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(54) **Laparoscopic apparatus for performing electrosurgical procedures**

Laparoskopisches Gerät zur Durchführung von elektrochirurgischen Verfahren

Instrument laparoscopique pour exécuter des procédures électrochirurgicales

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Description

BACKGROUND

1. Technical Field

[0001] The present disclosure relates generally to an apparatus and method for performing laparoscopic electrosurgical procedures, and more particularly, to an apparatus for controlling suction and irrigation cycles during laparoscopic electrosurgical procedures.

2. Background of Related Art

[0002] During electrosurgery, a source or active electrode delivers energy, such as radio frequency (RF) energy, from an electrosurgical generator to a patient and a return electrode or a plurality thereof carry current back to the electrosurgical generator. In monopolar electrosurgery, the source electrode is typically a hand-held instrument placed by the surgeon at the surgical site and the high current density flow at this electrode creates the desired surgical effect of ablating, cutting or coagulating tissue. The patient return electrodes are placed at a remote site from the source electrode and are typically in the form of pads adhesively adhered to the patient.

[0003] Bipolar electrosurgery is conventionally practiced using electrosurgical forceps-type device, where the active and return electrodes are housed within opposing forceps' jaws. The return electrode is placed in close proximity to the active (i.e., current supplying) electrode such that an electrical circuit is formed between the two electrodes (e.g., electrosurgical forceps). In manner, the applied electrical current is limited to the body tissue positioned between the electrodes.

[0004] During electrosurgical procedures, byproducts form at the surgical site from coagulated and/or cut flesh (e.g., debris, smoke, etc.). This debris may be removed by irrigating the site, where an irrigation fluid is supplied to the surgical site and then withdrawn through suction. Conventional irrigation mechanisms have been controlled mechanically with the mechanical controls disposed within a handle holding the electrosurgical instrument. Such designs could not achieve a desired level of suction and/or irrigation and moreover, these designs were not compact and ergonomic.

[0005] US 5,836,909 discloses a fluid control system for use in electrosurgery having a suction and irrigation hand piece in connection with the fluid control system. The hand piece has a suction activation switch and an irrigation activation switch.

[0006] Therefore, there is a need for an electrosurgical apparatus having an irrigation system controlled through electrical means and disposed outside the apparatus' handle.

SUMMARY

[0007] The invention provides a system for irrigating a surgical site according to claim 1. The present disclosure provides for a system, but this is not the system defined in claim 1, and apparatus for irrigating a surgical site during an electrosurgical procedure. The system includes a hand piece for controlling an electrosurgical generator and an irrigation system having an irrigation tube for supplying irrigation fluid and a suction tube for withdrawing irrigation fluid and smoke. The hand piece's controls are connected to a hardware module which controls irrigation and suction valves disposed within a valve cassette which adjusts the flow of the irrigation fluid and suction. In addition, the irrigation fluid is used to cool the electrode.

[0008] According to one embodiment of the present disclosure, a system for irrigating a surgical site during an electrosurgical procedure is provided, but this is not the system defined in claim 1. The system includes a hand piece having an elongated housing connected to a multilumen tube extending proximally from the housing and having an irrigation tube for delivering irrigation fluid, a suction tube for withdrawing irrigation fluid, and electrical wiring, the hand piece further includes first controls for adjusting flow of irrigation fluid within the irrigation tube and second controls for adjusting flow of irrigation fluid within the suction tube, the first and second controls transmitting first and second control signals through the electrical wiring; a valve cassette connected to the multilumen tube, the cassette including an irrigation valve configured to control the flow within the irrigation tube and a suction valve configured to control the flow within the suction tube, the irrigation tube further connected to an irrigation fluid source and the suction tube further connected to a vacuum source; and a hardware control module connected to the electrical wiring for receiving the first and second control signals and controlling the irrigation valve through an irrigation servo actuator based on the first control signals and controlling the suction valve through a suction servo actuator based on the second control signals.

[0009] According to another embodiment of the present disclosure, an apparatus for controlling irrigation at a surgical site during an electrosurgical procedure is provided, but this is not the system provide in claim 1. The apparatus includes an elongated housing, a multilumen tube extending proximally from the housing and having an irrigation tube for delivering irrigation fluid including an irrigation check valve, a suction tube for withdrawing irrigation fluid including a suction check valve, and electrical wiring, first and second controls transmitting first and second control signals, the multilumen tube connected to a valve cassette, the cassette including an irrigation valve configured to control the flow within the irrigation tube and a suction valve configured to control the flow within the suction tube, the irrigation tube further connected to an irrigation fluid source and the suction tube further connected to a vacuum source, and a hard-

ware control module configured to receive the first and second control signals and controlling the irrigation valve through an irrigation servo actuator based on the first control signals and controlling the suction valve through a suction servo actuator based on the second control signals.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The above and other aspects, features, and advantages of the present disclosure will become more apparent in light of the following detailed description when taken in conjunction with the accompanying drawings in which:

Fig. 1 is a block diagram illustrating in general an electrosurgical system according to an embodiment of the present disclosure;

Fig. 2A is a perspective view of a hand piece in accordance with an embodiment of the present disclosure;

Fig. 2B is a cross-sectional perspective view of a tube extending from the hand piece of Fig. 2A;

Fig. 3 is a block diagram of a valve cassette according to an embodiment of the present disclosure;

Fig. 4A is a perspective view of an active electrode with an irrigation tip according to one embodiment of the present disclosure;

Fig. 4B is a frontal view of the active electrode with the irrigation tip of Fig. 4A;

Fig. 4C is a cross sectional view of the active electrode with the irrigation tip of Fig. 4A;

Fig. 5A is a perspective view of an active electrode with an irrigation tip according to another embodiment of the present disclosure;

Fig. 5B is a cross sectional view of the active electrode with the irrigation tip of Fig. 5A;

Fig. 6A is a perspective view of an irrigation tip according to a further embodiment of the present disclosure; and

Fig. 6B is a cross sectional view of the irrigation tip of Fig. 6A.

DETAILED DESCRIPTION

[0011] Embodiments of the present disclosure are described below with reference to the accompanying drawings. In the following description, well-known functions or constructions are not described in detail to avoid obscuring the present disclosure in unnecessary detail.

