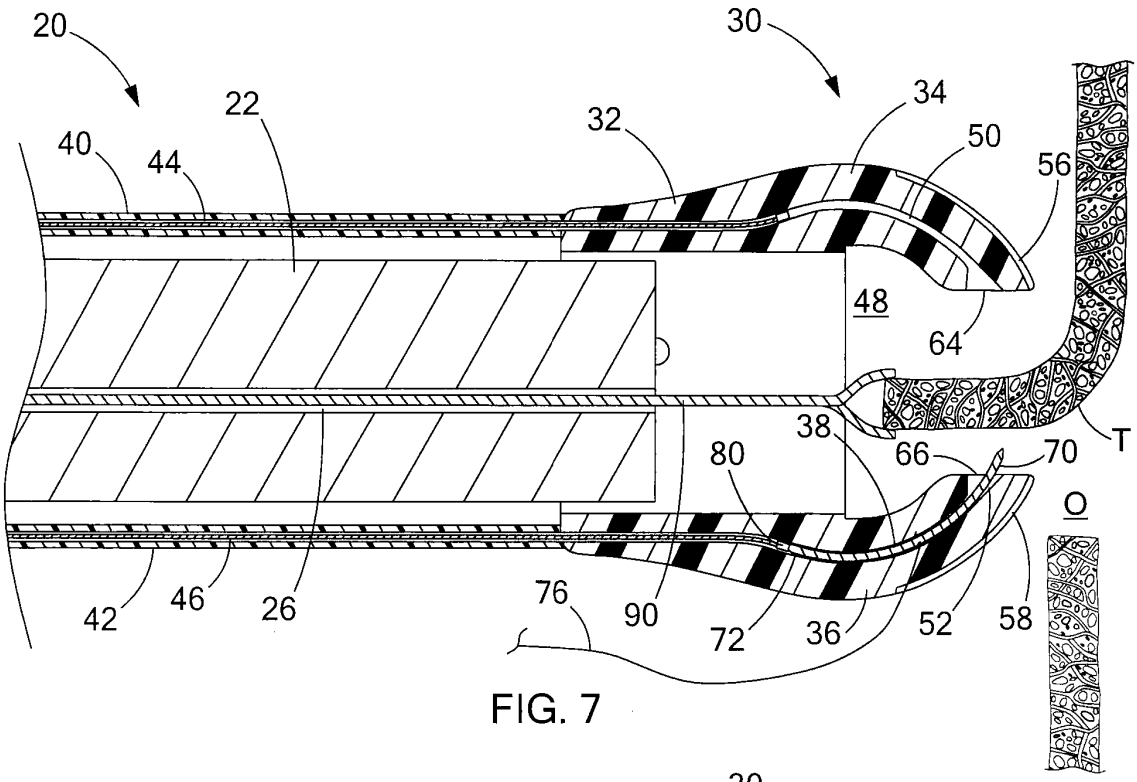
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FIG. 7

