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(54) DIAGNOSTIC OR TREATMENT TOOL FOR COLONOSCOPY

DIAGNOSE- ODER BEHANDLUNGSWERKZEUG FÜR KOLONOSKOPIE

OUTIL DE DIAGNOSTIC OU DE TRAITEMENT POUR COLONOSCOPIE

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US-A1- 2005 165 272
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Description

CROSS-REFERENCES TO RELATED APPLICATIONS

[0001] The present application claims priority from US Provisional Patent Application 60/881,036 to Cabiri et al., filed January 17, 2007, entitled, "Diagnostic or treatment tool for colonoscopy".

FIELD OF THE INVENTION

[0002] The present invention relates generally to endoscopic tools, and specifically to treatment and diagnostic tools suitable for use in the gastrointestinal (GI) tract.

BACKGROUND OF THE INVENTION

[0003] Many imaging and biopsy techniques are known for producing medical images and taking samples from body lumens, such as the gastrointestinal (GI) tract. For example, endoscopy is widely used for observing, photographing tissue, and taking specimens from lesions. In a conventional method of examining a colon, for example, a colonoscope is manually inserted into the colon, and manipulated so as to allow viewing of some or all of the colon. If it is desired to biopsy tissue, a biopsy tool is advanced through a working channel of the colonoscope until it emerges from the distal end of the colonoscope, and appears in the viewing field of an imaging system of the colonoscope. The distal end of the colonoscope is rotated by the physician until the biopsy tool is suitably positioned to allow the tissue to be excised. The excised tissue is then sent for laboratory analysis.

[0004] PCT Patent Publication WO 05/065044 to Cabiri et al., which is assigned to the assignee of the present patent application, describes apparatus for use with a biologically-compatible-fluid pressure source, the apparatus including an elongate carrier, adapted to be inserted through a proximal opening of a body lumen, and a piston head coupled to a distal portion of the carrier. The piston head is adapted to form a pressure seal with a wall of the lumen after the carrier has been inserted into the lumen. The piston head is advanced distally through the body lumen in response to pressure from the fluid pressure source. The apparatus is configured to facilitate distal advancement of the piston head by facilitating passage of fluid out of the lumen from a site within the lumen distal to the piston head. The apparatus additionally includes an optical system, coupled to the carrier in a vicinity of the distal portion, the optical system having distal and proximal ends. The optical system includes an image sensor, positioned at the proximal end of the optical system; an optical member having distal and proximal ends, and shaped so as to define a lateral surface, at least a distal portion of which is curved, configured to provide omnidirectional lateral viewing; and a convex mirror, coupled to the distal end of the optical member, wherein the optical member and the mirror have respective rotational shapes about a common rotation axis. In an embodiment, a sufficient net pressure force results in distal movement of the piston head along with the elongate carrier and a tool. The tool may comprise an imaging device, a biopsy device, or other apparatus to be used in the body lumen.

[0005] US Patent 6,296, 608 to Daniels et al. describes a catheter for diagnosing and performing an interventional procedure on tissue. The catheter has an elongated catheter shaft, and optical fibers, extending through the catheter shaft. The optical fibers transmit light to tissue located at a distal end of the catheter and convey light back from the tissue for analysis by a spectroscopic diagnosis system to determine whether an interventional procedure should be performed on the tissue. An interventional device is located at the distal end of the catheter for engaging tissue diagnosed by the spectroscopic diagnosis system in order to perform the interventional procedure on the tissue. An assembly for imaging and performing an interventional procedure on tissue has an endoscope in combination with an endoscopically insertable catheter. The endoscopically insertable catheter has an ultrasound imaging device for imaging a tissue structure located at a distal end of the endoscope so as to enable the depth of penetration of the tissue structure to be displayed. The endoscopically insertable catheter has an endoscopically insertable interventional device for engaging the tissue structure imaged by the ultrasound imaging device.

[0006] The following references may be of interest:

PCT WO 01/68540 to Friend
PCT WO 02/059676 to Gal
PCT WO 02/075348 to Gal
PCT WO 03/026272 to Gal
PCT WO 03/045487 to Gobel
PCT WO 03/046830 to Gal
PCT WO 03/054625 to Gal
PCT WO 03/096078 to Gal
PCT WO 04/008185 to Gal
PCT WO 04/042428 to Gal
PCT WO 04/069057 to Gobel
US 2002/0012059 to Wallerstein
US 2002/0107478 to Wendlandt
US 2002/0109772 to Kuriyama
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US 2003/0000526 to Gobel
US 2003/0052324 to Kimura
US 2003/0083547 to Hamilton
US 2003/0105386 to Voloshin
US 2003/0168068 to Poole
US 2003/0191369 to Arai
US 2004/0004836 to Dubuc
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US 2006/0164733 to Gal
US 4,012,126 to Rosendahl
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US 4,148,307 to Utsugi
US 4,176,662 to Frazer
US 4,403,985 to Boretos
US 4,647,761 to Cojan
US 4,690,131 to Lyddy, Jr.
US 4,714,075 to Krauter
US 4,976,524 to Chiba
US 5,259,364 to Bob
US 5,337,732 to Grundfest
US 5,473,474 to Powell
US 5,502,592 to Jamieson
US 5,662,587 to Grundfest
US 5,739,852 to Richardson
US 5,882,108 to Fraizer
US 5,906,591 to Dario
US 5,920,376 to Bruckstein
US 6,007,482 to Madni
US 6,028,719 to Beckstead
US 6,115,193 to Shu
US 6,157,018 to Ishiguro
US 6,222,683 to Hoogland
US 6,304,285 to Geng
US 6,333,826 to Charles
US 6,341,044 to Driscoll, Jr.
US 6,356,296 to Driscoll, Jr.
US 6,373,642 to Wallerstein
US 6,375,366 to Kato
US 6,388,820 to Wallerstein
US 6,424,377 to Driscoll, Jr.
US 6,449,103 to Charles
US 6,459,451 to Driscoll, Jr.
US 6,485,409 to Voloshin
US 6,493,032 to Wallerstein
US 6,503,192 to Ouchi
US 6,597,520 to Wallerstein
US 6,611,282 to Trubko
US 6,646,818 to Doi
US 6,702,735 to Kelly
US 6,704,148 to Kumata

[0007] The following references may also be of interest:

US 2005/0197531 to Cabiri describes an apparatus including a carrier and a piston head coupled to a distal portion of the carrier and adapted to form a pressure seal with a wall of a body lumen and to be advanced distally in the body lumen in response to fluid pressure applied inside the body lumen.

US 2005/0165272 to Okada describes an endoscpoe system having an insertion section for insertion into a body cavity, an introducer for performing treatment in the body cavity, and a capsule endoscope having an observation optical system used in combination with the introducer.

EP 1,586,275 to Olympus describes an endoscope having a plurality of mutually joined introduction guide tubes for introducing a treatment tool into a body cavity, such that effects caused by the movement of the plurality of the introduction guide tubes are mutually invalidated at a joint portion as a fulcrum, so that the position of the introduction guide tube is relatively stabilized in the body cavity.

SUMMARY OF THE INVENTION

[0008] In the present invention, an apparatus is provided comprising an endoscope for use in a gastrointestinal tract of a patient. The apparatus comprises an inflatable device, which is configured to be moved by fluid pressure through the gastrointestinal tract towards a treatment site. An optical system is coupled to the inflatable device, and images the gastrointestinal tract, in order to enable a physician to determine if a region being imaged by the optical system includes a target tissue that should be biopsied, examined, and/or treated. If so, a suitable tool is advanced through a working channel that is coupled to the inflatable device. The tool is configured to be passed through a channel lumen of the working channel, and to emerge from a distal end of the working channel. The tool comprises a tool steering mechanism to facilitate steering of the tool from outside of the patient.

[0009] The tool steering mechanism is typically controllable using techniques known in the art for transvascular or other intra-body steering of a tool or other longitudinal member, and may be controlled manually or robotically. Once the tool has exited the working channel, the steering mechanism of the tool typically enables the tool to be steered towards the target tissue even in the absence of any steering that may be provided by other portions of the apparatus (e.g., steering that may tilt the working channel towards the target tissue). For some applications, the working channel is not tilted at all to bring the tool nearer to the target tissue.

[0010] The endoscope typically (but not necessarily) comprises an omnidirectional optical system. Use of a tool with a tool steering mechanism, as described herein, is particularly suitable for use with a guide having an omnidirectional optical system, because the omnidirectional optical system can remain generally stationary, providing full omnidirectional imaging, while the tool with the tool steering mechanism moves independently, in order to interact with tissue anywhere in the field of view of the omnidirectional optical system, in a manner desired by the physician.

[0011] There is therefore provided an apparatus for use in a gastrointestinal tract of a patient in accordance with the independent claim. Further implementations are given by the dependent claims.

[0012] The present invention will be more fully understood from the following detailed description of embodiments thereof, taken together with the drawings, in which:

BRIEF DESCRIPTION OF THE DRAWINGS

[0013]

Fig. 1 is a schematic illustration of apparatus for performing a biopsy, not forming part of the present invention;

Fig. 2 is a cross-sectional illustration of the apparatus of Fig. 1, not forming part of the present invention;

Fig. 3 is an illustration of the apparatus of Fig. 1, not forming part of the present invention; and

Fig. 4 is a schematic illustration of a supply cable for the apparatus of Fig. 1, in accordance with an embodiment of the present invention.

