(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 117 621 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
06.11.2013 Bulletin 2013/45

(21) Application number: **08726317.4**

(22) Date of filing: **29.02.2008**

(51) Int Cl.:
B01D 46/10 *(2006.01)* ***A61B 18/00*** *(2006.01)*
B01D 46/00 *(2006.01)*

(86) International application number:
PCT/US2008/002759

(87) International publication number:
WO 2008/109014 (12.09.2008 Gazette 2008/37)

(54) WICK AND RELIEF VALVE FOR DISPOSABLE LAPARSCOPIC SMOKE EVACUATION SYSTEM

DOCHT UND ABLASSVENTIL FÜR LAPAROSKOPISCHES EINWEGRAUCHABSAUGSYSTEM

MÈCHE ET VALVE DE DÉTENTE POUR SYSTÈME D'ÉVACUATION DE FUMÉE LAPAROSCOPIQUE JETABLE

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MT NL NO PL PT RO SE SI SK TR

(30) Priority: **01.03.2007 US 904270 P**

(43) Date of publication of application:
18.11.2009 Bulletin 2009/47

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US-B1- 6 544 210

EP 2 117 621 B1

Printed by Jouve, 75001 PARIS (FR)

Description

CROSS REFERENCE TO RELATED PATENT APPLICATION

[0001] This application claims the priority benefit of U.S. Provisional Patent Application No. 60/904,270, filed March 1, 2007.

FIELD OF THE INVENTION

[0002] The invention relates to surgical procedures and, more specifically, to a device for more efficiently removing surgical waste and vapor smoke-free environment within the surgical field during laparoscopy.

BACKGROUND OF THE INVENTION

[0003] Laparoscopy is a fast growing surgical modality widely used in the treatment of certain prevalent physical ailments. Laparoscopy entails the introduction of an endoscope, light source, and surgical instruments through ports formed in the patient's abdomen. In order to facilitate the procedure, the patient's abdominal cavity is inflated with a suitable gas typically CO_2 to give the surgeon additional working area and minimize obstruction. Generally, laparoscopy avoids the risks of laparotomy, which requires the surgeon to open the abdomen and carry out the required procedure by his or her direct viewing.

[0004] However, when the laparoscopic procedure requires tissue removal by ablation, several channels through the abdominal wall are required. These include a channel for the laparoscopic camera needed for viewing the surgical field, a channel for the laser or electrosurgical instrument used to bum the target tissue, a channel for insufflation (introduction of CO_2 gas into the patient's cavity to expand the patient's cavity) with CO_2 gas, and a means for withdrawal of gas and smoke. Note that insufflation with a suitable gas is required during the laparoscopic procedure so as to provide both increased cavity volume and optimal visual conditions during the surgical procedure. A smoke clearing system is usually employed in order to maintain both the visual clarity and proper abdominal pressure within the expanded cavity during the procedure.

[0005] A common procedure for positioning the laparoscopic assembly in the patient's abdominal cavity includes first making an incision into the patient's abdominal wall through which a large gauge needle is inserted. A suitable gas, typically CO_2, is then introduced into the patient's abdominal cavity through the needle. The needle is then replaced with a trocar, which is then removed leaving behind a sleeve, or cannula, through which a laparoscope is introduced into the abdominal cavity. In order to perform laser or electrosurgery one or two additional small incisions are made in the abdominal wall over the surgical site and cannula/trocar assemblies positioned accordingly. These cannula/trocar assemblies may be used for the positioning of the insufflation tube as well as any other surgical instruments that may be required for the particular laparoscopic procedure.

[0006] A laparoscopic procedure typically requires a surgeon to employ either electrosurgery or laser surgery within the confined space of the patient's abdominal cavity. This surgery typically involves tissue burning or ablation. This tissue burning leads to the creation of smoke. Surgical smoke within the confines of a patient's abdominal cavity reduces the surgeon's view of the surgical site, increases the patient's hematocrit levels, and causes delays in the surgery while the smoke is cleared from the laparoscopic field. Efficient removal of the smoke is thus a necessity for the surgical team during the laparoscopic procedure.

[0007] Although a laparoscopic evacuation system ("lapevac system") is effective in maintaining cavity inflation pressure, one problem that occurs during its operation is the clogging of the inlet tube and filter by solid waste, water and humidity carried out of the abdominal cavity by the incoming waste stream. Because the cavity is moist and may be heated above normal temperature by some surgical procedures such as cauterization, surgical wastes can be driven off the cavity wall and internal organs in the form of particles, vapor, and liquids from broken cells and tissues. In addition, vapors within the cavity itself can be drawn into the waste stream. Another problem that may occur during laparoscopic surgery is the insufficient removal of waste vapor from the cavity, stratification of water vapor in the cavity as well as other visualization problems.

[0008] Therefore, there is a need in the field for an improved laparoscopic surgical system that is designed to prevent clogging of the inlet and filter by surgical waste and that will reduce or eliminate stratification of smoke and water vapor in the abdominal cavity during laparoscopic surgery

[0009] US 6544210 discloses the preamble of independent claim 1 and US 2005 000196 discloses a smoke removal system with a filter in the inlet means.

SUMMARY OF THE INTENTION

[0010] According to one aspect of the present invention, there is provided an inlet means as claimed in claim 1.

A smoke removal apparatus may comprise the inlet means. The smoke removal apparatus may comprise a multi-outlet valve incorporated into an outlet means.

[0011] One object of the present invention is to reduce or eliminate blocking of the inlet means by surgical waste.