[0012] The foregoing disclosure describes embodiments with reference to a monopolar laparoscopic surgical instrument. However, principles of the present disclosure may be utilized in a bipolar instrument as well as suitable open instruments.

[0013] An electrosurgical system and method to be used to perform cautery procedures, hemostatis, and other suitable procedures are provided. The system provides irrigation and/or suction (e.g., a vacuum line), which may be performed contemporaneously with the electrosurgical procedure or after the procedure is complete. In some embodiment, the irrigation fluid may be used to cool the electrosurgical cautery electrode to reduce eschar build-up, modify tissue effect, and/or prevent inadvertent burns from a heated electrode.

[0014] Embodiments of the presently disclosed electrosurgical system will now be described in detail with reference to the drawings wherein like reference numerals identify similar or identical elements. As used herein, the term "distal" refers to that portion that is further from the user while the term "proximal" refers to that portion that is closer to the user.

[0015] Fig. 1 shows an electrosurgical system including a generator 10, a hand piece 12 (e.g., an electrosurgical pencil) having an active electrode 14 at a distal end thereof which is brought in contact with a patient P to effect a cut and/or coagulation procedure depending upon the selected operating mode. The active electrode 14 is an electrically conducting element that is usually elongated and may be in the form of a thin flat blade with a pointed or rounded distal end. Alternatively, the active electrode 14 may include an elongated narrow cylindrical needle which is solid or hollow with a flat, rounded, pointed or slanted distal end.

[0016] Attached to the patient P is a return electrode 16 that returns the electrosurgical current from the patient P to the generator 10. The hand piece 12 is coupled to the generator 10 via a multilumen tube 18 extending from a proximal end of the hand piece 12. In one embodiment, the multilumen tube 18 includes electrical wires for supplying the electrosurgical energy to the active electrode 14 as well as electrical power for the controls of the hand piece 12.

[0017] The active electrode 14 may be used laparoscopically, e.g., inserted into a body cavity through a percutaneous incision. To accomplish this, the electrode 14 may be introduced into a body cavity through a suitable trocar (not shown). The trocar may include an elongated tube that penetrates the body cavity with its distal end and the electrode 14 is introduced thereto through its proximal end. In addition, the trocar may include a hemostatic valve disposed at its proximal end to prevent backflow of gases.

[0018] The hand piece 12 also includes an irrigation tip that irrigates the surgical site, the details of which will be described below. Other components of the irrigation

system, such as irrigation fluid supply and valve mechanisms may be disposed within the generator 10 or within a separate stand-alone device such as a suitable cassette. The irrigation and suction lines are coupled from the irrigation system to the hand piece 12 and thereafter to the irrigation tip and may be included within the multilumen tube 18.

[0019] The irrigation system supplies a suitable irrigation fluid such as a saline solution, through the irrigation tip near the active electrode 14. The irrigation fluid is used to cool the active electrode 14 during electrosurgical usage to reduce or eliminate eschar (e.g., sloughed-off dead tissue caused by a burn or cauterization). In addition, the irrigation fluid may be used to remove any debris caused by the electrosurgical procedure.

[0020] The hand piece 12 remains outside the body cavity and outside the trocar and allows the surgeon to control the electrosurgical operations as well as irrigation cycles. Referring to Fig. 2A, the hand piece 12 according to one embodiment of the disclosure is shown and includes a variety of controls within an elongated housing 19. The hand piece 12 includes mode selection controls 20 that allow the surgeon to select the operating mode for the generator 10 (e.g., cut, coagulation, blend). Generally, generators operate in a plurality of modes, e.g., cut, coagulation, or blend, accomplished by using different current waveforms. Using a constant waveform, a generator allows a surgeon to vaporize or cut tissue since a constant waveform produces heat very rapidly. Using an intermittent waveform causes a generator's duty cycle to be reduced to coagulate tissue. A blended current allows for a mixture of the two above waveforms to achieve intermediate results. The hand piece 12 also includes intensity controls 22 that allow the surgeon to modify the power of the energy being supplied to the active electrode 14, which is supported within the housing 19 and extends distally therefrom.

[0021] The hand piece 12 also includes controls for adjusting the irrigation system. More specifically, the hand piece 12 may include an irrigation controller 24 which activates and deactivates the flow of the irrigation fluid and an irrigation volume adjuster 26 which adjusts the flow volume of the irrigation fluid. In addition, the hand piece 12 includes a suction control 28 which activates and deactivates vacuum suction apparatus to withdraw the aspirated irrigation fluid. A suction volume adjuster 30 controls a setting level of the vacuum pump which controls the rate at which irrigation fluid is withdrawn.

[0022] The mode selection controls 20, intensity controls 22, irrigation volume adjuster 26 and suction volume adjuster 30 are operatively connected to a voltage divider network ("VDN") (e.g., a film-type potentiometer). For the purposes herein, the term "voltage divider network" relates to any suitable form of resistive, capacitive or inductive circuit that determines the output voltage across a voltage source (e.g., one of two impedances) connected in series. A "voltage divider" as used herein relates to a number of resistors connected in series which are provided with taps at certain points to make available a fixed or variable fraction of the applied voltage. An example of a hand piece employing such a voltage divider is discussed in a commonly-owned U.S. Patent Publication No. 2005-0113823 entitled "Electrosurgical Pencil With Improved Controls". It is also envisioned that the irrigation volume adjuster 26 and suction volume adjuster 30 divider networks may be aligned with a single slide (not explicitly shown) wherein moving of the slide in one direction adjusts flow of irrigation fluid and moving the slide in another direction adjusts flow of aspirated irrigation fluid.

[0023] The multilumen tube 18 extends proximally from the housing 19 and includes multiple lumens containing conduits for electrical wiring 36, an irrigation tube 32 that supplies the irrigation fluid to a surgical site, and suction tube 34 that withdraws the irrigation fluid by providing a conduit to a suitable vacuum source. The electrical wiring 36 includes wires for transmitting electrosurgical current to the active electrode 14 and control current for transmitting input signals from the controls of the hand piece 12. Using DC voltage to transmit input signals is well known in the art and is described in commonly owned U.S. Patents Nos. 3,699,967 and 3,801,800.

