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## Fluid management systems and methods

### Abstract

Single-use devices that carry at least one peristaltic pump for providing fluid flows in hysteroscopic or similar procedures. single-use handheld device with a motor-driven cutter and an integrated peristaltic pump used for resecting and removing tissue in an endoscopic procedure.

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## Background/Summary

RELATED APPLICATION INFORMATION (1) This application is a non-provisional of U.S. Provisional application 63/027,554 filed on May 20, 2020, the entirety of which is incorporated by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

(1) The present invention relates to single-use devices that carry at least one peristaltic pump for providing fluid flows in hysteroscopic or similar procedures that in one variation includes a single-use handheld device with a motor-driven cutter and an integrated peristaltic pump that is used for resecting and removing tissue in an endoscopic procedure.

SUMMARY OF THE INVENTION

(2) The present disclosure includes tissue resecting devices and methods of their use. For example, a variation of a tissue resecting device can comprise a handle carrying a motor drive. The tissue resecting device can also comprise an elongated sleeve assembly coupled to the handle. The elongated sleeve can have an outer sleeve with a distal opening for receiving tissue. The elongated sleeve can also have a moveable inner sleeve adapted to resect tissue received by a window at a distal end of the inner sleeve. The tissue resecting device can also comprise a peristaltic pump and a tissue trap carried by the handle.

(3) The motor drive can be adapted to move the inner sleeve and resect tissue. The motor drive can also be adapted to provide negative pressure in a passageway in the inner sleeve to thereby aspirate fluid and resected tissue through the passageway and into the tissue trap. The motor drive can move the inner sleeve axially, rotationally, or both. The tissue trap can be positioned proximally or distally relative to the motor drive. The peristaltic pump can have a rotational axis aligned with the rotational axis of a shaft of the motor drive. The tissue trap can be detachable from the handle. The tissue trap can include a transparent material.

(4) The motor drive can further be adapted to operate at a plurality of selected speeds to thereby provide a corresponding plurality of selected levels of negative pressure. The motor drive can be adapted to rotate the inner sleeve at a selected speed between 100 rpm and 5,000 rpm. The motor drive can also be adapted to adapted provide a negative pressure to cause an outflow rate between 10 ml/min and 1,000 ml/min.

(5) The tissue resecting device can further comprise a gear mechanism. The gear mechanism can provide oscillating rotation of the inner sleeve with the motor drive rotating in a single direction. The tissue resecting device can further comprise a second peristaltic pump carried by the handle. The second peristaltic pump can be adapted for providing fluid inflows from a fluid source through a channel in the sleeve assembly to a distal end thereof.

(6) The present disclosure also includes fluid management systems. For example, a variation of such a fluid management can comprise a housing, a first peristaltic pump, a second peristaltic pump, and at least one motor. The first peristaltic pump can be carried by the housing and can be adapted to provide fluid inflow to a treatment site. The first peristaltic can engage flexible tubing that extends from a fluid source. The second peristaltic pump can be carried by the housing and can be adapted to provide fluid outflows from the treatment site. The second peristaltic pump can engage flexible tubing that extends to a tissue catch. The at least one motor can be carried by the housing and can operate the first and second peristaltic pumps.

(7) The at least one motor can be adapted to provide inflow and outflow rates between 10 ml/min and 1,000 ml/min. The single-use fluid management system can further comprise a pressure sensor adapted to measure fluid pressure in the fluid inflow. The single-use fluid management system can further comprise a controller adapted to maintain a set pressure in a working space responsive to signals from the pressure sensor.

(8) The descriptions provided herein are examples of the invention described herein. It is contemplated that combinations of specific embodiments, specific aspects or combinations of the specific embodiments themselves are within the scope of this disclosure.

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## Description

BRIEF DESCRIPTION OF THE DRAWINGS

(1) Additional aspects of the invention will become clear from the following description of illustrative embodiments and from the attached drawings, in which:

(2) FIG. **1** is a perspective view of single-use tissue resecting device which includes a handle carrying a motor drive adapted to rotate a tubular cutter at a distal working end of an elongate shaft assembly wherein the motor drive is adapted to contemporaneously operate a peristaltic pump within the handle that is adapted to suction fluid and resected tissue from a treatment site.

(3) FIG. **2** is a perspective view of the device of FIGS. **1** and **2** showing the handle partly disassembled to show the peristaltic pump, the motor drive and a tissue catch together with an enlarged view of the working end of the elongate shaft assembly.

