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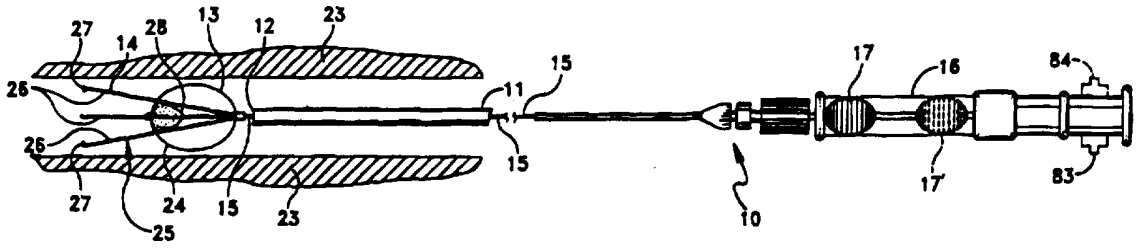
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(54) Title: METHOD AND APPARATUS FOR SEVERING AND CAPTURING POLYPS



(57) Abstract

An apparatus (10) and a method for managing polyps by which an elongated tubular member (11) generally positionable within a working channel of an endoscopic device. The tubular member (11) carries a selectively extendable severing device (13) and capturing device (14) at its distal end (12). Slide member (17) at the proximal end (16) of the tubular member (11) enables a physician to extend and retract the severing and capturing devices (13, 14). The physician retracts the capturing device (14) to grasp the portion of the polyp to be severed and retracts the severing device (13) to sever the polyp. The capturing device (14) retains the severed portion of the polyp for removal with the tubular member (11). In one of the embodiments the capturing device (14) includes an injection needle (71A).

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Description

Method and Apparatus for Severing and Capturing Polyps

Technical Field

This invention relates to surgical apparatus and methods for polyp management and more particularly to such apparatus and methods for severing and capturing polyps.

Background Art

The treatment of polyps and other similar growths in a patient has improved greatly within the last several decades. Polyps are generally collected for histopathological evaluation to determine if they are cancerous. Initially the primary method of treating polyps was major surgery. Now polypectomy procedures are based upon the insertion of a surgical catheter through the working channel of an endoscope. Polypectomy procedures have essentially replaced surgical procedures except when polypectomy procedures are deemed unsuitable, such as when the polyp or polyps to be removed are relatively planar in nature. As used in this application, an endoscope includes endoscopic or other similar device that is inserted into a patient and that includes a working channel for receiving a surgical catheter or the like and a viewing channel for viewing the interior of a vessel.

The following United States Letters Patent disclose surgical apparatus for polyp management procedures:

5,122,147 (1992) Sewell, Jr.

4,326,530 (1982) Fleury, Jr.

Sewell, Jr. discloses several embodiments of a polyp marking device and method of using them. FIG. 4 illustrates three generally concentric loops extending from the distal end of the housing. Spacing members contact each loop thereby to position the loops along radially inner, outer and underneath paths. The inner loop 20 has one end fixed to the housing and rachets onto

a polyp proximate its base by retraction of a second end extending distally through the housing. The outer loop 23 retracts to grasp the polyp proximate its free end. An intermediate cutting loop has one end fixed in the housing and severs the polyp by retraction of a second end extending through the housing. The inner loop 20 remains attached to the base of the severed polyp.

In another embodiment disclosed by Sewell, Jr. retraction of a cutting loop 21 severs an inner loop 20 from a housing. After such retraction, a forceps device is inserted through the distal end of the housing. Manipulation of the forceps device enables a physician to capture the severed portion of the polyp. Other embodiments disclosed by Sewell, Jr. disclose clamping devices or jaws having one or more cutting edges for severing a polyp whereby the jaws close to return the severed portion of the polyp. Sewell, Jr. avoids the use of an electric current for cauterizing the severed base by applying a hemostatic agent to the base of the polyp from the inner loop.

Fleury, Jr. discloses a surgical instrument for removing cellular tissue from body cavities. The instrument includes a proximal handle and a distally extending tubular member. A cable passes through the tubular member and includes a self-expanding loop or snare at its distal end. Extension and retraction of the cable enables the loop to enlarge and encompass a polyp and then contract to and sever the polyp. The loop conducts rf electrical current to cauterize the stump of the severed polyp. However, the catheter of Fleury, Jr. does not provide apparatus associated with the instrument itself for capturing the severed portion of the polyp. Rather Fleury, Jr. suggests that other suitable means such as suction associated with a colonscope equipment (i.e., an endoscopic device) captures the severed portion.

Another type of know surgical catheter for preforming polypectomy procedures includes a loop or snare disposed at the distal end of the catheter. A basket or net connects to the loop along its defined arc. In use the basket overlies the portion of a polyp to be severed by the loop. Thus, upon severing of the polyp the basket captures the severed portion.

The advantages of such prior art polypectomy procedures in contrast to major surgery are numerous. The advantages generally include reductions in the time and trauma of the operation itself, the time of recovery of the patient, the risk of infection and other problems associated with major surgery. Thus, a surgical catheter device of the prior art generally includes a tubular member extensible through the working channel of an endoscopic device with a cutting loop positioned at the distal end of the tubular member and may include a mechanism for cauterizing the base of a severed polyp.

However, prior art polypectomy devices sometimes are unsuitable for treating certain polyps and are cumbersome and often extend the duration of a procedure unnecessarily.

Some embodiments disclosed by Sewell, Jr., for example, require the use of a separate forceps instrument used in conjunction with the disclosed instrument to retrieve the severed polyp. Generally, Sewell, Jr. discloses a device which requires multiple control wires, three wires in the case of the embodiment of FIG. 4. Furthermore, Sewell, Jr. leaves the inner loop within the body of the patient so that it must be retrieved or otherwise passed from the patient's body.

The device disclosed by Fleury, Jr. also has limited usefulness because it does not include any apparatus for grasping the severed portion. Although some endoscopic devices use suction to extract tissue, the suction, at

acceptable levels, is frequently insufficient to hold severed polyp at the end of the device. Using suction also requires positioning the distal end of the endoscope proximate the polyp. This is not always a simple task. It frequently requires a high or skill and dexterity. Should the polyp not be held, it is often difficult to retrieve the severed polyp. Using a forceps device to retrieve such severed portion usually requires the removal of the surgical catheter from the working channel of the endoscope device and insertion of the forceps device. The snare and basket arrangements to offer the possibility at retrieving several polyps without removing the apparatus from a patient. However, the weight of the basket depending from the snare tends to deflect the snare and the distal end of the surgical instrument. Consequently it can be difficult to maneuver the snare over a selected polyp. The loops of the basket overlying the snare also can impede snare closure and severance of a severing polyp. Moreover, the movement of the basket loops along the snare tends to dull the snare and makes the severing more difficult. The baskets, being metallic, can contact the snare and bypass current used for cauterizing the severed stump of the polyp. Also, in the case where multiple polyps are collected there is no means to adequately associate the particular polyps collected with the location from which such polyps were taken.

The prior art taken collectively, thus fails to provide an easily used and simply constructed surgical apparatus for effectively and reliably severing and capturing polyps at diverse shapes and sizes. There is no suggestion of a method and apparatus for efficiently and effectively capturing a polyp or severing and capturing successive ones of such polyps in a reliable manner and, additionally, being able to associate the position from which such polyps were taken with particular polyps.

Further, the prior art devices which require repeated removal and insertion to take a plurality of polyps generally also require repeated removal and insertion of the endoscope, because polyps frequently are larger than the working channel of such endoscopes. Thus, the repeated insertion and removal increases the time for such polypectomy procedures and associated trauma to the patient.