[0024] As shown in Fig. 2B, an irrigation check valve 31 and a suction check valve 33 are disposed within the irrigation tube 32 and the suction tube 34, respectively, at the proximal end of the hand piece 12. The suction check valve 33 may be of "duck bill" design or in some embodiment may be a flap. Orientation of the suction check valve 33 allows fluids and vacuum to flow with minimum resistance therethrough but prevents fluid from draining in the opposing direction.

[0025] The irrigation check valve 31 may also be of "duck bill" design, as well as, a poppet, a flap, a spring-loaded ball type check valve, or any suitable check valve that may be inserted modularly into the irrigation tube. The irrigation check valve 31 is configured to open under sufficient opening pressure to allow for irrigation fluid to flow therethrough. Opening pressure from about 6 inches (1.5kPa) to about 48 inches (12kPa) of water column pressure is sufficient to prevent fluid in the irrigation tube 32 from draining through the hand piece 12 when an irrigation valve 42 is closed (see Fig. 3). The pressure is also sufficient to provide minimum resistance to flow pressure when the irrigation valve 42 is open.

[0026] With reference to Fig. 3, the multilumen tube 18 couples the hand piece 12 to a valve cassette 40 that includes suitable mechanisms for controlling the in-flow and out-flow of the irrigation fluid at the surgical site. The electrical wiring 36 is coupled to a contact block 38 which provides an electrical interface between the hand piece 12 and the generator 10. More specifically, the contact block 38 is electrically coupled to a hardware control module 50 that monitors and controls the operation of the generator 10 and the valve cassette 40. The control module 50 may include electronic circuitry such as a microprocessor, memory, and comparators for performing a

variety of functions within the purview of those skilled in the art (e.g., comparing values, receiving control signals, converting analog signals to and from digital signals, issuing control commands to generator 10 and valve cassette 40, etc.).

[0027] The valve cassette 40 includes a suction valve 44 which controls vacuum within the suction tube 34. Opening the suction valve 44 creates vacuum within the suction tube 34 by providing access to a vacuum pump (not explicitly shown) thereby leading to siphoning off of the aspirated irrigation fluid. Closing the suction valve 44 terminates access to the vacuum pump. Regulating the position of the suction valve 44 allows the surgeon to modulate the amount of suction.

[0028] The suction valve 44 may be regulated by a vacuum servo actuator 45 that opens and closes the valves based on control signals from the control module 50. The control signals originate from the suction control 28 and the suction volume adjuster 30 and are transmitted to the control module 50 along the electrical wiring 36 and through the contact block 38.

[0029] The valve cassette 40 also includes the irrigation valve 42 that adjusts the aperture of the irrigation tube 36, thereby adjusting the flow of the irrigation fluid to the surgical site. The irrigation valve 42 may be controlled by an irrigation servo actuator 43 receives control signals from the control module 50. The irrigation fluid may be dispensed from a pressurized bag 46 that may be compressed by a servo regulator 48 (e.g., an air supply pump).

[0030] In one embodiment, flow of the irrigation fluid is regulated in the following manner. Initially, the surgeon selects desired pressure for supplying the irrigation fluid. Thereafter, control signals are transmitted from the irrigation controller 24 and the irrigation volume adjuster 26 through the electrical wiring 36 and the contact block 38. The desired flow/pressure may be achieved by increasing pressure on the pressurized bag 46 and leaving the irrigation valve 42 open. Alternatively, the pressure on the pressurized bag 46 may remain static and the irrigation valve 42 may be adjusted to achieve the desired flow rate. Those skilled in the art will appreciate that irrigation fluid may be stored in a variety of containers (e.g., a storage tank) and be dispensed using a pump. The pump may be controlled by varying the pump's pressure between zero and maximum setting, e.g., a variable speed pump. The irrigation volume adjuster 26 includes a VDN may delivers a control voltage to the pump varying its output pressure.

[0031] Figs. 4A-C show the active electrode 14 with an irrigation tip 56. The active electrode 14 is bent into an L-shaped configuration. However, the electrode 14 may be in a variety of suitable shapes and configurations (e.g., spatula, needle, ball-point, solid, hollow, etc.). The active electrode 14 is positioned between an irrigation opening 52 and a suction opening 54 as shown in Figs. 4A-C. In one embodiment, the irrigation tip 56 is made from an insulative material to prevent accidental shock to the patient.

[0032] It is envisioned that during an electrosurgical procedure the irrigation fluid passes through the irrigation opening 52 and into the surgical site to wash away any debris generated during the surgical procedure. The irrigation fluid is then suctioned off through the suction opening 54 to evacuate the debris from the surgical site. In addition, the smoke generated during the procedure is also evacuated. The irrigation tip 56 may have a plurality of irrigation openings 52 and suction openings 54.

[0033] The present invention also contemplates that the irrigation fluid is used to cool the active electrode 14 in order to maintain the tip of the electrode 14 at a temperature below that of eschar formation (e.g., 100°C). The active electrode 14 may include specific geometry that improves heat transfer from the surface of the active electrode 14 to the irrigation fluid (e.g., grooves chiseled therein). To achieve efficient heat transfer from the active electrode 14, the irrigation fluid may be passed at a sufficiently slow rate so that the fluid flows along the active electrode 14 via capillary action and into the suction opening 54. The irrigation and suction openings 52, 54 extend for the same distance longitudinally to accommodate for irrigation of the active electrode 14.

[0034] It is also envisioned that the suction opening 54 may extend further than the irrigation opening 52. This arrangement allows the irrigation fluid to flow along a larger segment of the active electrode 14 than an arrangement where the irrigation and suction paths are approximately the same length. As a result, the active electrode 14 transfers more heat to the irrigation fluid. Such additional cooling may be utilized in electrosurgical procedures that have higher energy requirements, since such procedures generate more heat and require more cooling to alleviate eschar formation. In addition, extending the suction opening 54 allows for irrigation fluid to be jetted beyond the active electrode 14 allowing for better irrigation of the surgical site.

[0035] Figs. 5A-B show another embodiment of the active electrode 14 and the irrigation tip 56, where the active electrode 14 is positioned above the irrigation and suction openings 52, 54. This arrangement may be particularly useful where cooling of the electrode 14 is secondary to providing proper irrigation and evacuation of the debris and smoke from the surgical site. As shown in Fig. 5B, the irrigation opening 52 includes a lip 53 to direct the flow of the irrigation fluid downward and into the surgical site, which allows for rapid irrigation of the surgical site.