(4) FIG. **3** is an exploded view of the components in the interior of the handle of FIG. **1**, showing the peristaltic pump, the motor drive and the tissue catch.

(5) FIG. **4** is an exploded view of another variation of a device similar to that of FIGS. **1-3**, wherein the components in the interior of the handle include an inflow peristaltic pump, an outflow peristaltic pump, a motor drive, a tissue catch and a gear assembly configured for converting unidirectional rotation of the motor shaft into an oscillating rotational movement of a tubular cutting member in the working end of the shaft assembly.

(6) FIG. **5** is an enlarged perspective view of the working end of the device of FIG. **4**, which is similar to the working end of FIG. **2**, showing the fluid inflow channel communicating with the inflow peristaltic pump and further showing the tissue extraction passageway communicating with the outflow peristaltic pump.

(7) FIG. **6** is an exploded view of a single-use fluid management system wherein a housing carries an inflow peristaltic pump, an outflow peristaltic pump, a motor drive and a tissue catch.

(8) FIG. **7** is a schematic view of the single-use fluid management system of FIG. **6**.

(9) FIG. **8** is another view of the single-use fluid management system of FIGS. **6** and **7** showing the system components mounted on a roll-stand.

DETAILED DESCRIPTION OF THE INVENTION

(10) FIGS. **1** through **3** illustrate a motor-driven resecting device **100** that is designed for single-use, typically in a hysteroscopic procedure to resect and remove a polyp, a fibroid or other abnormal uterine tissue. As is known in the art, sterilization of re-usable handles with motor drives is complex and expensive. The cost of sterilization as well as the risks of infection from improperly sterilized devices makes single-use device less expensive to a hospital or physician's office, when compared to using sterilizable devices.

(11) Referring to FIGS. **1** and **2**, the handle or handpiece **104** includes a motor drive **105** and is coupled to an elongate shaft or sleeve assembly **110** extending about longitudinal axis **112**. The shaft assembly **110** extends distally from a rotatable hub **114** to the working end **115**. In one variation, the elongated shaft assembly **110** comprises an outer sleeve **120** with a distal window **122** and a motor-driven, rotating inner sleeve **125** with a window **128** therein (see FIGS. **2** and **5**). The motor drive **105** is coupled to an electrical source **135** and is adapted to rotate the inner sleeve **125** as further described below. (see FIGS. **2** and **3**). Such a type of tubular cutter is known in the art wherein the rotating inner sleeve **125** cuts tissue that interfaces with window **122** in the outer sleeve **120** as the inner sleeve window **128** rotates or oscillates at high speed. Either or both windows **122** and **128** may be configured with cutting teeth, with FIG. **2** illustrating teeth **136** on outer window **122** and teeth **138** on inner window **128**.

(12) As can be understood from FIGS. **1** and **2**, the rotating hub **114** of the shaft assembly **110** is coupled to the handle **104** so that the physician can rotate the shaft assembly **110** and working end **115** relative to the handle **104** to any rotational orientation for cutting tissue while maintaining the

handle **104** in an upright or stable position. The handle **104** can include an actuator button (not shown) for actuating the motor drive **105** or a footswitch can be used.

(13) Referring to FIGS. **1** and **2**, in one variation, the tissue resecting device **100** has a shaft assembly **110** with a diameter ranging from 2 mm to 6 mm, and more often the diameter is between 3 mm and 5 mm. The shaft assembly **110** has a diameter and length for cooperating with a working channel of an endoscopic viewing system or other introducer.

(14) As is known in the prior art, typically a fluid management system is used in a hysteroscopic resection procedures to expand a patient's uterine cavity to allow for endoscopic viewing. In one variation shown in FIGS. **1** and **2**, the resecting device **100** includes a peristaltic pump **140** carried in the interior of the handle **104** which thus comprises a component of a fluid management system. More in particular, the peristaltic pump **140** is configured to provide fluid outflows from a treatment site, where the fluid inflows can be provided by a simple fluid inflow mechanism, such as gravity flow from a hanging saline bag.