DETAILED DESCRIPTION OF EMBODIMENTS

[0014] Reference is made to Figs. 1 and 2, which are a schematic illustration and a cross-sectional illustration, respectively, of apparatus 20 for performing a biopsy, not forming part of the present invention. A biopsy is shown by way of illustration and not limitation, and the scope of the present invention includes apparatus for performing other procedures, such as treatment or diagnostic procedures. Apparatus 20 is inserted into and advanced through a gastrointestinal tract 40 of a patient, typically using techniques described in PCT Patent Publication WO 05/065044 to Cabiri et al. Apparatus 20 comprises an inflatable device 22, which is configured to be moved through the gastrointestinal tract to a treatment site, in response to a difference between fluid pressure proximal to the inflatable device and fluid pressure distal to the inflatable device. The apparatus may thus be advanced distally (to the right in Fig. 1) by application of a fluid pressure proximal to the inflatable device that is greater than the pressure distal to the inflatable device. Similarly, the apparatus may be moved proximally by application of a fluid pressure distal to the inflatable device that is greater than the pressure proximal to the device. Such distal fluid pressure is typically conveyed via a distal-communication lumen 26. Alternatively or additionally, apparatus 20 is moved proximally through the gastrointestinal tract by being pulled by an operator of the apparatus.

[0015] An optical system 24, typically an omnidirectional optical system, is coupled to inflatable device 22 and images gastrointestinal tract 40, in order to enable a physician to determine if a region being imaged by the optical system includes a target tissue 42 that should be biopsied, examined, and/or treated. If so, a tool 34 (e.g., a therapeutic tool or a diagnostic tool such as a biopsy tool) is advanced through a working channel 32 that is coupled to the inflatable device. For some applications, inflatable device 22 is toroidal, and working channel 32 passes through the hole defined by the toroidal shape of the inflatable device. (An outermost extent of the hole is indicated by dashed line 36 in Fig. 1.) Tool 34 is passed through a channel lumen of working channel 32, and emerges from a distal end of the working channel.

[0016] Tool 34 comprises a tool steering mechanism 44 to facilitate steering of the tool from outside of the patient. The exploded view in Fig. 1 shows a previous position of tool 34 in dashed lines, and a current position of the tool (around the target tissue) in solid lines. Thus, as shown, the tool is typically able to be steered by steering mechanism 44 independently of any motion of working channel 32. Typically, inflatable device 22 is stationary after tool 34 has been advanced out of the distal end of working channel 32. If appropriate, the inflatable device is advanced or withdrawn slightly within gastrointestinal tract 20, to facilitate a procedure performed by the tool (e.g., a biopsy or treatment). This motion, however, typically does not involve tilting of the inflatable device so as to better position the tool with respect to target tissue 42. (It is noted that although some embodiments of the present invention are described with respect to the inflatable device not being tilted during a procedure, the scope of the present invention includes such tilting, if appropriate for a given procedure.)

[0017] Tool steering mechanism 44 itself typically comprises control wires within a sheath 30, or other apparatus known in the art for remote steering of an intra-lumen tool.

[0018] Typically, the toroidal shape of inflatable device 22 allows various tubes and wires to be in fluid or electrical communication with control and analysis apparatus outside of the patient's body. For example, a distal-communication lumen 26 may allow pressure to be vented from the region distal to the inflatable device to outside of the patient's body. Alternatively or additionally, an intra-balloon lumen 28 allows the pressure within the inflatable device to be regulated.

[0019] Fig. 3 is an illustration of apparatus 20, not forming part of the present invention. It is noted that steering mechanism 44 of tool 34 is typically able to direct the tool to substantially any site of the gastrointestinal tract within view of optical system 24. Thus, for example, the tool can typically be advanced and retracted longitudinally, bent using wires within the tool, and rotated by rotating the body of the tool within the working channel.

[0020] Fig. 4 is a schematic illustration of apparatus 20, in accordance with an embodiment of the present invention. A multi-lumen supply cable 50 provides lumens 52, 54, 56, and 58, respectively, for:

(1) supplying water,

(2) controlling various inflatable device ("balloon") pressures,

(3) sensing various inflatable device ("balloon") pressures, and

(4) sensing gastrointestinal tract pressures (e.g., sensing pressure distal to apparatus 20).

[0021] Examples of suitable apparatus for moving an instrument through the gastrointestinal tract are shown

in the figure; other examples are described in the above-referenced WO 05/065044 to Cabiri et al. Typically, supply cable 50 is disposed within working channel 32. As shown in Fig. 3, at least a portion of supply cable 50 is typically disposed longitudinally within inflatable device 22. The portion disposed within inflatable device 22 is shaped to define openings for respective distal ends of lumens 54 and 56 such that lumens 54 and 56 are in fluid communication with the inside of inflatable device 22. The openings in supply cable 50 for lumens 54 and 56 within inflatable device 22 facilitate the respective controlling and sensing of various inflatable device pressures (it being understood that one opening is also suitable for both functions, for some applications).