[0036] Figs. 6A-B show an irrigation adapter 58 without the active electrode 14. The irrigation adapter 58 includes an irrigation opening 60 and a front suction opening 64. The irrigation adapter 58 may include a ball (not explicitly shown) serving a ball valve, such as when the suction is on or the irrigation adapter 58 is pressed against a surface (e.g., tissue) the ball retracts to allow for irrigation fluid to pass through the front suction opening 64. In addition, the irrigation adapter 58 also includes one or more side suction opening 62.

[0037] Fig. 6B shows a cross sectional view of the irrigation adapter 58 and its connectivity to the irrigation tube 32 and the suction tube 34. The irrigation fluid enters the irrigation adapter 58 through an irrigation passage 66 and flows through an irrigation channel 70 of the irrigation adapter 58. The irrigation fluid is extracted through a suction channel 72 and enters the suction tube 34 through a suction passage 68. The suction passage 72 extends further than the irrigation passage 70 to allow for separated and distinct in and out flow paths.

[0038] The irrigation adapter 58 is coupled to the irrigation and suction tubes by a plurality of ridges 74, 76, 78, 80. The ridges 74, 76 are in contact with the top and bottom outside surfaces of the suction passage 68 and the ridges 78, 80 are in contact with the top outside surface of the irrigation passage 70 and the suction passage 80, respectively. In effect, the ridges 78, 80 secure the entire irrigation adapter 58, while the ridges 78, 80 provide additional support to the suction passage 72 that extends beyond the length of the irrigation passage 70.

[0039] It is envisioned that the irrigation and suction system of the present disclosure may be utilized as a stand-alone system (e.g., not part of an electrosurgical apparatus).

Claims

1. A system for irrigating a surgical site during laparoscopic electrosurgical procedures whereby an active electrode (14) delivers energy from an electrosurgical generator (10) to a patient and at least one return electrode (16) carries current back to the electrosurgical generator, comprising:

the electrosurgical generator;
a hand piece (12) having an elongated housing (19) coupled to a multilumen tube (18) extending from the housing, the active electrode supported within the housing and extending distally from the housing, the electrode being coupled to the electrosurgical generator, the multilumen tube including an irrigation tube (32) for delivering irrigation fluid, a suction tube (34) for withdrawing irrigation fluid, and electrical wiring; **characterised by**:

the hand piece further including first controls (24, 26) for controlling the flow of irrigation fluid within the irrigation tube, and second controls (28, 30) for controlling the suction within the suction tube wherein the first controls include an irrigation controller (24) for activating and deactivating the flow of the irrigation fluid and an irrigation volume adjuster (26) for adjusting the flow volume of the irrigation fluid and the second controls include a suction control (28) for activating and deactivating a vacuum source for withdrawing aspirated irrigation fluid and a suction volume adjuster (30) for controlling a setting level of the vacuum source, which controls the aspirated irrigation fluid is withdrawn;
the first and second controls transmitting first and second control signals through the electrical wiring; and **characterised by**:

a valve cassette (40) coupled to the multilumen tube, the valve cassette including an irrigation valve (42) configured to control the flow within the irrigation tube and a suction valve (44) configured to control the flow within the suction tube;
the irrigation tube coupled to an irrigation fluid source (46) and the suction tube coupled to the vacuum source; and
a hardware control module (50) coupled to the electrical wiring for receiving the first and second control signals and operable to control the irrigation valve based on the first control signals and to control the suction valve based on the second control signals.

2. A system of claim 1, wherein the irrigation source is a pressurized bag (46).

3. A system of claim 2, further comprising a servo regulator for adjusting a pressure within the pressurized bag.

4. A system according to any preceding claim, wherein the irrigation fluid is delivered by a variable speed pump from the irrigation source.

5. A system of any preceding claims, wherein the first controls further comprise:

a first voltage divider network supported on the housing and being electrically coupled to the hardware control module for adjusting flow of irrigation fluid within the irrigation tube; and
a second voltage divider network supported on the housing and being electrically coupled to the hardware control module adjusting flow of aspirated irrigation fluid within the suction tube.

6. A system of claim 5, wherein at least one of the first and second voltage divider network is a potentiometer.

7. A system of claim 5 or 6, wherein the first and second voltage divider networks are aligned with a single

slide wherein movement of the slide in one direction adjusts flow of irrigation fluid and movement of the slide in another direction adjusts flow of aspirated irrigation fluid.

8. A system of any preceding claims, further comprising:

an irrigation tip (56) having at least one outlet opening for supplying irrigation fluid and at least one inlet opening (54) for withdrawing irrigation fluid with the electrode disposed therein to allow for irrigation fluid to flow therebetween and cool the electrode.

9. A system of claim 8, wherein the electrode is disposed between the at least one inlet opening and the at least one outlet opening (52) for supplying irrigation fluid.

10. A system of claim 9, wherein the at least one outlet opening includes a lip (53) for directing the irrigation fluid.

11. A system of any one of claims 1 to 7, further comprising an irrigation tip (56) including an irrigation adapter comprising at least one irrigation opening (52) for supplying irrigation fluid, at least one inlet opening (54) for withdrawing irrigation fluid, and a ball disposed at the at least one irrigation opening to prevent irrigation fluid from flowing therethrough unless the ball is pushed inwards.

Patentansprüche

1. System zum Spülen einer chirurgischen Lokalisation während eines laparoskopischen elektrochirurgischen Verfahrens, wobei eine aktive Elektrode (14) Energie von einem elektrochirurgischen Generator (10) zu einem Patienten zuführt und zumindest eine Rückführelektrode (16) Strom zu dem elektrochirurgischen Generator zurück führt, umfassend:

den elektrochirurgischen Generator;
ein Handstück (12) mit einem länglichen Gehäuse (19), das an eine Multilumenröhre (18) gekoppelt ist, die sich von dem Gehäuse aus erstreckt, wobei die aktive Elektrode in dem Gehäuse gehalten wird und sich in distaler Richtung von dem Gehäuse aus erstreckt, wobei die Elektrode mit dem elektrochirurgischen Generator gekoppelt ist, wobei die Multilumenröhre eine Spülröhre (32) zum Zuführen von Spülfluid, eine Saugröhre (34) zum Absaugen von Spülfluid und eine elektrische Verdrahtung umfasst; **dadurch gekennzeichnet, dass**:
das Handstück ferner eine erste Steuerung (24, 26) zum Steuern der Strömung von Spülfluid innerhalb der Spülröhre und eine zweite Steuerung (28, 30) zum Steuern des Unterdrucks innerhalb der Saugröhre aufweist, wobei die erste Steuerung eine Spülsteuerung (24) zum Aktivieren und Deaktivieren der Strömung des Spülfluids und einen Spülvolumeneinsteller (26) zum Einstellen des Strömungsvolumens des Spülfluids aufweist und die zweite Steuerung eine Unterdrucksteuerung (28) zum Aktivieren und Deaktivieren einer Vakuumquelle zum Absaugen von angesaugtem Spülfluid und einen Unterdruckvolumeneinsteller (30) zum Steuern eines Einstellniveaus der Vakuumquelle aufweist, die das angesaugte Spülfluid steuert, das abgesaugt wird;
wobei die erste und zweite Steuerung ein erstes und zweites Steuerungssignal durch die elektrische Verdrahtung überträgt; und **gekennzeichnet durch**:

eine Ventilkassette (40), die mit der Multilumenröhre gekoppelt ist, wobei die Ventilkassette ein Spülventil (42) aufweist, das dazu ausgestaltet ist, die Strömung innerhalb der Spülröhre zu steuern, und ein Saugventil (44), das dazu ausgestaltet ist, die Strömung innerhalb der Saugröhre zu steuern;
wobei die Spülröhre mit einer Spülfluidquelle (46) gekoppelt ist und die Saugröhre mit der Vakuumquelle gekoppelt ist; und
ein Hardware-Steuerungsmodul (50), das mit der elektrischen Verdrahtung gekoppelt ist, um das erste und zweite Steuerungssignal zu empfangen, und dazu betrieben werden kann, das Spülventil auf der Grundlage des ersten Steuerungssignals zu steuern und das Saugventil auf der Grundlage des zweiten Steuerungssignals zu steuern.

2. System nach Anspruch 1, wobei die Spülquelle ein unter Druck stehender Beutel (46) ist.

3. System nach Anspruch 2, ferner umfassend einen Servoregler zum Einstellen eines Drucks innerhalb des unter Druck stehenden Beutels.

4. System nach einem vorhergehenden Anspruch, wobei das Spülfluid durch eine Pumpe mit variabler Geschwindigkeit von der Spülquelle zugeführt wird.

5. System nach einem der vorhergehenden Ansprüche, wobei die erste Steuerung ferner umfasst:

eine erste Spannungsteilerschaltung, die auf dem Gehäuse gehalten wird und elektrisch mit dem Hardware-Steuerungsmodul gekoppelt wird, um eine Strömung von Spülfluid innerhalb der Spülröhre einzustellen; und
eine zweite Spannungsteilerschaltung, die auf dem Gehäuse gehalten wird und elektrisch mit dem Hardware-Steuerungsmodul gekoppelt ist, das eine Strömung von angesaugtem Spülfluid innerhalb der Saugröhre einstellt.

6. System nach Anspruch 5, wobei die erste und/oder zweite Spannungsteilerschaltung ein Potentiometer ist.

7. System nach Anspruch 5 oder 6, wobei die erste und zweite Spannungsteilerschaltung mit einem einzigen Gleiter fluchten, wobei eine Bewegung des Gleiters in eine Richtung eine Strömung von Spülfluid einstellt und eine Bewegung des Gleiters in eine andere Richtung eine Strömung von angesaugtem Spülfluid einstellt.

8. System nach einem der vorhergehenden Ansprüche, ferner umfassend:

eine Spülspitze (56) mit zumindest einer Auslassöffnung zum Zuführen von Spülfluid und zumindest einer Einlassöffnung (54) zum Absaugen von Spülfluid mit der darin angeordneten Elektrode, um es dem Spülfluid zu ermöglichen, zwischen diesen zu strömen und die Elektrode zu kühlen.

9. System nach Anspruch 8, wobei die Elektrode zwischen der zumindest einen Einlassöffnung und der zumindest einen Auslassöffnung (52) zum Zuführen von Spülfluid angeordnet ist.

10. System nach Anspruch 9, wobei die zumindest eine Auslassöffnung eine Lippe (53) aufweist, um das Spülfluid auszurichten.

11. System nach einem der Ansprüche 1 bis 7, ferner umfassend eine Spülspitze (56) mit einem Spüladapter, der zumindest eine Spülöffnung (52) zum Zuführen von Spülfluid, zumindest eine Einlassöffnung (54) zum Absaugen von Spülfluid und eine Kugel, die an der zumindest einen Spülöffnung angeordnet ist, aufweist, um Spülfluid daran zu hindern, hierdurch zu strömen, wenn die Kugel nicht nach innen gedrückt wird.

Revendications

1. Système d'irrigation d'un site chirurgical durant des procédures laparoscopiques électrochirurgicales, par lequel une électrode active (14) délivre de l'énergie d'un générateur électrochirurgical (10) à un patient, et au moins une électrode de retour (16) ramène le courant au générateur électrochirurgical, comprenant:

le générateur électrochirurgical;
une pièce à main (12) comportant un boîtier oblong (19) couplé à un tube à lumières multiples (18) s'étendant du boîtier, l'électrode active étant supportée dans le boîtier et s'étendant distalement du boîtier, l'électrode étant couplée au générateur électrochirurgical, le tube à lumières multiples comprenant un tube d'irrigation (32) pour la délivrance d'un fluide d'irrigation, un tube d'aspiration (34) pour le retrait du fluide d'irrigation et un câblage électrique; **caractérisé par**:

la pièce à main comprend en outre des premières commandes (24, 26) pour commander l'écoulement du fluide d'irrigation dans le tube d'irrigation, et des deuxièmes commandes (28, 30) pour commander l'aspiration dans le tube d'aspiration, où les premières commandes comprennent un dispositif de commande d'irrigation (24) pour activer et désactiver l'écoulement du fluide d'irrigation, et un ajusteur de volume d'irrigation (26) pour ajuster le volume d'écoulement du fluide d'irrigation, et les deuxièmes commandes comprennent une commande d'aspiration (28) pour activer et désactiver une source de vide pour le retrait du fluide d'irrigation aspiré, et un ajusteur de volume d'aspiration (30) pour commander un niveau réglé de la source de vide, qui commande le fluide d'irrigation aspiré est retiré;
les première et deuxième commandes transmettant des premier et deuxième signaux de commande à travers le câblage électrique; et **caractérisé par**:

une cassette de vanne (40) couplée au tube à lumières multiples, la cassette de vanne incluant une vanne d'irrigation (42) configurée pour commander l'écoulement dans le tube d'irrigation, et une vanne d'aspiration (44) configurée pour commander l'écoulement dans le tube d'aspiration;
le tube d'irrigation étant couplé à une source de fluide d'irrigation (46), et le tube d'aspiration étant couplé à la source de vide; et
un module de commande de matériel (50) couplé au câblage électrique pour recevoir les premier et deuxième si-

gnaux de commande et aptes à commander la vanne d'irrigation sur la base des premiers signaux de commande et pour commander la vanne d'aspiration sur la base des deuxièmes signaux de commande.