Disclosure of Invention

Therefore, it is an object of the present invention to provide a surgical apparatus for effectively and reliably severing and capturing a polyp.

Another object of this invention is to provide a surgical apparatus that is simple to manufacture and use and that efficiently and effectively captures and severs a polyp.

Still another object of this invention is to provide a method for managing polyps that enables a physician to efficiently and effectively remove polyps from a patient.

Yet another object of this invention is to provide a surgical apparatus having a holding device and a severing device positioned at a distal end of the apparatus that are independent of each other.

Yet still another object of this invention is to provide a surgical apparatus having a control mechanism for concurrent extension and retraction of a holding device and a severing device positioned at a distal end of the apparatus.

Still yet another object of this invention is to provide a method for severing and capturing a polyp that includes the step of positively holding the polyp prior to severing such that the severed portion of the polyp is captured.

Yet a further object of this invention is to provide a method and apparatus for enlarging a polyp to promote severing and for capturing a polyp.

Still yet a further object of this invention is to provide a method and apparatus for successive severing and capturing of polyps within a patient prior to removal of the apparatus.

A further object of this invention is to provide a method and apparatus for retaining severed and captured polyps in an order corresponding to the order of such severing and capturing.

According to one aspect of this invention apparatus for severing and retaining a polyp includes an axially extending catheter with a distal end that can be positioned proximate a polyp. A self-expansible severing and capturing device is extensible from the distal end in an expanded form and is retractable into the catheter in a compacted form. Actuation of a control device at a proximal end of the catheter externally of the patient enables extension and retraction of the severing and capturing device relative to the distal end of the catheter thereby to enable polyp removal.

According to another aspect of this invention a surgical instrument adapted for use in the working channel of an endoscopic device captures and severs a portion of a polyp includes an elongated tubular member extending proximally from a distal end and a snare carried by the tubular member for encompassing and severing a polyp. Selective extension of a holding device carried by the tubular member independently of the snare holds the polyp proximate its free end so that upon severing of the polyp the holding device retains the severed portion of the polyp.

According to yet another aspect of this invention a surgical instrument for severing and capturing a polyp

includes an elongated tubular member proximally extending from a distal end adapted to extend through the working channel of an endoscopic device with a viewing channel. The tubular member supports a snare for extension in an enlarged condition and retraction in a compact condition relative to the distal end. Control apparatus enables a physician to selectively extend and retract the snare. A capturing device connects with the control apparatus for extension and retraction with the snare so that upon retraction the snare grasps and retains a portion of the polyp severed by the snare.

According to a further aspect of this invention a method for managing polyps in a patient includes locating a catheter proximate a selected polyp. Extension of a self-expansive severing device from the catheter encompasses the polyp proximate its base. Extension of a holding device from the distal end of the catheter upon maneuvering engages the polyp proximate a free end thereof. Retracting the severing device into the catheter severs the polyp proximate the polyp's base; the holding device retains the severed portion that includes the free end.

According to yet a further aspect of this invention a method for managing polyps in a patient includes locating a catheter proximate a select polyp. Extension and orientation of a severing and holding device from the catheter includes encompassing the polyp with a severing portion of the device and a holding portion of the device engaging the polyp proximate a free end thereof. Retraction of the severing and holding device severs the polyp with the holding portion of the device retaining a separate portion including the free end of the selected polyp.

Brief Description of the Drawings

The appended claims particularly point out and

distinctly claim the subject matter of this invention. The various objects, advantages and novel features of this invention will be more fully apparent from a reading of the following detailed description in conjunction with the accompanying drawings in which like reference numerals refer to like parts, and in which:

FIG. 1 is a plan view of a surgical instrument constructed in accordance with this invention having a severing and holding device at a distal end portion for location within a patient proximate a polyp;

FIG. 2 is a enlarged side elevation of a distal end portion of FIG. 1;

FIG. 3 is a enlarged plan view of the distal end portion of FIG. 1 with the severing and holding device in partially retracted position;

FIG. 4 is a enlarged plan view of the distal end portion of FIG. 1 with the severing and holding device in a retracted position with the polyp severed at is base and the severed portion retained by the holding device;

FIG. 5 is an enlarged plan view of the distal end portion of another surgical instrument in accordance with this invention;

FIG. 6 is an enlarged side elevation of the distal end portion of the embodiment of FIG. 5;

FIG. 7 is an enlarged plan view similar to FIG. 5 of the distal end portion of another surgical instrument in accordance with this invention;

FIG. 8 is a side elevation of the distal end portion of FIG. 7;

FIG. 9 is a plan view of the embodiment of FIG. 7 with the severing and holding device in a partially retracted position;

FIG. 10 is a plan view of the embodiment of FIG. 7 with a severing portion of the severing and holding device retracted into the tubular member;

FIG. 11 is a plan view of the embodiment of FIG. 7 with the distal portion of a holding portion of the severing and holding device retracted proximate the distal end of the tubular member;

FIG. 11A is a view of the embodiment of FIG. 7 similar to FIG. 11 with the distal portion of the holding portion having a plurality of severed polyps retained therein;

FIG. 12 is a side elevation of a yet another surgical instrument constructed in accordance with this invention with a severing device and a holding device in an extending position relative to a tubular member;

FIG. 13 is a cross-section of the tubular member of FIG. 12 taken along the line 13-13;

FIG. 14 is a cross-section of the handle portion of FIG. 12 taken along the line 14-14;

FIG. 15 is a cross-section of the handle portion of FIG. 12 taken along the line 15-15;

FIG. 16 is a side elevation of the distal portion of FIG. 12 with the holding device and the severing device partially retracted into the tubular member;

FIG. 17 is similar to FIG. 16 with the severing device retracted and the holding device retracted proximate the distal end of the tubular member;

FIG. 18 is a perspective view of a distal portion of yet still another surgical instrument in accordance with this invention;

FIG. 19 is a perspective view of a distal portion of a further surgical instrument in accordance with this invention; and

FIG. 19A is the view of FIG. 19 with a plurality of severed polyps retained on the retaining portion of the device and with the severing portion retracted.

Best Mode for Carrying Out the Invention

As depicted in FIG. 1, apparatus 10 for managing

polyps according to this invention includes a radially flexible, axial stiff elongated catheter or tubular member 11 extending proximally from a distal end 12 with a severing device 13 and a capturing device 14 extensible from and retractable relative to the distal end 12. The severing device 13 and the capturing device 14 connect at their proximal ends to a cable 15 that extends through the catheter 11 to a handle 16. The cable 15 in this embodiment connects to a slide member 17 suitably supported in the handle 16, although alternatively the cable can be fixed to the handle 16 with the slide member 17 connecting to the tubular member 11. Those skilled in the art will appreciate that displacement of the slide member 17 enables a user to selectively control the distal extension and proximal retraction of the severing device and the capturing device relative to the distal end 12.

FIGS. 1 through 4 illustrate the use of the present invention which is preferably used with a known endoscopic device having a working channel and a viewing channel. The severing device 13 in this embodiment is formed as a snare 24, and the capturing device 14 comprises forceps 25 with distally extending legs 26 secured to the snare extending from the distal end of the cable 15. Each of the legs 26 includes an inwardly extending portion 27 at its free or distal end.