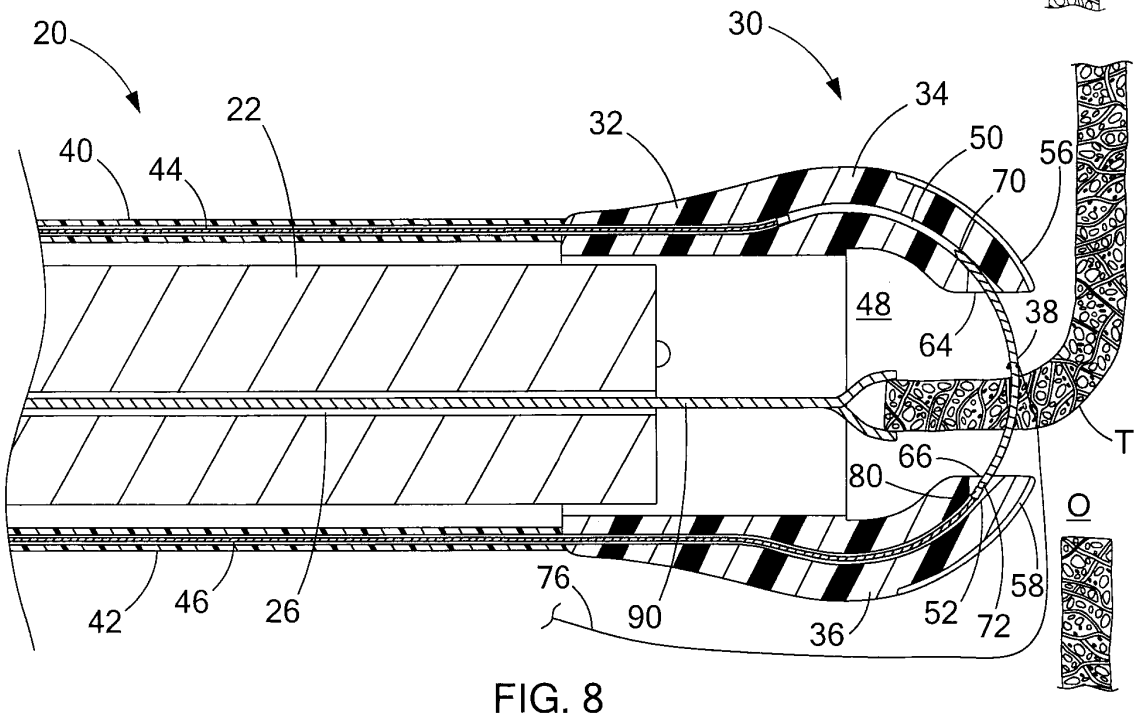
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FIG. 8

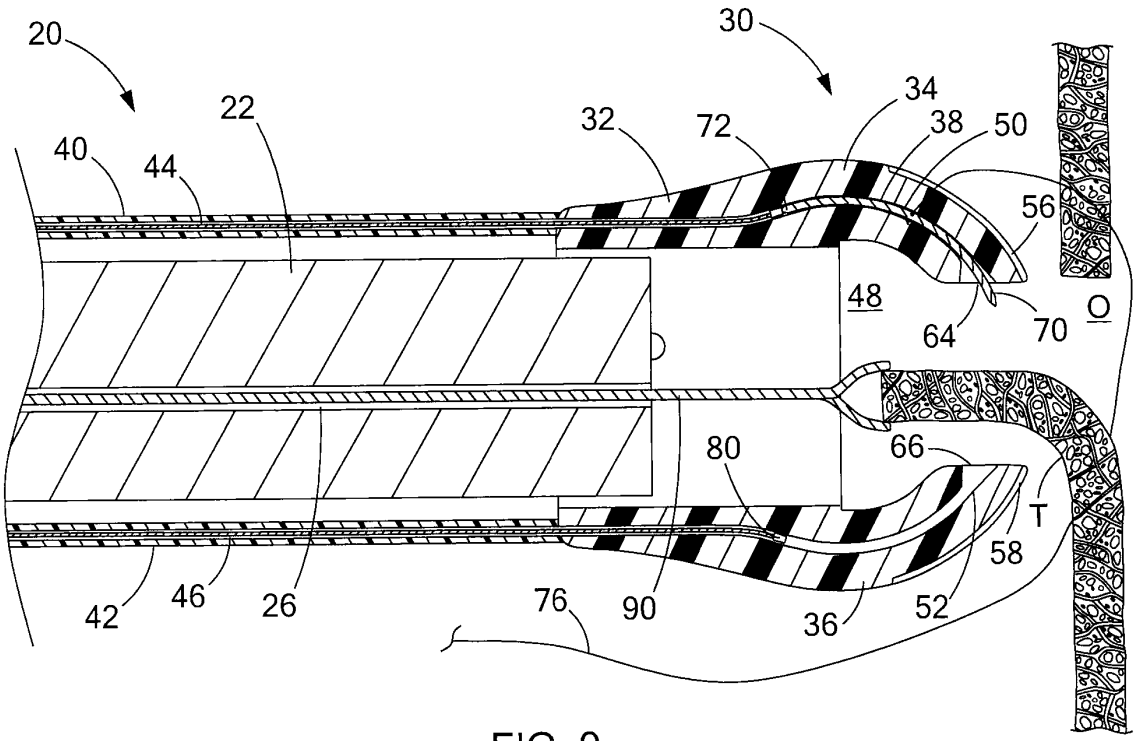
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FIG. 9