2. Système selon la revendication 1, dans lequel la source d'irrigation est un sac sous pression (46).

3. Système selon la revendication 2, comprenant en outre un servo-régulateur pour ajuster une pression dans le sac sous pression.

4. Système selon l'une quelconque des revendications précédentes, dans lequel le fluide d'irrigation est délivré par une pompe à vitesse variable de la source d'irrigation.

5. Système selon l'une quelconque des revendications précédentes, dans lequel les premières commandes comprennent en outre:

un premier réseau de division de tension supporté sur le boîtier et couplé électriquement au module de commande de matériel pour ajuster l'écoulement du fluide d'irrigation dans le tube d'irrigation; et
un deuxième réseau de division de tension supporté sur le boîtier et couplé électriquement au module de commande de matériel ajustant l'écoulement du fluide d'irrigation aspiré dans le tube d'aspiration.

6. Système selon la revendication 5, dans lequel au moins un parmi le premier et le deuxième réseau de division de tension est un potentiomètre.

7. Système selon la revendication 5 ou 6, dans lequel les premier et deuxième réseaux de division de tension sont alignés avec un curseur unique, où le mouvement du curseur dans une direction ajuste l'écoulement du fluide d'irrigation, et un mouvement du curseur dans l'autre direction ajuste l'écoulement du fluide d'irrigation aspiré.

8. Système selon l'une quelconque des revendications précédentes, comprenant en outre: une pointe d'irrigation (56) ayant au moins une ouverture de sortie pour la délivrance du fluide d'irrigation et au moins une ouverture d'entrée (54) pour le retrait du fluide d'irrigation, l'électrode étant disposée dans celle-ci pour permettre au fluide d'irrigation de s'écouler entre celle-ci et de refroidir l'électrode.

9. Système selon la revendication 8, dans lequel l'électrode est disposée entre la au moins une ouverture d'entrée et la au moins une ouverture de sortie (52) pour la délivrance du fluide d'irrigation.

10. Système selon la revendication 9, dans lequel la au moins une ouverture de sortie comprend une lèvre (53) pour diriger le fluide d'irrigation.

11. Système selon l'une quelconque des revendications 1 à 7, comprenant en outre une pointe d'irrigation (56) incluant un adaptateur d'irrigation comprenant au moins une ouverture d'irrigation (52) pour la délivrance du fluide d'irrigation, au moins une ouverture d'entrée (54) pour le retrait du fluide d'irrigation, et une bille disposée à la au moins une ouverture d'irrigation pour empêcher un écoulement du fluide d'irrigation à travers celle-ci à moins que la bille ne soit poussée vers l'intérieur.

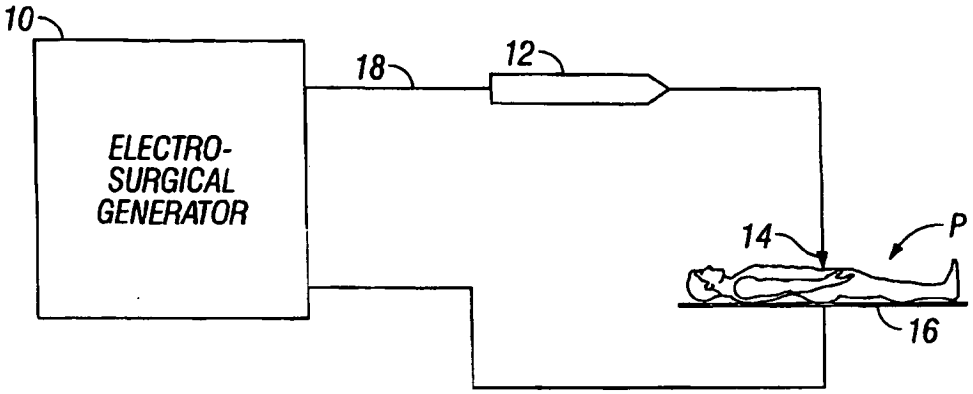

FIG. 1

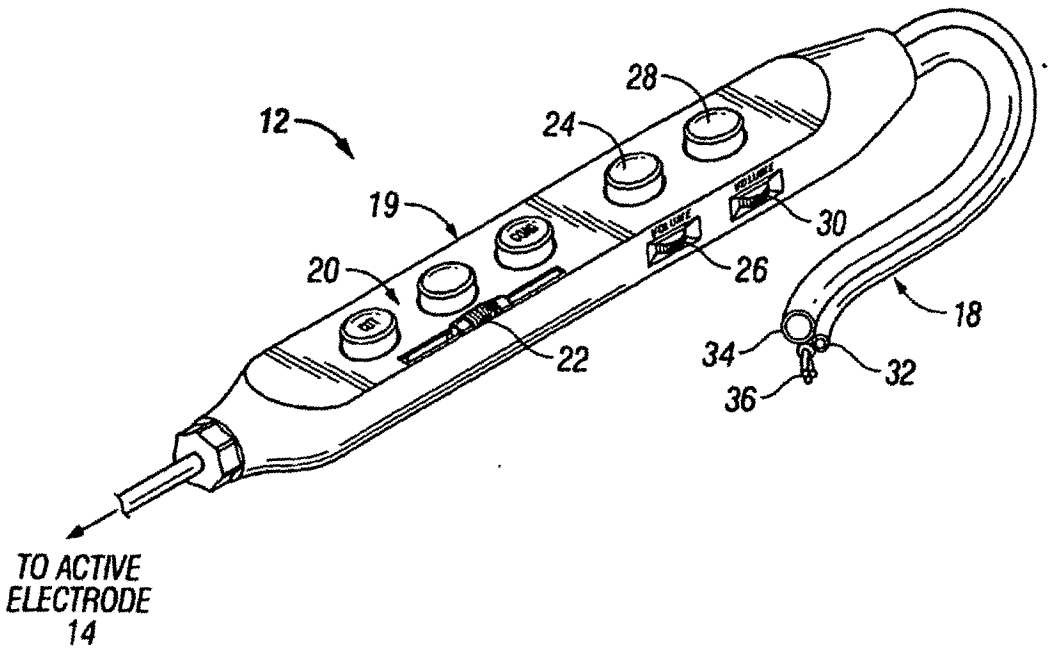
12
28
24
19
20
30
26
22
18
34
32
36
TO ACTIVE ELECTRODE 14