[0022] Openings are provided at the distal end of apparatus 20 for lumens 52 and 58. These openings facilitate, respectively, (1) supplying of water to gastrointestinal tract 40, and (2) the sensing of gastrointestinal tract pressures distal to apparatus 20.

[0023] Reference is now made to Figs. 3 and 4, which are schematic illustrations of intraluminal apparatus. A primary lumen 66 of supply cable 50 is configured for passage therethrough of a cable 60 (such as an electrical cable) (Fig. 4). Typically, cable 60 comprises a hollow tube shaped to define a lumen for passage therethrough of a tool tube 62 for tool 34 (not shown in Fig. 4 for clarity of illustration). As shown in Fig. 3, a functional working tool 34 is disposed at a distal end of working tool sheath 30. Working tool sheath 30 is typically flexible and configured for sliding advancement though tool tube 62. Typically, a wire 70 is disposed within working tool sheath 30 and facilitates bending and/or steering of sheath 30, and thereby tool 34. Additionally, a wire 72 is disposed within working tool sheath 30 and facilitates the operation of tool 34. Wires 70 and 72 extend through the entire apparatus 20 such that respective proximal ends of wires 70 and 72 are disposed outside the body of the patient. Respective distal ends of wires 70 and 72 are therefore controllable by the operating physician from outside the body of the patient.

[0024] Wires 70 and 72 are shown as being disposed in separate lumens within sheath 30 by way of illustration and not limitation. Alternatively, wires 70 and 72 are disposed within the same lumen within sheath 30.

[0025] Typically, working tool sheath 30 is configured for sliding advancement through tool tube 62. As such, various working tools may be advanced through tool tube 62. For example, following the use of tool 34, the operating physician may pull on a proximal end of sheath 30 in order to extract tool 34 from apparatus 20. Subsequently, the physician may advance a different tool through tool tube 62.

[0026] Typically, but not necessarily, the procedure is performed in the patient's colon. Alternatively, the procedure is performed in another site of the gastrointestinal tract.

[0027] Some embodiments of the present invention have been described herein and shown in the figures with respect to a biopsy tool. This is by way of illustration and not limitation, and the scope of the present invention includes the use of tools other than biopsy tools, such as diagnostic and treatment tools. For example, tool 34 may comprise a biopsy tool (e.g., as shown in Figs. 1 and 3), such as a polypectomy snare or any other tissue retrieval mechanism; a therapeutic or diagnostic needle; a treatment tool such as for performing ablation, endoscopic tattooing (e.g., to mark a polyp), manipulating mucosal tissue, endoscopic resection, or another treatment or minimally-invasive surgical procedure; a drug administration tool; an endoscopic cytology tool; or an imaging tool such as a spectral imaging tool. In an embodiment of the present invention, a tool like a conventional tool that has no steering capacity (such as a commercially-available tool in this list of tools) is supplemented by the addition of one or more steering wires to the conventional tool. For some applications, such an enhanced tool is used in combination with an endoscope such as is shown in the figures, or in the above-cited Cabiri PCT publication.

[0028] In an embodiment, the steering capacity provided by tool 34 is used to control an endoscope. The endoscope controlled by the tool may be a conventional endoscope (e.g., a conventional colonoscope) or, alternatively, an endoscope such as is shown in the figures, or in the above-cited Cabiri PCT publication. In an embodiment, tool 34 tilts a distal tip of the endoscope. For some applications, if it is determined that distal motion of the endoscope is at least partially blocked, the distal motion may be restored by utilizing the steering capacity of the tool (e.g., to maneuver the endoscope).

[0029] Alternatively or additionally, the stiffness of tool 34 is used to facilitate advancement of an endoscope (e.g., an endoscope such as is shown in the figures, or in the above-cited Cabiri PCT publication). For example, the stiffness of the tool may be used to restore or support the distal motion of the endoscope by pushing the tool.

[0030] It is noted that although apparatus 20 is described as including an inflatable device to provide movement through gastrointestinal tract 40, the scope of the present invention includes the use of (a) a tool having a steering mechanism, in combination with (b) a conventional endoscope (e.g., a conventional colonoscope), which is advanced through the gastrointestinal tract by being pushed from outside of the patient's body.

[0031] It will be appreciated by persons skilled in the art that the present invention is not limited to what has been particularly shown and described hereinabove. Rather, the scope of the present invention is defined by the claims.