(15) FIG. **2** shows the handle **104** of FIG. **1** with a first side of the exterior shell **142** removed to show the motor drive **105** and peristaltic pump **140**. In a variation, the handle **104** carries an inexpensive, DC electric motor drive **105** which allows for its disposability. As can be seen in the exploded view of FIG. **3**, the motor drive **105** has a drive shaft **144** that connects a central shaft **145** of the peristaltic pump **140** which has rollers **148** aligned with the axis **112** of the drive shaft **144**. The peristaltic pump **140** is of a conventional design with **3** or **4** rollers that are adapted to engage flexible tubing **150** shown in phantom view. The flexible tubing **150** has a distal end **152** that couples to a fitting **154** in a housing portion **155** of the rotatable hub **114**. The flexible tubing **150** can be disposed with a space in the handle **104** or can be secured by retention clips in an inferior surface of the handle. The interior lumen of the tubing **150** communicates with a chamber **158** in the housing **155** which is open to a fluid port **160** in the proximal end **162** of the rotating inner sleeve **125** (FIG. **3**). In FIG. **3**, it further can be seen that the proximal end **162** of inner sleeve **125** is fixed to the central shaft **145** of the peristaltic pump **140**. Thus, in the variation of FIGS. **2** and **3**, the motor drive **105** is configured to rotate the inner sleeve **125** and peristaltic pump **140** at the same RPM, which can be from 100 RPM to 5,000 RPM. In one variation, the motor drive **105** provides a negative pressure to cause an outflow rate between 10 ml/min and 1,000 ml/min.

(16) Referring again to FIGS. **2** and **3**, the handle **104** further carries a tissue trap **170** of a type know in the art where fluid outflow and tissue chips are carried into the tissue trap **170** by the peristaltic pump **140** and the tissue trap has a filter that captures the resected tissue chips in a filter, where the tissue chips can be collected for biopsy purposes. In one variation, the tissue trap **170** is made of a transparent material to allow viewing of the tissue chips. In FIG. **3**, the direction of fluid outflows is indicated by arrows in the tubing **150**. The proximal end **172** of the tubing is connected to a fitting **174** in the tissue trap **170**. Another length of tubing **175** couples to a proximal fitting **176** of the tissue trap **170** which extends to a remote collection reservoir **180** (FIGS. **1-2**).

(17) FIG. **4** is an exploded view of another variation of a resection device **200** and FIG. **5** is an enlarged view of the working end **205** of the device **200** of FIG. **4**. In this variation, the shaft assembly **210** remains the same with an outer sleeve **220** and window **222** with a motor-driven inner sleeve **225** and window **228** for resecting tissue.

(18) The resection device **200** of FIGS. **4** and **5** differs from the previous embodiment in that a gear mechanism **235** is carried within the handle **236** to oscillate rotation of the inner sleeve **225** instead of unidirectional rotation. Further, the handle **236** carries a first peristaltic pump **240**A for providing fluid inflows and a second peristaltic pump **240**B for providing fluid outflows as described previously. In one aspect of the invention, the device **200** carries all the components of a fluid management system with both inflow and outflow pumps and a tissue catch **242**. In the exploded view of FIG. **4**, the first inflow peristaltic pump **240**A is in fluid communication with a fluid source **245**, such as a saline bag. The pump **240**A engages flexible tubing **250**A that extends to the fluid source **245**. The outflow peristaltic pump **240**B engages flexible tubing **250**B which

operates as described previously, with the distal end **252** of the outflow tubing **250**B communicating with a chamber (nor shown) in housing **255** which receives fluid and tissue chips from port **260** in inner sleeve **225** (see FIG. **3**).

(19) As can be understood from FIGS. **4** and **5**, the distal end **262** of inflow tubing **250** a connect to a passageway **264** in housing **255** that further communicates with in an inflow channel **265** in the shaft assembly **210** which consists of the annular space in the bore of the outer sleeve **220** and outward of the outer surface of the inner sleeve **225** (FIG. **5**). Turning to FIG. **5** which shows the working end **205**, it can be seen that fluid inflows are indicated by arrows AA where the fluid exits the space between the inner sleeve **225** and outer sleeve **220**. The motor drive **270** can be adapted provide inflow and outflow rates between 10 ml/min and 1,000 ml/min. The motor drive **270** is operatively coupled to an electrical source **275** which may be a battery in the handle or a remote battery or power source. Actuation of the system can be provided by a switch **276** in the handle or a foot switch.