FIG. 2A

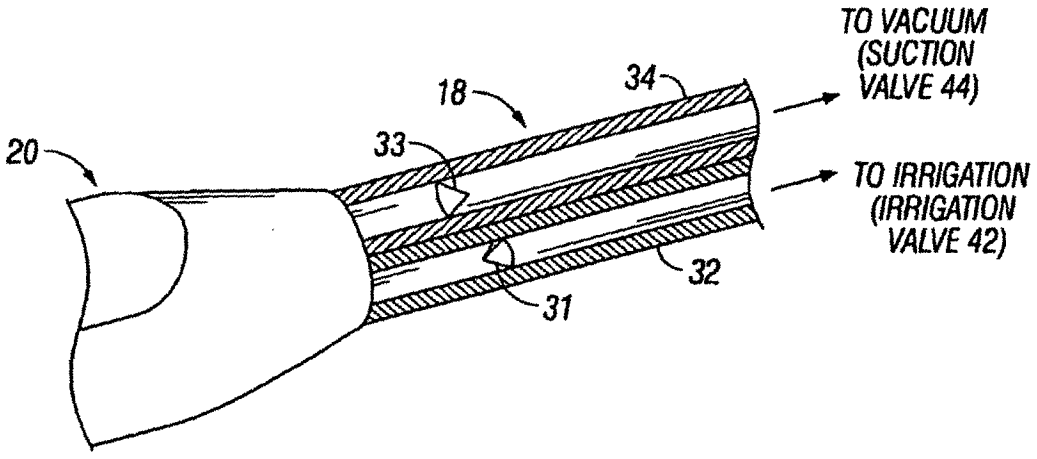
TO VACUUM (SUCTION VALVE 44)
34
18
20
33
TO IRRIGATION (IRRIGATION VALVE 42)
32
31

FIG. 2B

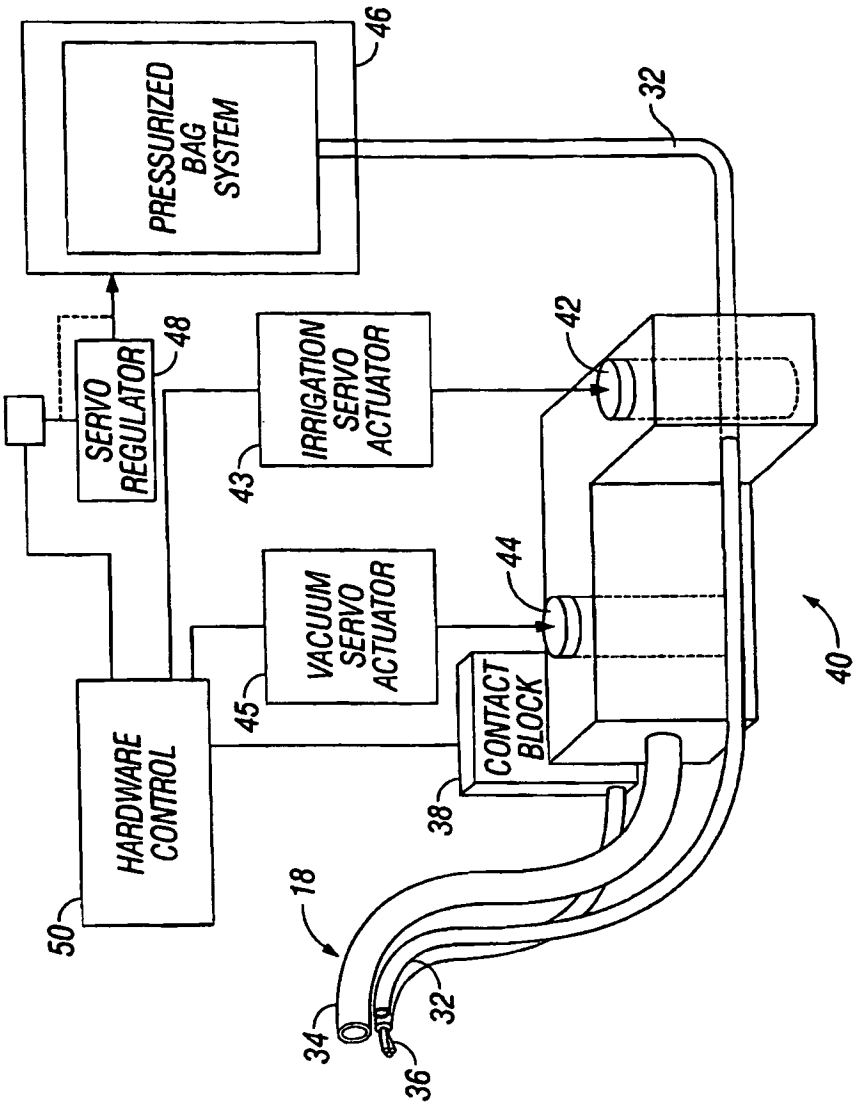
PRESSURIZED BAG SYSTEM
46
32
SERVO REGULATOR
48
IRRIGATION SERVO ACTUATOR
43
42
VACUUM SERVO ACTUATOR
45
44
CONTACT BLOCK
38
40
HARDWARE CONTROL
50
18
34
36
32