Claims

1. Apparatus for use in a gastrointestinal tract of a patient comprising an endoscope, said endoscope comprising an inflatable device (22), configured to

be moved through the gastrointestinal tract (40) to a treatment site, in response to a difference between fluid pressure proximal to the inflatable device and fluid pressure distal to the inflatable device, such that said endoscope is advanced distally by application of said fluid pressure proximal to said inflatable device, said endoscope comprising:

an optical system (24), coupled to the inflatable device, and configured to image the gastrointestinal tract in a certain field of view;
a working channel (32), coupled to the inflatable device, and shaped to define a channel lumen therein to provide access from outside of the patient to the treatment site;
a multi-lumen supply cable (50), at least a portion of which is disposed within the inflatable device in said working channel, said multi lumen supply cable comprising a primary lumen (66) and a cable (60) passing through said primary lumen;
characterized in that said cable (60) comprises a hollow tube shaped to define a lumen for passing a tool tube (62) through the cable, said tool tube (62) being shaped to define a tool lumen for sliding advancement therethrough of a tool (34) comprising a tool steering mechanism (44) having control wires (70 72) configured and operable to direct the tool to substantially any site of the gastrointestinal tract within said field of view of said optical system to facilitate steering of the tool from outside of a body of the patient and to maneuver the apparatus by tilting a distal tip of said endoscope.

2. The apparatus according to claim 1, wherein the control wires are comprised within a sheath (30); such that the tool is advanced and retracted longitudinally, bent, and rotated by rotating a body of the tool within the working channel.

3. The apparatus according to claim 2, wherein said control wires extend through the apparatus and comprise respective proximal and distal ends such that respective proximal end of said wires are disposed outside said body and respective distal ends are controllable from outside of said body.

4. The apparatus according to any one of claims 1-3, wherein said optical system is configured to provided an omnidirectional imaging.

5. The apparatus according to any one of claims 1-4, wherein said tool has a certain stiffness selected to facilitate advancement of the apparatus, to restore or support distal motion of the apparatus by pushing the tool.

6. The apparatus according to any one of claims 1-5, wherein said tool is an endoscopic tool.

7. The apparatus according to any one of claims 1-6, wherein said tool comprises one of: a therapeutic tool, a diagnostic tool, a biopsy tool, a treatment tool, a drug administration tool, an endoscopic cytology tool, an imaging tool, a spectral imaging tool, a polypectomy snare tool, a tissue retrieval tool, a therapeutic or diagnostic needle, an ablation tool, an endoscopic tattooing tool, a mucosal tissue manipulating tool, and an endoscopic resection tool.

Patentansprüche

1. Gerät zur Verwendung in einem Magen-Darm-Trakt eines Patienten, umfassend ein Endoskop, wobei das Endoskop eine aufblasbare Vorrichtung (22) umfasst, dazu konfiguriert, durch den Magen-Darm-Trakt (40) zu einer Behandlungsstelle bewegt zu werden, in Reaktion auf einen Unterschied zwischen einem Fluid-Druck proximal zu der aufblasbaren Vorrichtung und einem Fluid-Druck distal zu der aufblasbaren Vorrichtung, so dass das Endoskop durch Aufbringen des Fluid-Drucks proximal zu der aufblasbaren Vorrichtung distal vorwärts bewegt wird, wobei das Endoskop umfasst:

ein optisches System (24), das mit der aufblasbaren Vorrichtung gekoppelt ist, und das dazu konfiguriert ist, den Magen-Darm-Trakt in einem bestimmten Sichtfeld abzubilden;
einen Arbeitskanal (32), der mit der aufblasbaren Vorrichtung gekoppelt ist, und der so geformt ist, dass er ein Kanal-Lumen darin definiert, um einen Zugang von außerhalb des Patienten zu der Behandlungsstelle bereitzustellen;
ein Multi-Lumen-Versorgungskabel (50), von dem mindestens ein Abschnitt innerhalb der aufblasbaren Vorrichtung in dem Arbeitskanal angeordnet ist, wobei das Multi-Lumen-Versorgungskabel ein primäres Lumen (66) und ein Kabel (60) umfasst, das durch das primäre Lumen hindurchgeht;
dadurch gekennzeichnet, dass
das Kabel (60) eine hohle Röhre umfasst, die so geformt ist, dass sie ein Lumen für den Durchgang einer Werkzeugröhre (62) durch das Kabel definiert;
wobei die Werkzeugröhre (62) so geformt ist, dass sie ein Werkzeug-Lumen für eine gleitende Vorwärtsbewegung für ein Werkzeug (34) durch es hindurch definiert, das einen Werkzeug-Steuermechanismus (44) mit Steuerdrähten (70, 72) umfasst, die dazu eingerichtet und funktionsfähig sind, um das Werkzeug zu im We-

sentlichen jeder Stelle des Magen-Darm-Trakts in dem Sichtfeld des optischen Systems zu führen, um ein Steuern des Werkzeugs von außerhalb eines Körpers des Patienten zu ermöglichen und um das Gerät durch Neigen einer distalen Spitze des Endoskops zu manövrieren.