(20) Referring to FIG. **4**, both peristaltic pumps **240**A and **240**B can be a conventional design with **3** or **4** rollers engage the flexible tubing **250**A and **250**B, respectively. Both pumps **240**A and **240**B can be connected to motor shaft **266** of motor drive **270**. As can be seen in FIG. **4**, the pumps **240**A and **240**B can rotate in the same direction, but the flexible tubing **250**A and **250**B can be disposed around the roller **272***a* and **272***b* of the pumps in opposing directions (i.e., one clockwise and the other counterclockwise) to that fluid flow in opposing directions in the tubing. In other variations, the handle **232** can be provided with a single motor and gear mechanisms to drive the pumps in opposing directions, or the handle can be provided with an individual motor for each pump. While peristaltic pumps **240**A and **240**B are shown in the figures, it should be appreciated that other types of pumps can be used, such as piston pumps, impeller pumps, vane pumps and the like.

(21) Referring again to FIG. **4**, the exploded view of handle **236** shows the gear mechanism **235** which converts the single direction of rotation of the motor drive shaft **266** to an oscillating rotation of the inner sleeve **225** to thus provide and oscillating movement of the inner sleeve cutting window **228** at the working end **205** of the device **200** (See FIG. **5**). As is well known in the field of tissue resection, tubular cutters work optimally when the inner rotating sleeve and inner cutting window **228** oscillates, for example, with several revolutions in one rotational direction followed by a similar number of rotations in the opposite direction. Such oscillation provides improved cutting performance when compared with devices that rotate a cutting member in a single direction. The gear mechanism **235** is more fully described in commonly owned U.S. patent application Ser. No. 16/678,647 titled ENDOSCOPE AND METHOD OF USE filed Nov. 8, 2019, which is incorporated herein by reference. The gear mechanism **235** can operate at any suitable rotation speed, for example 100 RPM to 5000 RPM or more.

(22) In another aspect of the invention, the peristaltic pumps **240**A and **240**B of the resecting device **200** can provide different flow rates, wherein one flow rate (inflow or outflow rate) can range from 50% to 100% of the other flow rate. Such varied inflow and outflow rates can be provided for any constant pump rotational speed by varying the interior lumen diameter of the inflow tubing **250**A and the outflow tubing **250**B. Alternatively, a gear mechanism can be provided to rotate the pumps at different rotational speeds, for any given motor speed.

(23) In another optional variation, a device **200** as in FIG. **4** can include a pressure sensor **280** positioned to measure pressure in the inflow line **250**A distal to the pump **250**A. The pressure sensor **280** can be configured to send pressure signals to a processor or controller **285** which in turn can include control algorithms for actuation of the pumps. In another variation, the device **200** can be provided with first and second motor drives (not shown) coupled to the respective pumps **240**A and **240**B, and the controller **285** can control operation of the pumps independently to maintain a set pressure in a treatment site based on pressure readings by the pressure sensor **280**.

(24) While FIG. **4** shows two separate peristaltic pumps **240**A and **240**B, it should be appreciated that a single peristaltic pump with elongated rollers may be configured with inflow and outflow

tubing disposed opposing rotational directions around the roller to provide the inflows and outflows.

(25) While FIG. **4** shows on variation of a handle design in which the pumps **240**A and **240**B, gear mechanism **235**, motor **270** and tissue catch **242** are positioned in a particular longitudinal arrangement, these components can be positioned in any suitable manner within the handle **236**.

(26) FIGS. **6**, **7** and **8** illustrate schematically another variation of the invention which comprises a single-use fluid management system **300** that can be used for diagnostic procedures or that can be used with a separate resection device **302** in shown in FIG. **7** in a resection procedure. In a hysteroscopic diagnostic procedure, both the fluid inflow and outflow lines would be connected to an endoscope. In a resection procedure, the fluid inflow would be connected to an endoscope and the outflow line would be connected to the resection device.

(27) In FIG. **6**, it can be seen that the fluid management system **300** consists of a housing **304** that carries a motor drive **305** with motor shaft **306** that drives peristaltic pump portions **320**A and **320**B that are similar to the pumps in the previously described system. The peristaltic pumps **320**A and **320**B engage respective tubing sets **325**A and **325**B to provide fluid inflows and outflows. A fluid source **245** and collection reservoir **180** are provided as in the previous system. A tissue catch **330** also is the same as described previously. The fluid inflows from pump **320**A are configured to flow into a working space **332**, such as a uterine cavity, as shown in FIG. **7**. The inflow can be directed through an inflow channel in an electronic endoscope **335** with image sensor **336** as shown in FIG. **7**. The endoscope **335** is coupled to display **338**. The motor drive **305** is connected to an electrical source **275** which is either a battery in the housing **304** or a remote battery or power source, which may be connected to the controller **285** further described below.