FIG. 3

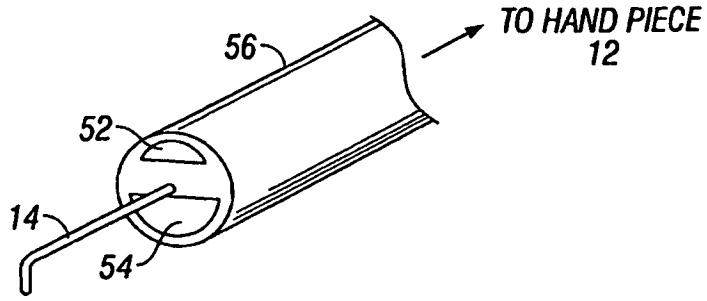

FIG. 4A

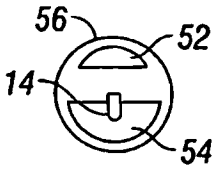

FIG. 4B

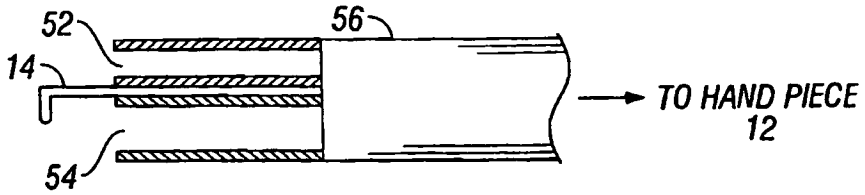

FIG. 4C

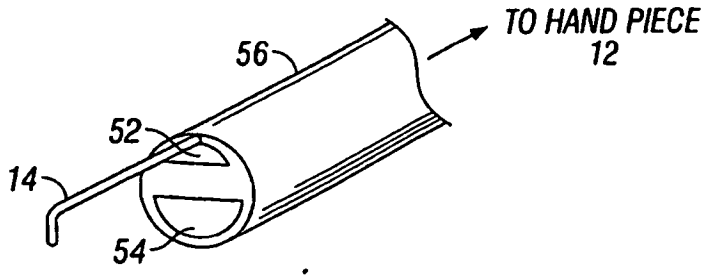

FIG. 5A

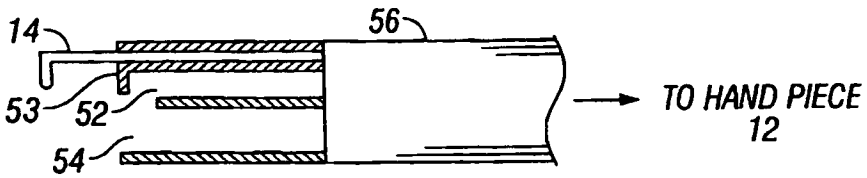

FIG. 5B

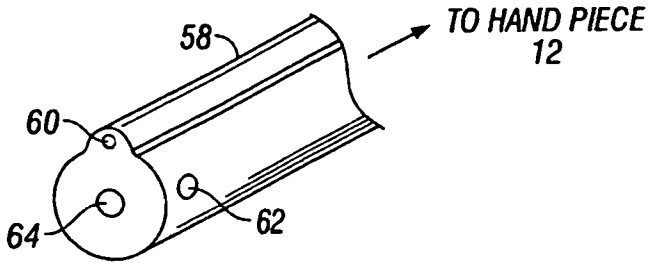

FIG. 6A

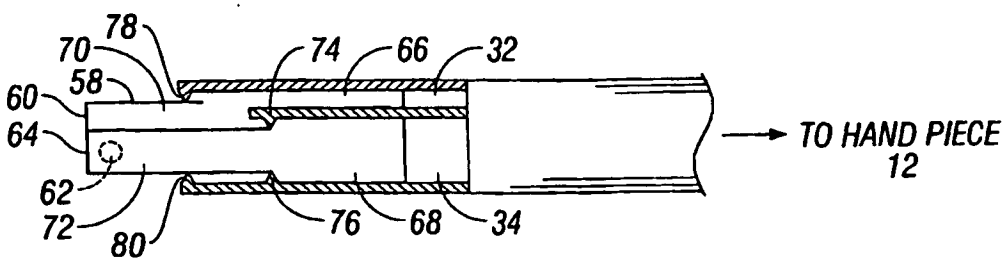

FIG. 6B

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 5836909 A **[0005]**
- US 20050113823 A **[0022]**
- US 3699967 A **[0023]**
- US 3801800 A **[0023]**

专利名称(译)	用于执行电外科手术的腹腔镜装置		
公开(公告)号	EP1795139B1	公开(公告)日	2012-03-28
申请号	EP2006025700	申请日	2006-12-12
[标]申请(专利权)人(译)	舍伍德服务股份公司		
申请(专利权)人(译)	SHERWOOD SERVICES AG		
当前申请(专利权)人(译)	COVIDIEN AG		
[标]发明人	SARTOR JOE D		
发明人	SARTOR, JOE D.		
IPC分类号	A61B18/14 A61M1/00		
CPC分类号	A61B18/1482 A61B2218/002 A61B2218/007		
优先权	11/299468 2005-12-12 US		
其他公开文献	EP1795139A1		
外部链接	Espacenet		

摘要(译)

公开了一种用于在电外科手术期间冲洗手术部位的系统和设备。该系统包括手持件，该手持件具有细长的壳体，该壳体连接到多腔管，该多腔管从壳体向近侧延伸并具有用于输送冲洗流体的冲洗管，用于抽出冲洗流体的抽吸管和电线，用于调节灌溉流量的第一控制器灌溉管内的流体和第二控制器，用于调节吸管内的冲洗流体的流量。阀芯连接到多腔管，其包括配置成控制灌溉管内的流动的冲洗阀和配置成控制吸管内的流动的吸入阀。硬件控制模块基于来自第一和第二控制器的控制信号控制灌溉阀和吸入阀。

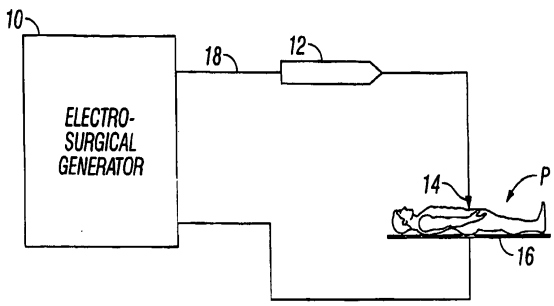

FIG. 1