In use, a physician inserts the distal end 12 through the working channel of an endoscope and uses the viewing channel to position the distal end 12 proximate a polyp 28. Once the severing and capturing devices 13 and 14 are extended relative to the distal end 12, the physician maneuvers the severing device 13 to encompass the polyp 28 proximate its base 30. The proper maneuvering of the severing device also positions the capturing device 14 as illustrated in FIGS. 1 and 2. The physician then retracts the cable 15 relative to the distal end 12 by moving the

slide member 17 (FIG. 1) from its distal position toward the position 17' to displace the severing and capturing device 13 and 14 into the tubular member 11. As depicted in FIG. 3, retraction of the severing device 13 and the capturing device 14 causes the severing device 13 to close and sever a portion 31 of the polyp 28 and concurrently to urge the severed portion 31 into engagement between the legs 26. Thus, after the severing of the polyp 28 the severed portion 31 is retained by the capturing device 14 so that it can be removed from the patient as the tubular member 11 is withdrawn.

FIGS. 5 and 6 depict an alternative embodiment including a severing device 13 and a capturing device 14. In this case the capturing device 14 comprises two leg members 40 extending from opposed central portions of the snare 24 to define a plane intersecting the plane of the snare 24. Retraction of the severing device 13 and the capturing device 14, once positioned so that the severing device 13 encompasses a polyp 28 with the capturing device 14 disposed proximate the free end of the polyp 28, urges the leg members 40 toward each other so that the portion 31 of the polyp 27 to be severed from the base 30 is grasped or gripped by the leg members 40 enabling retention and removal of the polyp from the patient. Each of the leg members 40 may also include a radially inwardly extending projection 41 proximate free ends 42 to capture the severed portion 31 in a positive fashion.

FIGS. 7 through 11 depict another embodiment of this invention that includes a severing device 13 and a capturing device 14 that are formed as a snare 24 and a collar or clip 50, respectively. The clip 50 has a closed distal end 51 with legs 52 extending proximally therefrom. The legs 52 attach to opposed central portions of the snare 24 so that the clip lies outside the plane defined by the snare 24. In using this embodiment, a physician

positions the snare 24 to encompass a polyp 28 proximate its base and the clip 50 opposite the base 30 of the polyp 28. Retraction of the snare 24 into the tubular member 11, as depicted in FIGS. 9 and 10, severs the polyp 28 and urges the severed portion 31 into the clip 51. Further retraction, as depicted in FIG. 11 urges the severed portion 31 into a secure position against the distal end of the clip 51. It will be appreciated by those skilled in the art that providing a collar or clip of sufficient distal extension for receiving a plurality of polyps will enable the removal of such polyps prior to removal of the apparatus 10 from the patient's lumen 23.

The embodiment of FIG. 7 thus enables the grasping and retention of a plurality of polyps. The plurality of retained polyps will be arranged sequentially with the distal most polyp corresponding to the first sample sequentially with the proximal most polyp being the last polyp captured. Thus, the polyps will be stacked in the clip in the order of severing. Specifically each polyp is urged distally in the clip 50, as the cable 15 is retracted to bring the distal end 51 of the clip 50 proximate the distal end 12 of the tubular member 11. Thus, as illustrated in FIG. 11A where severed polyps 31 and polyps 31A and 31B have been sequentially severed and retained, the polyps 31, 31A and 31B would reside between the legs 52 in a secure position at the distal end 51 of the clip 50.

Use of this embodiment enables the physician to associate the polyps with the position from which it was severed. Thus, for example, only a portion of the plurality of the captured polyps are found to be cancerous, this ability to determine the location can be used to determine what segments of the lumen 23 need to be surgically removed. Use of this embodiment also eliminates the waste of time involved in removing from the

patient's lumen 23 the tubular member 11 and generally an associate endoscope through which the tubular member is extended to retrieve a severed polyp after each severing and capturing operation.

FIG. 12 depicts still another apparatus 60 according to this invention that comprises a radially flexible, axial stiff elongated catheter or tubular member 61 having a distal end 62 from which a severing device 63 and a capturing device 64 extend and retract. The severing device 63 and the capturing device 64 connect at their proximal ends to a cable 65 and a hollow cable or hypotube 66, respectively, that extend proximal through lumens 67 and 68 (FIG. 13) in the tubular member 11 to a two part handle 69. The severing device 64 comprises an expansible snare 70, the capturing device 63, a forceps-needle combination 71 that extends through a sheath 72 and that includes a hollow needle 71A that conveys fluid into a polyp.

Referring now to FIGS. 12, 14 and 15, a physician controls the operation of the forceps-needle combination 71 and the snare 70 from the handle 69 at a proximal end of the apparatus. A first portion 73 of the handle 69 (FIG. 14) supports a slider 74 that attaches to the cable 65. Distal displacement of the slider 74 enables the physician to extend the snare 70 from the distal end 62 as depicted in FIG. 12; proximal displacement of the slider 74 retracts the snare 70 as depicted in FIG. 17.

The handle 69 also includes an electrical plug 83 that suitably connects with the cable 65 to provide mono-polar cauterization of a base of a polyp severed by the snare 70. Alternatively, the electrical plug 83 can be eliminated in cases not needing cauterization or hypotube 66 can suitably connect plug 84 with the forceps needle combination 71 to enable bi-polar cauterization.

A second portion 75 (FIG. 15) of the handle 69 includes a slider 76 disposed in a slidable housing 77 supported in an outer housing 78 as depicted in cross-section in FIG. 14. The sheath 72 connects with the slider 76. Displacement of the slider 76 relative to the slidable housing 77 displaces the forceps-needle combination 71 relative to the sheath 72, thus enabling the extension, as depicted in FIG. 12, and retraction as depicted FIG. 16. The hypotube 66 secures to a proximal end 80 of the slidable housing 77 so that displacement of the slidable housing 77 and the slider 76 together displaces the forceps needle combination 71 and the sheath 72 relative to the distal end 62 of the tubular member 61 (FIGS. 12 and 17). A proximal end 81 of the hypotube 66 in this embodiment includes an injection hub 82.

In operating the apparatus 60, the physician preferably positions the tubular member 61 to extend from the working channel of an endoscopic device 100 previously inserted in a patient. The physician manipulates the slider 74 and the slidable housing 77 and the slider 76 to extend the snare 70 and the forceps-needle combination 71 over a polyp 85, as depicted in FIG. 12. If the polyp 85 is a relatively small, flat polyp of a type that is usually difficult to sever and/or retrieve by prior art apparatus, the physician positions the snare 70 to encompass a base 86 of the polyp 85 and pierces the polyp 85 with the needle 71A between the base 86 and a free end 87 of the polyp 85 to inject a suitable fluid (e.g., a saline solution or sclerotherapy agents) into the polyp 85 from the injection hub 82 to expand and swell the polyp 85. The physician then closes forceps legs 71B of the forceps needle combination 71 to capture the now swollen polyp 85 by distal displacement of the sheath 72 relative to the forceps legs 71B (FIG. 16). Retraction of the snare 70 severs the polyp 85 so that the forceps-needle

combination 71 retains the severed portion including the free end 87. Retracting the slidable housing 77 and distal displacing the slider 76, as shown in FIG. 17, moves the forceps-needle combination 71 into close proximity of the distal end 62.

FIGS. 18 and 19 depict distal portions of the apparatus 60 with alternative capturing devices 64A and 64B, respectively. The embodiment of FIG. 18 includes only a forceps device 89 with extending legs 90. Those skilled in the art will understand that in this case the hypotube 66 can be solid and that the sheath 22 can, alternatively, be omitted so that the legs 90 expand and contract upon extension and retraction relative to the distal end 62 of the tubular member 61. Additionally, the hypotube 66 can be connected to a slider suitably mounted in a handle (not shown) similarly to the slider 74 of FIG. 12 with the slidable housing 77 of FIG. 12 also omitted.