(28) In the fluid management system **300** of FIGS. **6** and **7**, a pressure sensor **340** again is positioned to measure pressure in the inflow line **325**A distal to the pump **320**A. The pressure sensor **340** is configured to send pressure signals to the processor or controller **285**. In this variation, the controller **285** may be adapted for single use or can be re-useable and carried in suitable housing which also may carry the battery or power source **275**. The controller **285** includes control algorithms for actuation of the pumps **320**A and **320**B for maintaining a set pressure in the working space **332**, such as a uterine cavity, in response to pressure signals from the sensor **340**.

(29) In order to operate the fluid management system **300**, a control pad **350** is coupled to the controller **285**, which can include an ON/OFF button **355** for actuating the pumps. Further, the control pad **350** can include buttons **356** and **358** for increasing and decreasing the set pressure. Another button (not shown) can be provided for a “flush” mode wherein the fluid flow rate is increased to a higher level for flushing the working space **332**. The control pad can be disposable and attached to the handle of the endoscope **335** when performing a diagnostic procedure or can be attached to the handle of a resecting device **302** in a resection procedure. In use, a saline bag comprising the fluid source **245** and the collection reservoir (e.g., a plastic bag) **180** can be hung on a stand **360** as shown in FIG. **8**. The controller **285** can comprise a small housing that also can be attached to the stand **360** carrying the saline bag **245**. The single-use disposable fluid management system **300** can be positioned in any suitable location for coupling to the endoscope **335** and optionally to the resecting device **302**. The system thus occupies a very small footprint compared to commercially available fluid management systems.

(30) In a variation shown in FIG. **8**, the stand **360** can include a first load sensor **370** operatively connected to a first hook **372** carrying the saline bag **245** (fluid source) and a second load sensor **375** connected to a second hook **376** carrying the collection reservoir **180**, wherein both load sensors send signals to the controller **285**. The controller **285** then can use controller algorithms as known in the art to calculate a fluid deficit. Other variations can include using a single load sensor that weighs both the saline bag **245** and the collection reservoir **180** as is known in the art. In another variation, the system can include a drape **380** and separate pump **385** for pumping fluid collected by a drape **380** to the collection reservoir **180** which can allow for more accurate

calculation of fluid deficits.

(31) Although particular embodiments of the present invention have been described above in detail, it will be understood that this description is merely for purposes of illustration and the above description of the invention is not exhaustive. Specific features of the invention are shown in some drawings and not in others, and this is for convenience only and any feature may be combined with another in accordance with the invention. A number of variations and alternatives will be apparent to one having ordinary skills in the art. Such alternatives and variations are intended to be included within the scope of the claims. Particular features that are presented in dependent claims can be combined and fall within the scope of the invention. The invention also encompasses embodiments as if dependent claims were alternatively written in a multiple dependent claim format with reference to other independent claims.

(32) Although particular embodiments of the present invention have been described above in detail, it will be understood that this description is merely for purposes of illustration and the above description of the invention is not exhaustive. Specific features of the invention are shown in some drawings and not in others, and this is for convenience only and any feature may be combined with another in accordance with the invention. A number of variations and alternatives will be apparent to one having ordinary skills in the art. Such alternatives and variations are intended to be included within the scope of the claims. Particular features that are presented in dependent claims can be combined and fall within the scope of the invention. The invention also encompasses embodiments as if dependent claims were alternatively written in a multiple dependent claim format with reference to other independent claims.

(33) Other variations are within the spirit of the present invention. Thus, while the invention is susceptible to various modifications and alternative constructions, certain illustrated embodiments thereof are shown in the drawings and have been described above in detail. It should be understood, however, that there is no intention to limit the invention to the specific form or forms disclosed, but on the contrary, the intention is to cover all modifications, alternative constructions, and equivalents falling within the spirit and scope of the invention, as defined in the appended claims.