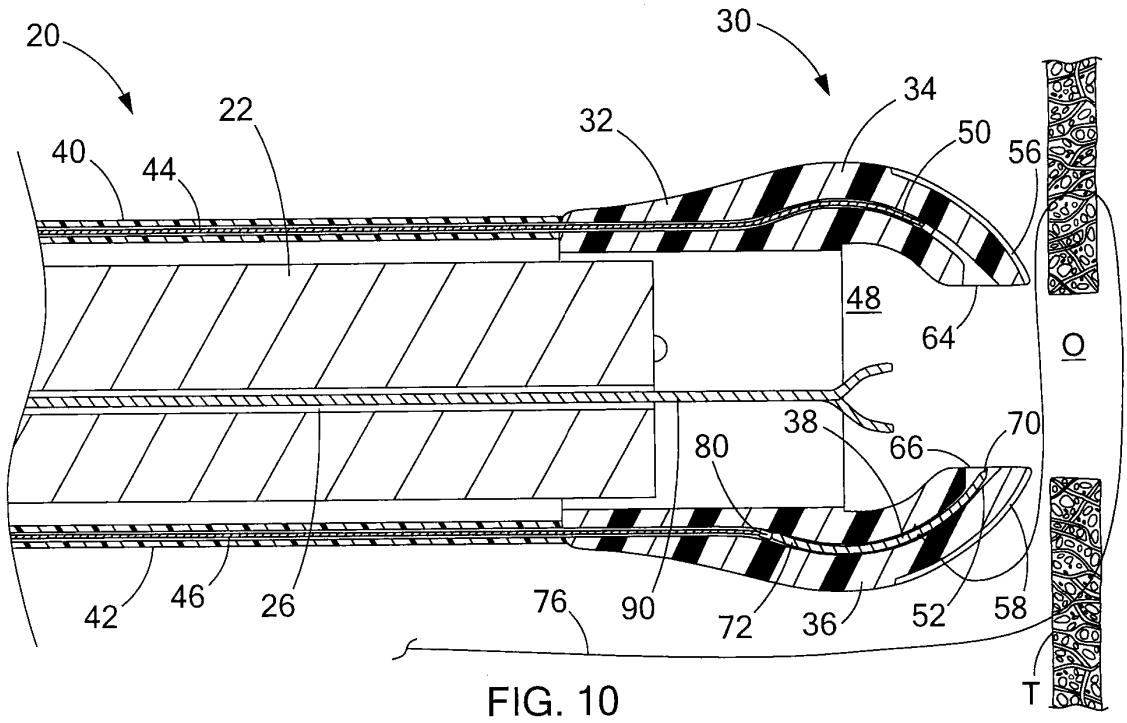
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FIG. 10