The capturing device 64 of the embodiment of FIG. 19 includes only a needle 91 without any forceps device. The needle 91 operates substantially the same as the needle 71A of the embodiment of FIG. 12. That is, it connects with a proximal slidable member (not shown) to extend and retract the needle 91 and includes a means for enabling a fluid to be injected through the needle 91. The needle 91 further includes one or more barbs 92 or other similar surface features formed thereon proximate its distal end. The barbs 92 tend to retard withdrawal of the needle 91 from the polyp 85. Consequently, the polyp 85 tends to remain on the needle 91.

Thus, after severing the polyp 85 by the snare 70, the severed portion polyp 85 including the free end 87 can be removed by withdrawal of the elongated tubular member 61. This embodiment also enables the collection of additional polyps by successively extending and positioning the snare 70 and needle 91 and then retracting

the snare 70, as discussed above. That is to collect an additional selected polyp, such as the polyp 85 after collecting polyps 85B and 85A, respectively, the user positions the distal end of the device proximate the polyp 85 and extends the snare 70 to encompass the polyp and the needle 91 to pierce the polyp. Upon piercing the selected polyp 85, previously severed polyps retained on the needle 91 are urged proximally along the needle 91. The user can then inject the polyp 85 with a suitable solution, if desired, prior to severing the polyp 85 by retracting the snare 70. Once severed, the polyp 85 would be retained on the needle 91 as described above. Thus, as illustrated in FIG. 19A, a plurality of polyps severed and retained in the sequential order of the polyps 85B, 85A, 85 are retained proximate the distal end of the needle 91.

In summary, there have been described various embodiments of devices for severing and capturing polyps without prior art surgical intervention. Specifically, these devices include a catheter or like elongated tubular member having one or more lumens therein adapted for extending through the working channel of an endoscopic device having a viewing channel. Severing and capturing devices connect with control apparatus at the proximal end of the catheter to enable extension and retraction of the severing and capturing device relative to the distal end of the catheter. This structure enables a physician to selectively grasp a polyp, sever a portion of the polyp from its base and withdraw the polyp from the patient. The severing device typically includes a snare. The capturing device may comprise a closed end clip, legs arranged in a forceps-like configuration, a barbed needle, or combination thereof. A needle can also allow a physician to inject fluid into a polyp thereby to enlarge the polyp and facilitate its severing and its removal.

Those skilled in the art will further appreciate that the described devices can be relatively easily constructed according to known methods and relatively easily used by physicians familiar with prior art devices. However, this invention provides physicians with devices that are more versatile in dealing with polyps and that are relatively easily used while also providing greater surety in retention of the portions of polyps that are severed as compared with the prior art devices. This invention has been disclosed in terms of certain embodiments. It will be apparent that many modifications can be made to the disclosed apparatus without departing from the invention. Therefore, it is the intent of the appended claims to cover all such variations and modifications as come within the true spirit and scope of this invention.

Claims

1. Apparatus for severing and retaining a polyp in a patient comprising:

A. a catheter means extending between a distal end tip and a proximal end, for positioning proximate a polyp;

B. a self-expansible severing and capturing means for retrieving a polyp, said means being extensible from said distal end of said catheter in an expanded form and retractable into said distal end in a compacted form; and

C. control means at the proximal end of said catheter for selectively extending and retracting said severing and capturing means relative to said distal end of said catheter means.

2. Apparatus for severing and grasping a polyp as recited in claim 1 wherein said severing and capturing means includes a continuous wire lying in said expanded condition in a substantially open form in a first plane to receive a polyp therethrough and a collar portion disposed distally from said first portion and lying in a second plane such that retraction of said continuous wire urges the closing of said open area to sever a polyp extending therethrough and to urge such severed polyp into said collar portion.

3. Apparatus for severing and grasping a polyp as recited in claim 2 wherein said collar portion is elongated to receive therein and retain a plurality of polyps severed by sequentially positioning said continuous wire in the open form area portion over ones of the polyps and retracting said continuous wire.

4. Apparatus for severing and grasping a polyp as

recited in claim 1 wherein said control means includes an axially stiff, radially flexible cable extending through said catheter means and said severing and capturing means includes a continuous wire supported at a distal end of said cable, said wire defines in an open form a first plane and a plurality of legs, distally extending and generally lying outside the first plane.

5. Apparatus for severing and grasping a polyp as recited in claim 3 wherein said legs connect to the distal end of said cable.

6. Apparatus for severing and grasping a polyp as recited in claim 1 wherein said control device includes a manually actuated slider at a proximal end of said catheter means and an axially stiff, radially flexible cable extending through said catheter means connecting said slider and said severing and capturing means such that displacement of said slider urges like displacement of said severing and capturing means.

7. Apparatus for grasping and severing a polyp as recited in claim 1 wherein said severing and grasping device comprises a self-expanding continuous wire connected to a distal end of a proximally extending cable disposed in a first lumen in said catheter means and a plurality of spaced legs connected to a distal end of a second proximally extending cable disposed in a second lumen of said catheter means.

8. Apparatus for grasping and severing a polyp as recited in claim 1 wherein said severing and grasping device comprises a self-expanding continuous wire connected at a distal end of a proximally extending cable disposed in a first lumen in said catheter means and a combination needle forceps apparatus supported at a distal end of a second proximally

extending cable disposed in a second lumen of said catheter means.

9. Apparatus for grasping and severing a polyp as recited in claim 1 wherein said severing and grasping device comprises a self-expanding continuous wire connected at a distal end of a proximally extending cable disposed in a first lumen in said catheter means and a needle supported at a distal end of a second proximally extending cable disposed in a second lumen of said catheter means.

10. Apparatus for grasping and severing a polyp as recited in claim 9 wherein said needle includes a surface feature on an outer surface of a distal portion thereof for retaining a portion of a polyp into which said distal portion of said needle is inserted.

11. A surgical instrument for severing a polyp in a patient and capturing the severed portion of such polyp, said instrument comprising:

A. an elongated tubular member extending proximally from a distal end;

B. means carried by said tubular member for encompassing a selected polyp proximate the base of the polyp and for severing the polyp thereat; and

C. means carried by said tubular member independent of said encompassing and severing means and selectively extensible relative to said distal end of said tubular member for holding the polyp proximate a free end and spaced from the base thereof such that upon severing the polyp by said encompassing and severing means said holding means retains the severed portion of said polyp.

12. An instrument as recited in claim 11 wherein said

encompassing and severing means includes a snare and a proximally extending cable such that retraction of said snare into said distal end tends to sever a polyp encompassed by said snare.

13. An instrument as recited in claim 12 wherein said holding means includes a plurality of generally axially extending spaced legs with inwardly extending radial projections, said legs normally being positioned in said tubular member in a compact condition and upon extension therefrom assuming an expanded condition such that relative retraction of said legs into said distal end of said tubular member urges said projection proximate one another so as to grip a polyp disposed therebetween.

14. An instrument as recited in claim 13 wherein said holding means further includes an injection means associated therewith for enabling the selective swelling of polyps into which said injecting means is inserted.

15. An instrument as recited in claim 12 wherein said holding means includes injection means supported at a distal end thereof for selective insertion into a polyp and selective injection of such polyp with a solution for swelling such polyp.

16. An instrument as recited in claim 15 wherein said injection means comprises a needle.

17. An instrument as recited in claim 16 wherein said needle includes a surface feature on a distal end thereof for retaining a portion of a polyp into which said distal portion of said needle is inserted.

18. Apparatus for grasping and severing a polyp as recited in claim 16 wherein said holding means further includes a plurality of distally extending legs selectively spaced so as to enable gripping of a desired portion of a polyp.

19. Apparatus for grasping and severing a polyp as recited in claim 11 wherein said holding means and said severing means are supported at a distal end of a first and a second axially stiff, radially flexible cable.