2. Gerät nach Anspruch 1, wobei sich die Steuerdrähte in einer Hülle (30) befinden, so dass das Werkzeug longitudinal vorwärts und rückwärts bewegt wird, gebogen wird, und durch Drehen eines Körpers des Werkzeugs innerhalb des Arbeitskanals gedreht wird.

3. Gerät nach Anspruch 2, wobei sich die Steuerdrähte durch das Gerät erstrecken und jeweilige proximale und distale Enden umfassen, so dass jeweilige proximale Enden der Drähte außerhalb des Körpers angeordnet sind und jeweilige distale Enden von außerhalb des Körpers gesteuert werden können.

4. Gerät nach einem der Ansprüche 1-3, wobei das optische System dazu konfiguriert ist, ein omnidirektionales Abbilden bereitzustellen.

5. Gerät nach einem der Ansprüche 1-4, wobei das Werkzeug eine bestimmte Steifigkeit aufweist, die ausgewählt ist, um eine Vorwärtsbewegung des Geräts zu ermöglichen, um eine distale Bewegung des Geräts durch Schieben des Werkzeugs wiederherzustellen oder zu unterstützen.

6. Gerät nach einem der Ansprüche 1-5, wobei das Werkzeug ein endoskopisches Werkzeug ist.

7. Gerät nach einem der Ansprüche 1-6, wobei das Werkzeug eines der folgenden umfasst:

ein therapeutisches Werkzeug, ein diagnostisches Werkzeug, ein Biopsie-Werkzeug,
ein Behandlungs-Werkzeug, ein Medikamentenverabreichungs-Werkzeug, ein endoskopisches Zytologie-Werkzeug, ein Abbildungs-Werkzeug, ein Spektralabbildungs-Werkzeug, ein Polypektomieschlingen-Werkzeug, ein Gewebeentnahme-Werkzeug, eine therapeutische oder diagnostische Nadel, ein Ablations-Werkzeug, ein endoskopisches Tätowier-Werkzeug, ein Schleimhautgewebe-Manipulations-Werkzeug, und ein endoskopisches Resektions-Werkzeug.

Revendications

1. Appareil destiné à être utilisé dans le tractus gastro-intestinal d'un patient, ledit appareil comprenant un endoscope, ledit endoscope comprenant un dispositif gonflable (22), configuré pour être déplacé à travers le tractus gastro-intestinal (40) jusqu'à un site de traitement, en réponse à une différence entre une pression de fluide à proximité du dispositif gonflable et une pression de fluide à distance du dispositif gonflable, de telle sorte que ledit endoscope progresse distalement sous l'effet de l'application de ladite pression de fluide à proximité dudit dispositif gonflable, ledit endoscope comprenant :

un système optique (24), couplé au dispositif gonflable, et configuré pour imager le tractus gastro-intestinal dans un certain champ de vision ;
un canal de travail (32), couplé au dispositif gonflable, et formé pour définir en son intérieur une lumière de canal pour permettre l'accès au site de traitement depuis l'extérieur du patient ;
un câble d'alimentation à lumières multiples (50), dont au moins une partie est disposée à l'intérieur du dispositif gonflable dans ledit canal de travail, ledit câble d'alimentation à lumières multiples comprenant une lumière primaire (66) et un câble (60) passant dans ladite lumière primaire ;
caractérisé en ce que ledit câble (60) comprend un tube creux formé de manière à définir une lumière pour faire passer un tube d'outil (62) dans le câble, ledit tube d'outil (62) étant formé de manière à définir une lumière d'outil pour la progression par glissement à l'intérieur de celui-ci d'un outil (34) comprenant un mécanisme d'orientation d'outil (44) ayant des fils de commande (70, 72) configurés et mis en oeuvre pour diriger l'outil essentiellement vers tout site du tractus gastro-intestinal à l'intérieur dudit champ de vision dudit système optique pour faciliter l'orientation de l'outil depuis l'extérieur du corps d'un patient et pour manoeuvrer l'appareil par inclinaison d'une pointe distale dudit endoscope.

2. Appareil selon la revendication 1, dans lequel les fils de commande sont compris à l'intérieur d'une gaine (30) ; de telle sorte que l'outil est avancé et rétracté longitudinalement, fléchi, et entraîné en rotation par rotation d'un corps de l'outil à l'intérieur du canal de travail.

3. Appareil selon la revendication 2, dans lequel lesdits fils de commande s'étendent à travers l'appareil et comprennent des extrémités proximales et distales respectives de telle sorte que les extrémités proximales respectives desdits fils sont disposées à l'extérieur dudit corps et les extrémités distales respectives peuvent être commandées depuis l'extérieur dudit corps.

4. Appareil selon l'une quelconque des revendications 1 à 3, dans lequel ledit système optique est configuré pour fournir une imagerie omnidirectionnelle.

5. Appareil selon l'une quelconque des revendications 1 à 4, dans lequel ledit outil a une certaine rigidité sélectionnée pour faciliter la progression de l'appareil, pour restaurer ou supporter le mouvement distal de l'appareil en poussant l'outil.