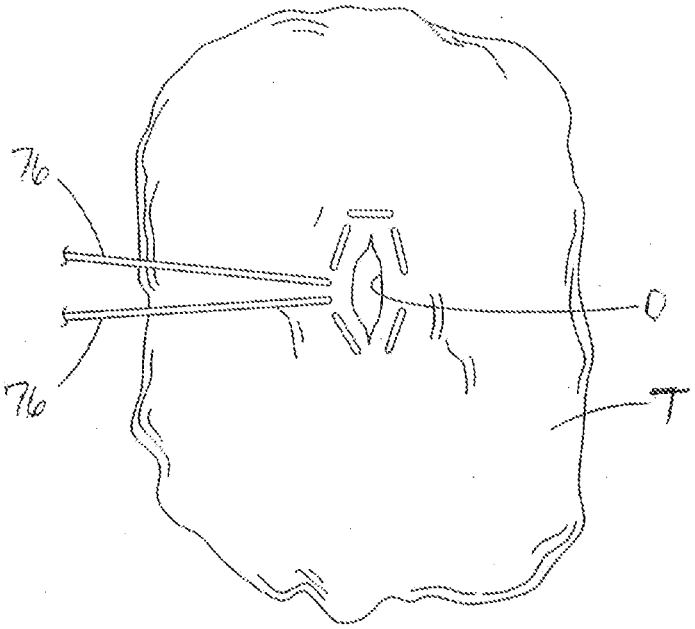

FIG. 11

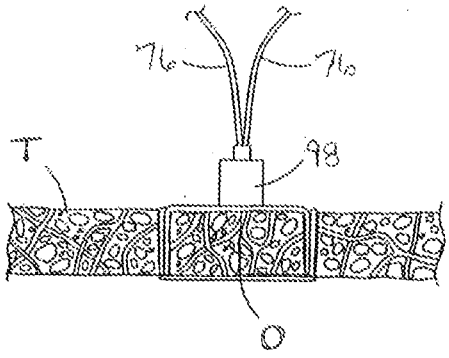

FIG. 12

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 2007030753 A **[0005]**
- US 5330482 A **[0020]**
- US 20080300629 A **[0027]**
- US 20090069847 A **[0027]**

专利名称(译)	用于缝合组织的医疗装置和方法		
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申请号	EP2010803185	申请日	2010-12-17
[标]申请(专利权)人(译)	库克医学技术有限责任公司		
申请(专利权)人(译)	库克医疗技术有限责任公司		
当前申请(专利权)人(译)	库克医疗技术有限责任公司		
[标]发明人	MCLAWHORN TYLER EVANS DUCHARME RICHARD W		
发明人	MCLAWHORN, TYLER, EVANS DUCHARME, RICHARD, W.		
IPC分类号	A61B17/062 A61B17/04 A61B17/29 A61B17/00 A61B17/06		
CPC分类号	A61B17/0625 A61B17/0469 A61B17/0482 A61B17/0487 A61B17/29 A61B2017/00296 A61B2017/06019 A61B2017/06047 A61B2017/0609		
优先权	61/289275 2009-12-22 US		
其他公开文献	EP2515767A1		
外部链接	Espacenet		

摘要(译)

公开了用于缝合组织的医疗装置和方法，其可以通过内窥镜和/或腹腔镜使用，并且提供围绕穿孔的缝合线的简单，可靠和可控的放置，以完全闭合。医疗系统（20）的一个实施例通常包括具有第一（34）和第二（36）臂的端盖（30），针，缝合线（76），以及第一和第二控制构件（44,46）。第一和第二控制构件用于使针在第一和第二臂之间来回穿过。

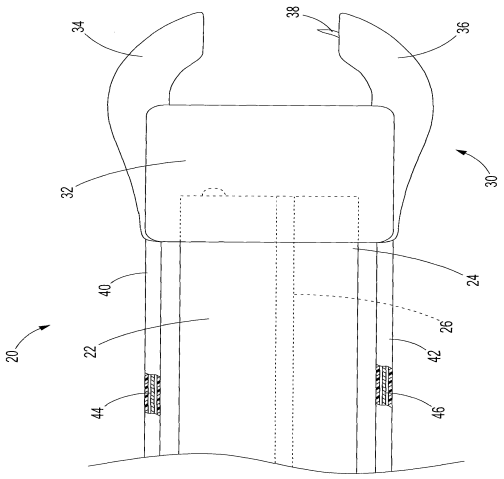

FIG. 1