20. In a surgical instrument for severing and capturing a polyp having an elongated tubular member proximally extending from a distal end, a snare plane supported by said tubular member for extension in an enlarged condition from and retraction in a compact condition into said distal end in a first plane, and control means for selectively extending said snare relative to said distal end so as to enable positioning said snare to encompass a polyp and for selectively retracting said snare relative to said distal end so as to sever such polyp, the improvement comprising a capturing device connected to said control means such that said capturing device is extended with said snare in substantially a second plane and upon retraction of the snare by said control means said capturing device grasps the polyp outside the first plane so that upon severing of the polyp by said snare said capturing device retains the severed portion of the polyp.

21. An instrument as recited in claim 20 wherein said control means includes a cable supporting said snare at a distal end thereof.

22. An instrument as recited in claim 21 wherein said capturing device includes a plurality of spaced legs extending distally from opposed portions of said snare intermediate a distal end of said snare and said distal end of said cable.

23. An instrument as recited in claim 22 further comprising a clip portion joining the distal ends of said spaced legs such that said legs are adapted for

receiving and holding therebetween a portion of a polyp.

24. An instrument as recited in claim 21 wherein upon extension said snare defines a first plane and a portion of said capturing device defines a second plane substantially parallel with said first plane.

25. An instrument as recited in claim 21 wherein said capturing device includes a plurality of spaced legs extending from said distal end of said cable, each of said legs having inwardly directed fingers proximate distal ends of said legs.

26. An instrument as recited in claim 21 further comprising a handle supporting the proximal end of said tubular member wherein said control means includes an actuator slidably disposed in said handle for enabling displacement along the axis of said tubular member to selectively extend and retract said snare relative to said distal end of said tubular member.

27. An instrument as recited in claim 21 wherein said capturing device comprises a closed distal end clip structure with proximally extending spaced legs secured to said snare intermediate a distal end of said snare and said cable.

28. An instrument as recited in claim 27 wherein each of said legs comprising a first generally planar extending portion proximate said closed distal end of said clip structure and a second generally vertically extending portion remote from said closed distal end of said clip structure such that said first generally planar extending portion of said clip structure define the second plane that is generally parallel to said first plane.

29. A method for managing polyps in a patient comprising the steps of:

A. inserting a catheter within the patient with a distal end disposed proximate a selected polyp;

B. extending in a first plane a self-expansive severing device from the catheter and positioning the severing device so as to encompass the selected polyp proximate the polyp's base;

C. extending a holding device in a second plane from the distal end of the catheter;

D. positioning and manipulating the holding device so as to engage the polyp proximate a free end thereof; and

E. retracting the severing device into the catheter to sever the selected polyp proximate the polyp's base such that the holding device retains a severed portion including the free end of the selected polyp.

30. A method as recited in claim 29 wherein said steps of extending include extending a tubular member to pierce the polyp such that the severed portion is retained by the tubular member.

31. A method as recited in claim 29 further comprising repeating said steps of extending, positioning and manipulating, and retracting to thereby collect a plurality of severed polyp portions.

32. A method as recited in claim 31 further comprising the step of removing the catheter after collection of a plurality of severed polyp portions wherein said repeating of said steps of extending, positioning and manipulating, and retracting causes the severed polyps portions to be retained by the holding device in an order corresponding to the order of severing.

33. The method as recited in claim 29 wherein said step of positioning and manipulating the holding device comprises orienting the catheter so that upon said

step of extending including extending a needle from the distal end of the catheter to pierce the selected polyp.

34. A method as recited in claim 33 further comprising the step of injecting fluid through the needle into the pierced polyp to enlarge the polyp prior to said step of retracting the severing device.

35. A method as recited in claim 29 further comprising the step of swelling the selected polyp to promote the ease of positioning of the severing device to encompass the selected polyp proximate its base and to promote the ease of manipulating the holding device to engage the selected polyp.

36. A method as recited in claim 29 wherein said step of retracting the severing device also retracts the holding device such that the engagement of the holding device with the portion of the selected polyp is promoted thereby.

37. A method as recited in claim 29 further comprising removing said tubular member from the lumen of the patient after said retracting step to remove the retained, severed portion of the selected polyp from the body of the patient and selectively repeating said steps B) through E) to retain a plurality of severed portions of a plurality of severed polyps prior to said step or removing.

38. A method for managing polyps in a patient comprising the steps of:

A. inserting a catheter within the patient with a distal end disposed proximate a selected polyp;

B. extending a severing and holding device with a holding portion of the swing and holding device in a plane offset from the severing device;

C. orienting the severing and holding device with a severing portion of the severing and holding

device encompassing the polyp and the holding portion engaging the polyp proximate a free end thereof; and

D. retracting the severing portion to sever the polyp with the holding portion retaining a severed portion including the free end of the selected polyp.

39. A method as recited in claim 38 further comprising:

E) removing the catheter from the patient to retrieving the retained polyp.

40. A method as recited in claim 39 wherein said steps of B) through D) are repeated so as to retain a plurality of polyp prior to step E).

41. A method as recited in claim 40 wherein said step of retracting retains polyps in an ordering corresponding to the order in which each polyp is retained thereby upon repetition of said steps B) through D).