6. Appareil selon l'une quelconque des revendications 1 à 5, dans lequel ledit outil est un outil endoscopique.

7. Appareil selon l'une quelconque des revendications 1 à 6, dans lequel ledit outil comprend l'un de : un outil thérapeutique, un outil diagnostic, un outil de biopsie, un outil de traitement, un outil d'administration de médicament, un outil de cytologie endoscopique, un outil d'imagerie, un outil d'imagerie spectrale, un outil d'anse de polypectomie, un outil de prélèvement de tissu, une aiguille thérapeutique ou diagnostique, un outil d'ablation, un outil de tatouage endoscopique, un outil de manipulation des muqueuses, et un outil de résection endoscopique.

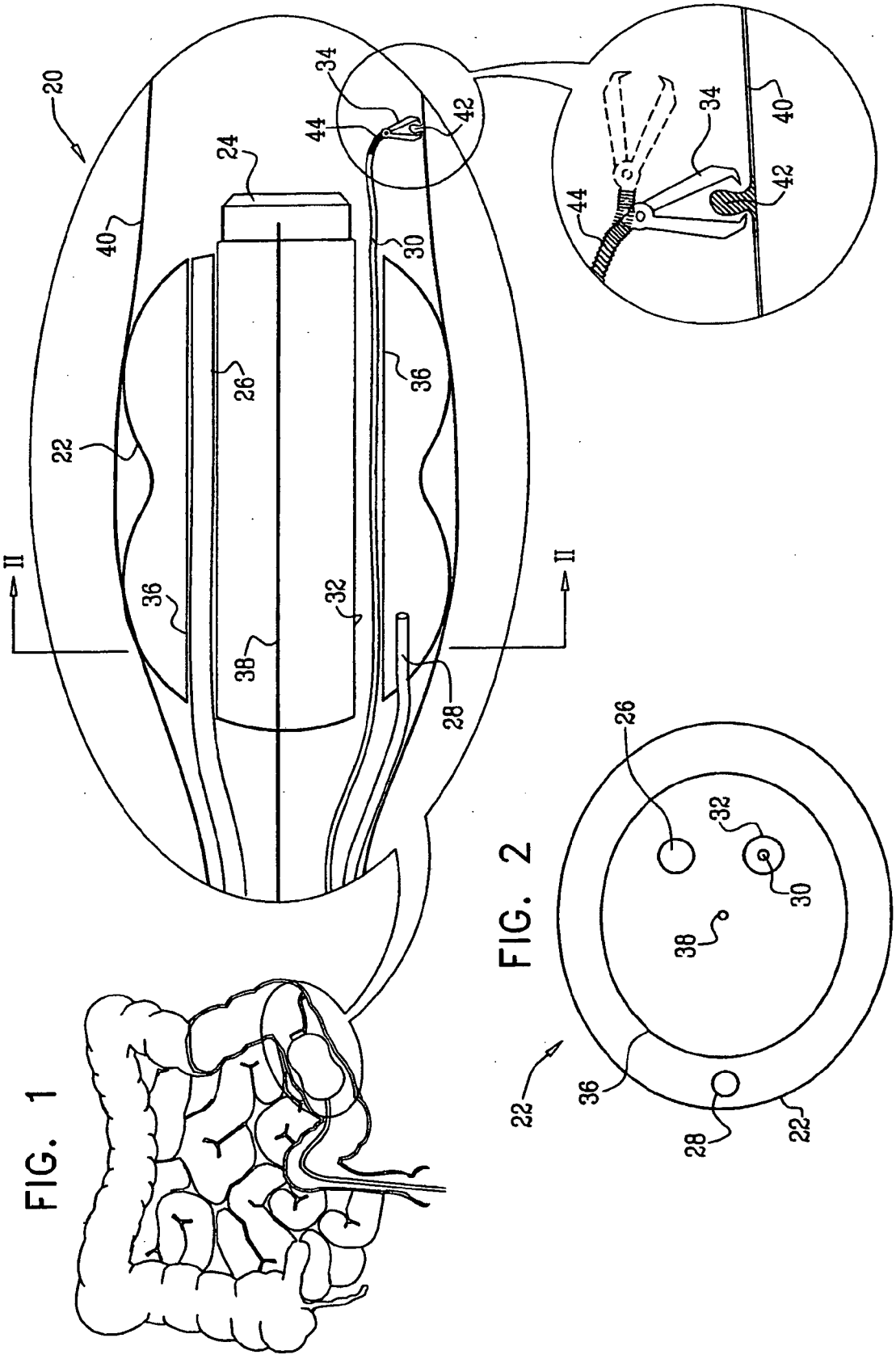
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FIG. 1