(34) The use of the terms “a” and “an” and “the” and similar referents in the context of describing the invention (especially in the context of the following claims) are to be construed to cover both the singular and the plural, unless otherwise indicated herein or clearly contradicted by context. The terms “comprising,” “having,” “including,” and “containing” are to be construed as open-ended terms (i.e., meaning “including, but not limited to,”) unless otherwise noted. The term “connected” is to be construed as partly or wholly contained within, attached to, or joined together, even if there is something intervening. Recitation of ranges of values herein are merely intended to serve as a shorthand method of referring individually to each separate value falling within the range, unless otherwise indicated herein, and each separate value is incorporated into the specification as if it were individually recited herein. All methods described herein can be performed in any suitable order unless otherwise indicated herein or otherwise clearly contradicted by context. The use of any and all examples, or exemplary language (e.g., “such as”) provided herein, is intended merely to better illuminate embodiments of the invention and does not pose a limitation on the scope of the invention unless otherwise claimed. No language in the specification should be construed as indicating any non-claimed element as essential to the practice of the invention.

(35) Preferred embodiments of this invention are described herein, including the best mode known to the inventors for carrying out the invention. Variations of those preferred embodiments may become apparent to those of ordinary skill in the art upon reading the foregoing description. The inventors expect skilled artisans to employ such variations as appropriate, and the inventors intend for the invention to be practiced otherwise than as specifically described herein. Accordingly, this invention includes all modifications and equivalents of the subject matter recited in the claims appended hereto as permitted by applicable law. Moreover, any combination of the above-

described elements in all possible variations thereof is encompassed by the invention unless otherwise indicated herein or otherwise clearly contradicted by context.
(36) All references, including publications, patent applications, and patents, cited herein are hereby incorporated by reference to the same extent as if each reference were individually and specifically indicated to be incorporated by reference and were set forth in its entirety herein.

## Claims

1. A tissue resecting device comprising: a handle carrying a motor drive comprising a drive shaft; an elongated sleeve assembly coupled to the handle, the elongated sleeve assembly having an outer sleeve comprising a distal opening for receiving tissue and a plurality of outer teeth, and a moveable inner sleeve adapted to resect tissue received by an inner window at a distal end of the inner sleeve, wherein the inner window comprises a plurality of inner teeth configured to resect tissue received in the distal opening; a peristaltic pump carried by the handle, wherein the peristaltic pump comprises one or more rollers, wherein a proximal end of the inner sleeve is fixed to a central shaft of the peristaltic pump, wherein the central shaft contacts each of the one or more rollers and connects to the drive shaft such that the motor drive is configured to rotate the central shaft and the one or more rollers with respect to a longitudinal axis of the elongated sleeve assembly; and a tissue trap carried by the handle; wherein the motor drive is adapted to move the inner sleeve to resect tissue, and adapted to provide negative pressure in a passageway in the inner sleeve to aspirate fluid and resected tissue through the passageway and into the tissue trap.
2. The tissue resecting device of claim 1 wherein the motor drive moves the inner sleeve rotationally.
3. The tissue resecting device of claim 1 wherein the motor drive moves the inner sleeve axially.
4. The tissue resecting device of claim 1 wherein the motor drive moves the inner sleeve axially and rotationally.
5. The tissue resecting device of claim 1 wherein the tissue trap is positioned proximally relative to the motor drive.
6. The tissue resecting device of claim 1 wherein the peristaltic pump is positioned distally relative to the motor drive.
7. The tissue resecting device of claim 1 wherein the peristaltic pump has a rotational axis aligned with the rotational axis of a shaft of the motor drive.
8. The tissue resecting device of claim 1 wherein the tissue trap is detachable from the handle.
9. The tissue resecting device of claim 1 wherein the tissue trap includes a transparent material.
10. The tissue resecting device of claim 1 wherein the motor drive is adapted to operate at a plurality of selected speeds to thereby provide a corresponding plurality of selected levels of negative pressure.
11. The tissue resecting device of claim 1 wherein the motor drive is adapted to rotate the inner sleeve at a selected speed between 100 rpm and 5,000 rpm.
12. The tissue resecting device of claim 1 wherein the motor drive is adapted provide a negative pressure to cause an outflow rate between 10 ml/min and 1,000 ml/min.
13. The tissue resecting device of claim 1 further comprising a gear mechanism for oscillating rotation of the inner sleeve with the motor drive rotating in a single direction.
14. The tissue resecting device of claim 1 further comprising a second peristaltic pump carried by the handle adapted for providing fluid inflows from a fluid source through a channel in the elongated sleeve assembly to a distal end thereof.