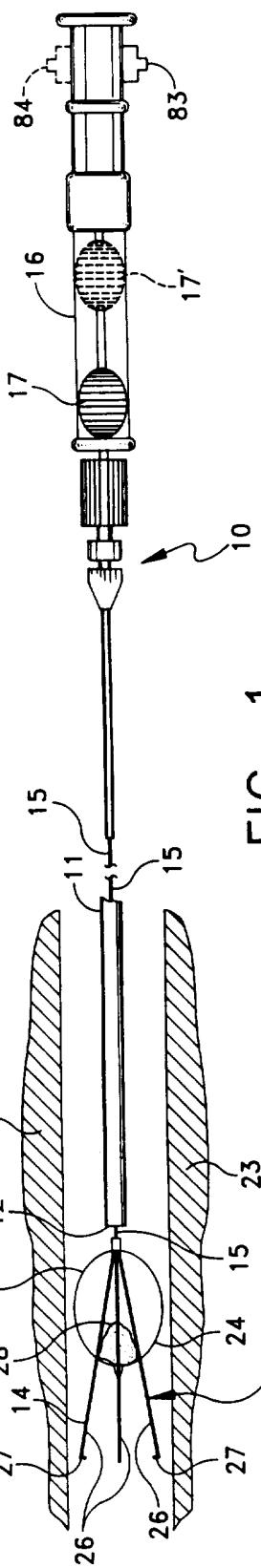


FIG. 1

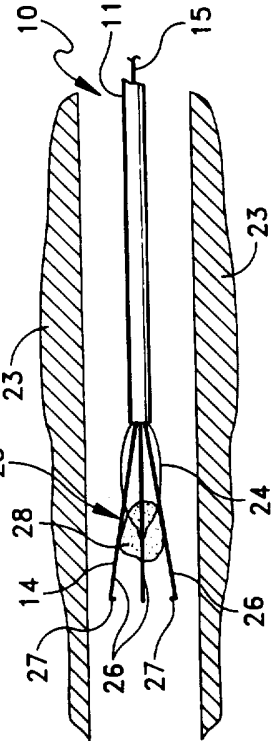


FIG. 3

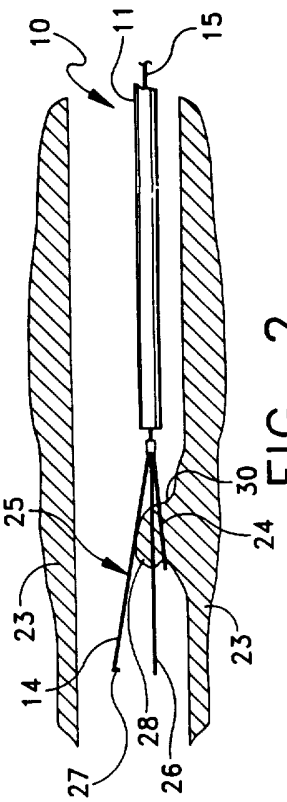


FIG. 2

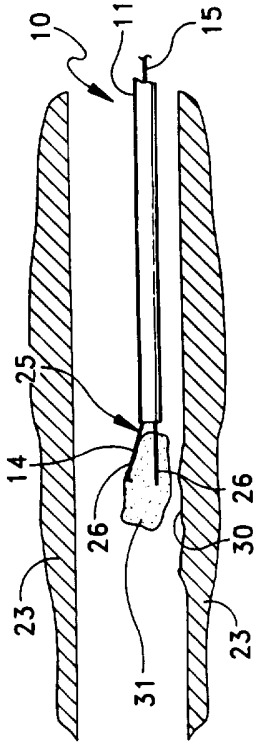


FIG. 4

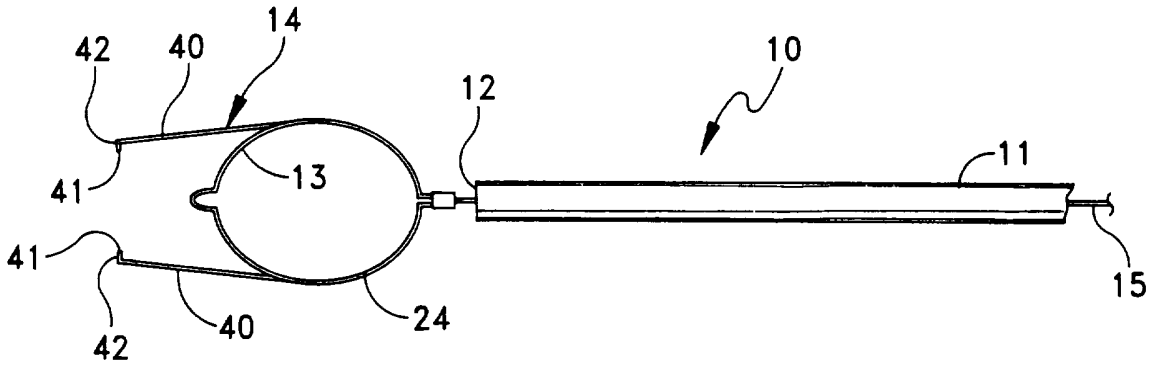


FIG. 5

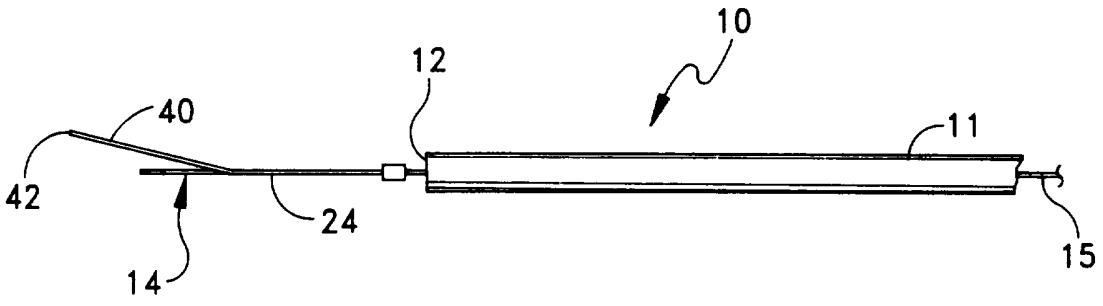


FIG. 6

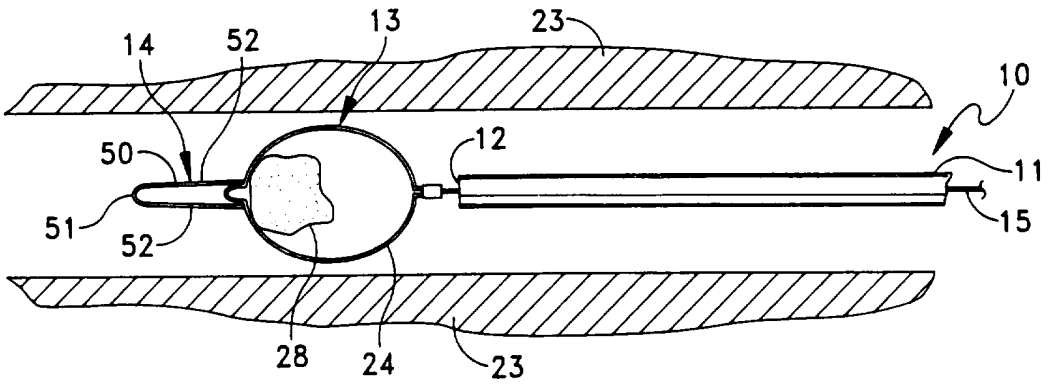


FIG. 7

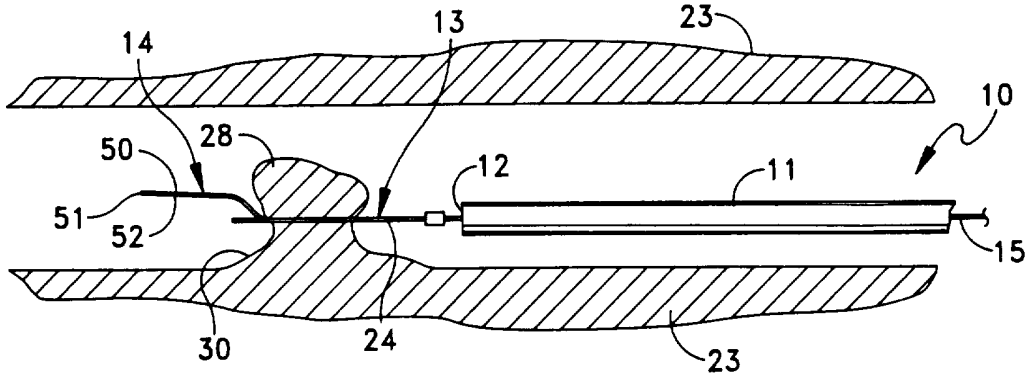


FIG. 8

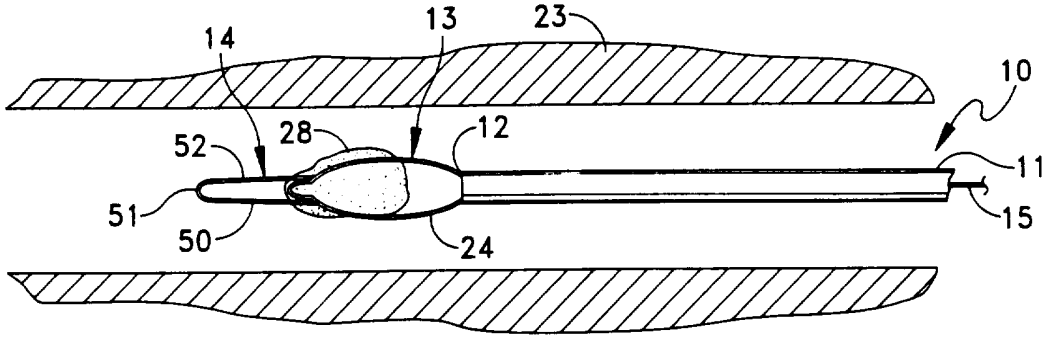


FIG. 9

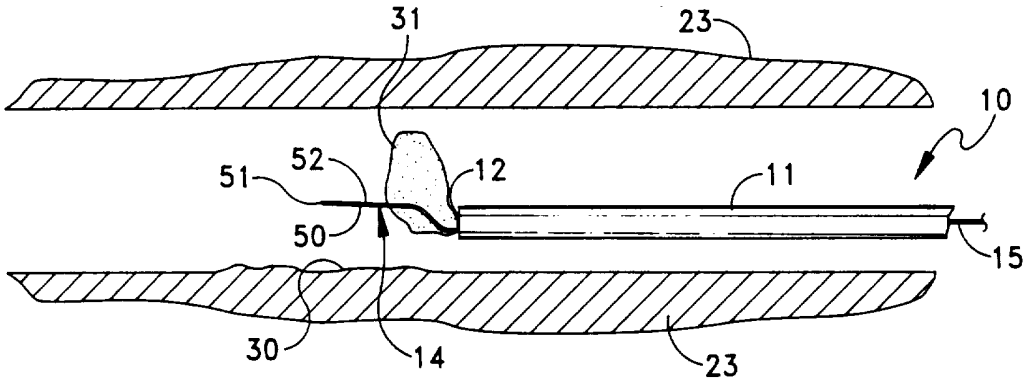


FIG. 10

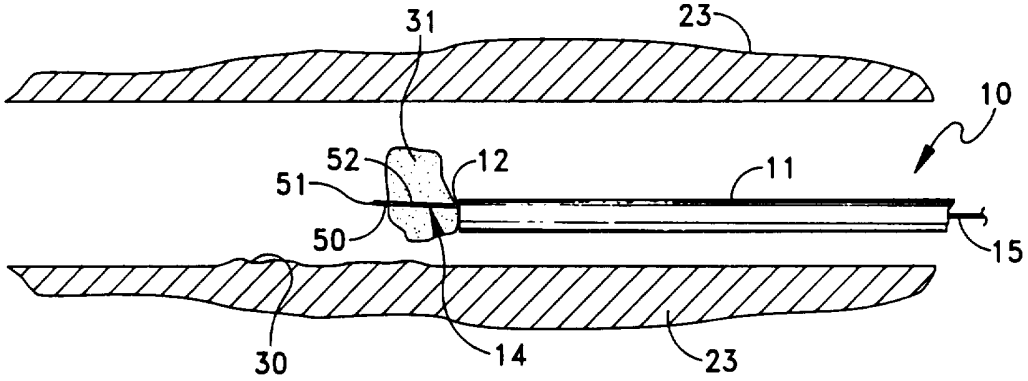


FIG. 11

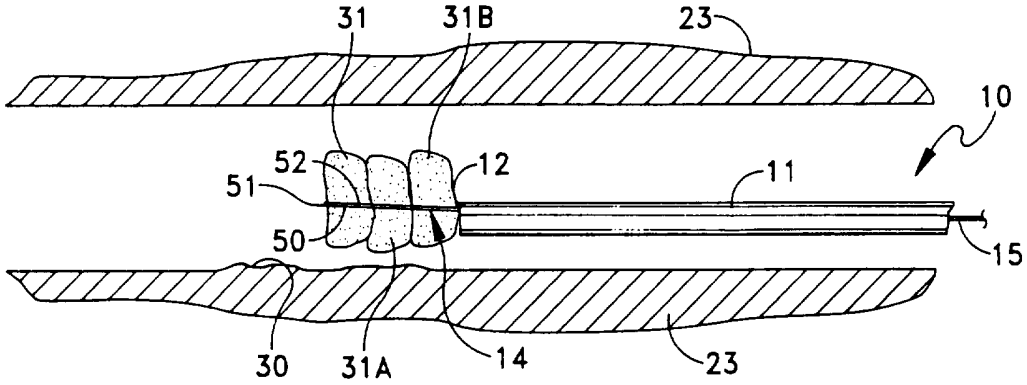


FIG. 11A

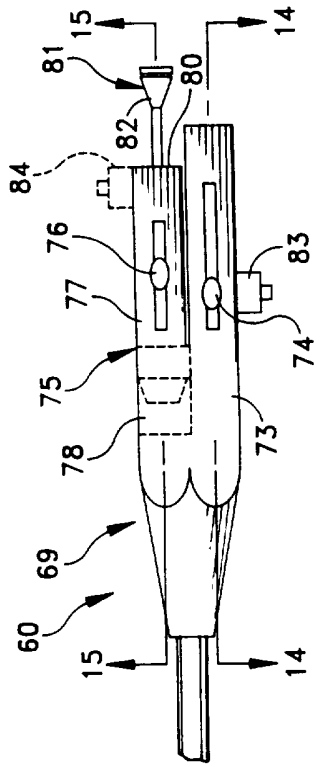


FIG. 12

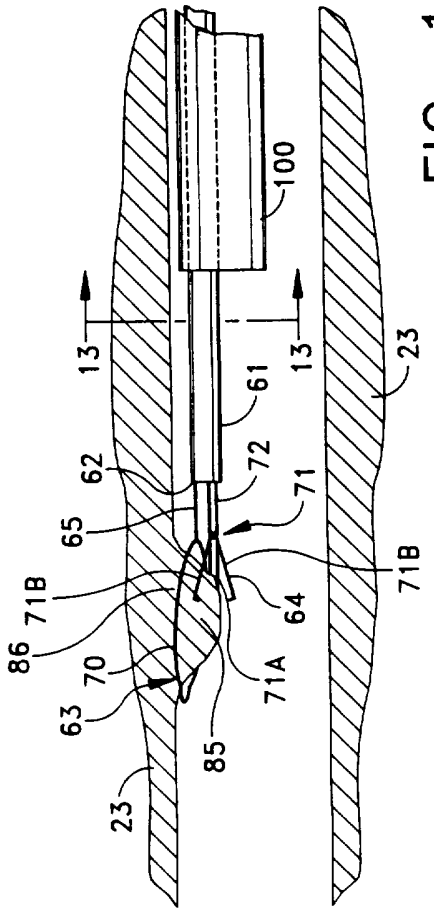


FIG. 13

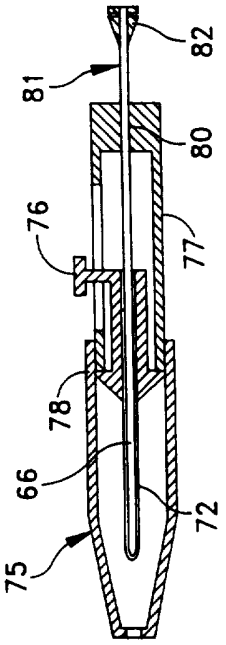


FIG. 15

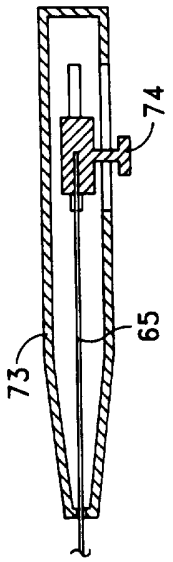


FIG. 14

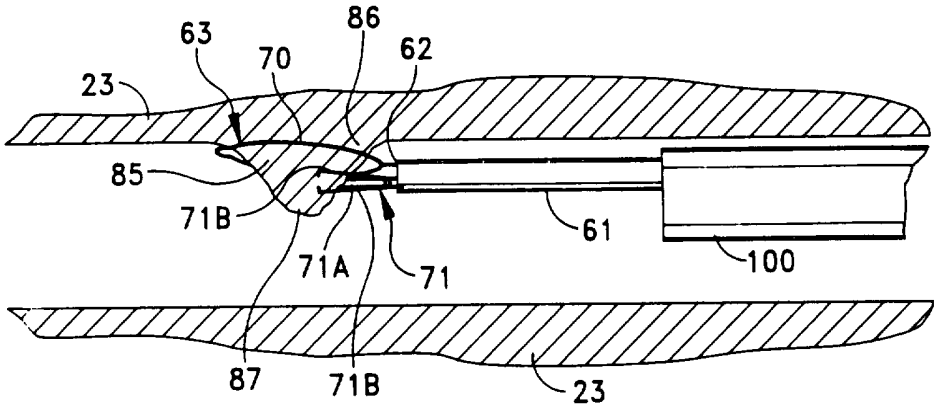


FIG. 16

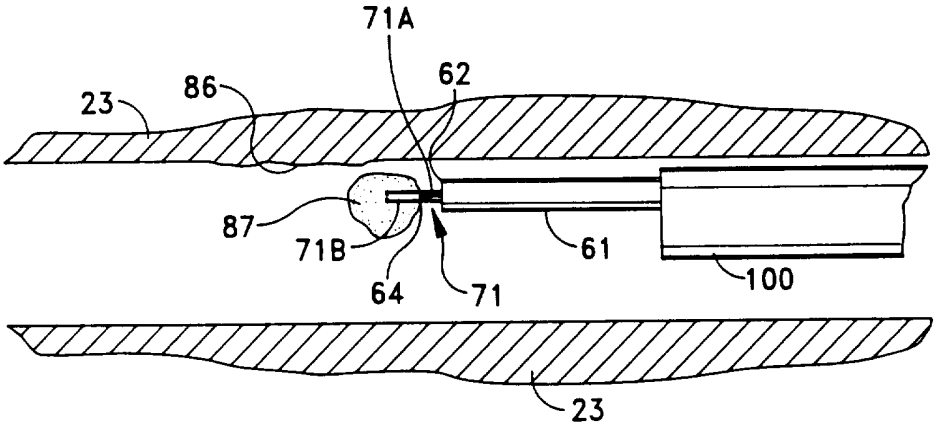


FIG. 17

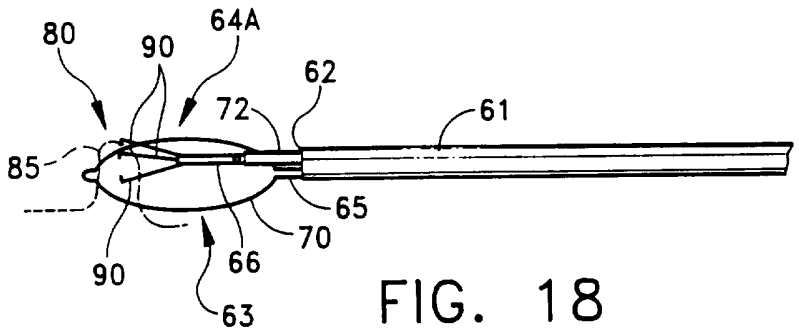


FIG. 18

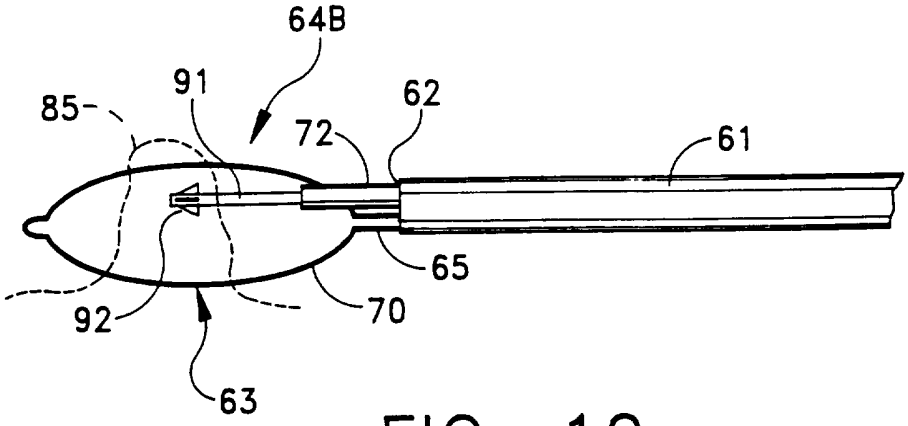


FIG. 19

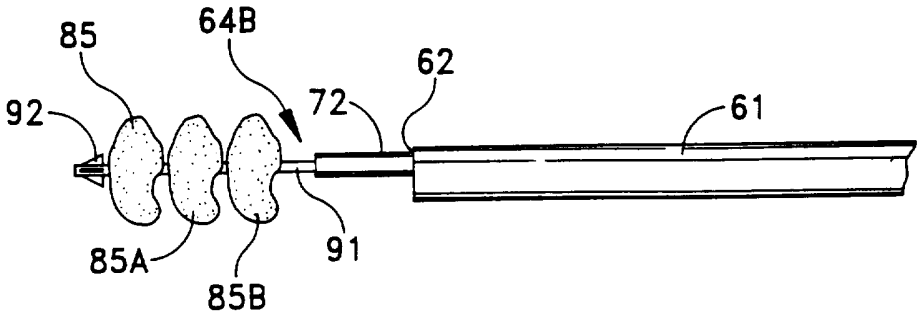


FIG. 19A

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US96/05069

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :A61B 17/24, 17/26