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FIG. 2

FIG. 3

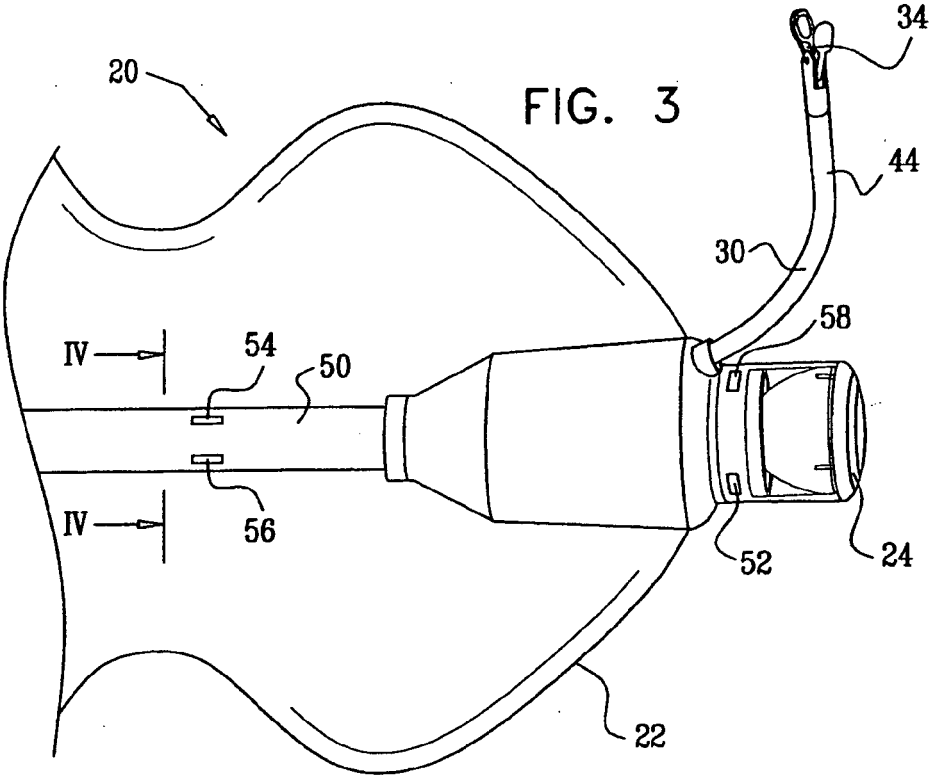
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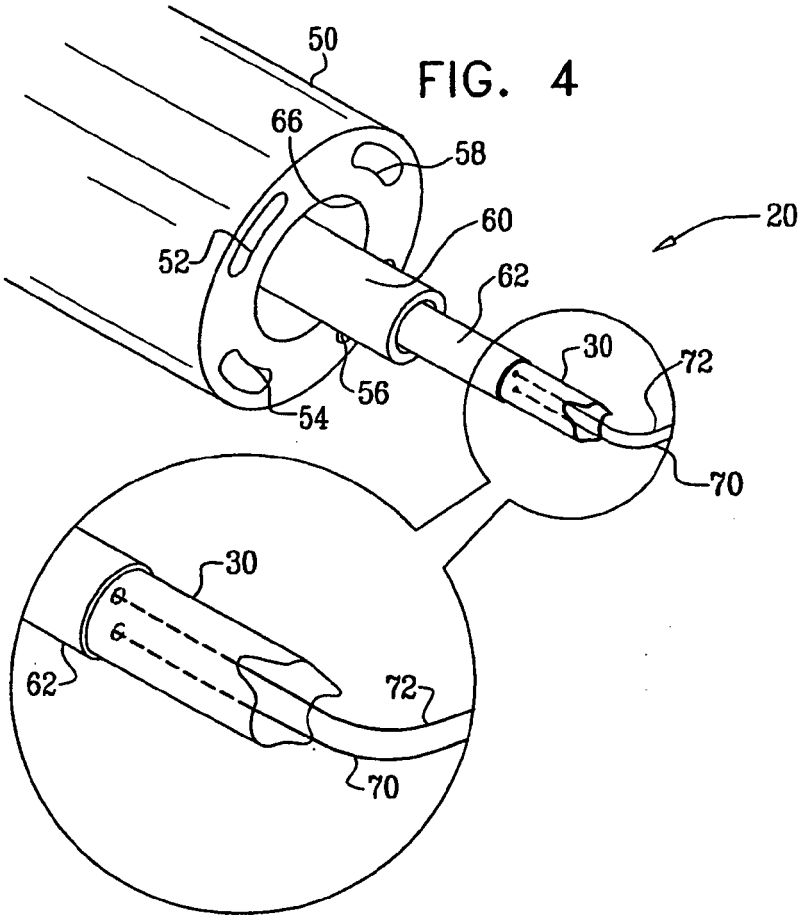
FIG. 4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