US CL :606/110
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)

U.S. : 606/110, 113, 114, 127

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 practicable, search terms used)

Please See Extra Sheet.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US, A, 5,417,697 (WILK ET AL.) 23 May 1995, see column 2 line 42 to column 4 line 61, and Figs. 1-8b.	1, 4, 7, 11, 12, 19, 29, 33, 36 --- 5, 20-22, 24, 34, 35, 38, 39
Y	US, A, 5,171,233 (AMPLATZ ET AL.) 15 December 1992, see column 3 line 7 to column 5 line 57, and Figs. 1a, 3 and 4.	2, 3 , 27, 28.
Y	US, A, 5,336,227 (NAKAO ET AL.) 09 August 1994, see Figs. 1A, 13 and 15, and column 2 line 50 to column 5 line 14.	6, 14-16.

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

*	Special categories of cited documents:	"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
"A"	document defining the general state of the art which is not considered to be part of particular relevance	"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
"E"	earlier document published on or after the international filing date	"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
"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)	"&"	document member of the same patent family
"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		

Date of the actual completion of the international search 26 JUNE 1996	Date of mailing of the international search report 02 AUG 1996
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3590	Authorized officer JUSTINE R. YU Telephone No. (703) 308-2675

Form PCT/ISA/210 (second sheet)(July 1992)*

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US96/05069

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US, A, 4,509,517 (ZIBELIN) 09 April 1985, see Figs. 5-9, and column 4 line 60 to column 6 line 4.	10, 17, 23, 30.
Y	US, A, 5,176,688 (NARAYAN ET AL.) 05 January 1993, see Figs. 1-5.	8, 9, 26
Y	US, A, 5,376,094 (KLINE) 27 December 1994, see Figs. 8-18, and column 1 line 58 to column 6 line 18.	13, 18, 25
Y	US, A, 4,807,626 (McGIRR) 28 February 1989, see Figs. 1, 2 and 7-13.	31, 32, 35, 37, 40, 41.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US96/05069

B. FIELDS SEARCHED
Electronic data bases consulted (Name of data base and where practicable terms used):

APS

Search Terms: tissue or polyp#, loop or snare or wire, captur, legs or jaws or forceps, needle#, and inject.