[0012] A second object of the present invention is reduce or eliminate stratification of surgical smoke and water vapor in the abdominal cavity by supplying a venting valve on the outlet means of the surgical smoke removal device to effect quick removal of smoke and water vapor.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] The nature and mode of operation of the present invention will now be more fully described in the following detailed description of the invention taken with the accompanying drawing figures, in which:

[0014] Figure 1 is a schematic view of a laparoscopic smoke evacuation system of the prior art depicting the arrangement of the smoke evacuation system during laparoscopic surgery;

[0015] Figure 2 is a top perspective view of a typical disposable laparoscopic smoke evacuation system according to an embodiment of the present invention;

[0016] Figure 3 is an exploded top perspective view of the disposable laparoscopic smoke evacuation system shown in Figure 2;

[0017] Figure 3A depicts an enlarged view of the wick assembly inserted into the inlet tube of the smoke evacuation system;

[0018] Figure 4 is a top perspective view depicting the components of the wick assembly in an assembled condition;

[0019] Figure 4A is a top perspective view of a partially disassembled wick assembly;

[0020] Figure 4B is a side view of the assembled wick assembly ;

[0021] Figure 5 is a side view of the wick component of the wick assembly ;

[0022] Figure 5A is an end view showing the wick depicted in Figure 4;

[0023] Figure 5B is an isometric view of the wick shown in Figure 4;

[0024] Figure 6A is an isometric view of one embodiment of the two-way valve in the divert mode;

[0025] Figure 6B is a top view of the two way outlet valve in the divert mode;

[0026] Figure 6C is a side view of the two-way outlet valve from the side facing the outlet port in the divert mode;

[0027] Figure 6D is a cross section of the two-way valve taken along line H-H in Figure 5B in the divert mode;

[0028] Figure 7A is an isometric view of the two-way valve showing the valve barrel in the open (flow through) mode;

[0029] Figure 7B shows a top view of the two-way valve in the open mode;

[0030] Figure 7C is a side view of the two-way valve in the open mode facing the side of the outlet showing the open channel to the valve outlet;

[0031] Figure 7D is a cross section of the two-way valve taken along line I-I in Figure 6B showing the channel configuration when the valve is in the open mode;

[0032] Figure 8A is a top view of a second embodiment of the two-way outlet divert valve in the off mode;

[0033] Figure 8B is a top view of the second embodiment of the two-way outlet valve in the open mode; and,

[0034] Figure 8C is a top view of the second embodiment of the two-way outlet valve in the divert mode.

DETAILED DESCRIPTION OF THE INVENTION

[0035] At the outset, it should be appreciated that like drawing numbers on different drawing views identify identical structural elements of the invention. While the present invention is described with respect to what is presently considered to be the preferred embodiments, it is understood that the invention is not limited to the disclosed embodiment.

[0036] Furthermore, it is understood that this invention is not limited to the particular methodology, materials and modifications described and as such may, of course, vary. It is also understood that the terminology used herein is for the purpose of describing particular embodiments only, and is not intended to limit the scope of the present invention.

[0037] Adverting now to the figures, Figure 1 is a schematic view of a laparoscopic smoke evacuation system of the prior art depicting the arrangement of the smoke evacuation system during laparoscopic surgery. Smoke clearing device **10** includes housing **12.** Housing **12** may be made out of a variety of materials, such as a metal or a plastic, as long as the material facilitates the device's use and is preferably disposable. The housing **12** preferably has a generally rectangular box shape or it may have a generally cylindrical hollow shape, preferably with rounded corners. The housing **12** contains an inlet port **14** at one end, i.e., on one side and an outlet port **16** at the other end, i.e., on the opposite side. One end of an inlet tube **18** is connected to the inlet port **14.** One end of an outlet tube **20** is connected to the outlet port **16.** This tubing is preferably conventional sterile flexible plastic tubing. It is envisioned that conventional Luer lock structures **22** will be used to connect the tubes **18** and **20** to the housing **12,** but other locking structures could alternatively be used.

[0038] The patient's inner cavity, such as the abdominal cavity, is shown as **24** and the patient's skin is schematically shown as **25** in Figure 1. The patient's tissue which is to be removed is shown as **26,** with the surgical smoke shown and indicated as **26a, 26b,** and **26c.** Three trocars containing laparoscopic surgical instrument clusters **28, 30** and **32** extend through the patient's skin **25** into the cavity **24.**

[0039] These groups of instruments are representative of the type of instruments that are typically used in laparoscopic surgery. Each instrument cluster includes a cannula/trocar for introducing the instrument into the patient's cavity and maintaining a seal to the cavity **24** to preclude gas escape from the cavity **24.** Each cannula/trocar has a single channel or passage along its length that allows instruments to be inserted into the body while maintaining the intra-abdominal pressure created by insufflation. Instrument cluster **28** is a single channel instrument cluster which serves to house the laser instrument **34** and direct the laser beam to the operating site. An annular channel **36** around the instrument **34** within the trocar serves as an annular egress passage from

near the operating site for gas to be drawn around the laser instrument **34** and out of the patient's cavity to the smoke clearing device **10** of the present invention.

[0040] Figure 2 is a top perspective view of a typical disposable laparoscopic smoke evacuation system **100** ("lapevac 100"). Such devices are described in U.S. Patent No. 6,544,210 to Trudel, et al.

Housing **111** is shown with inlet means, in this case inlet tube **112** and outlet means, in this case outlet tube **120** attached to inlet attachment **112a** and outlet attachment **120a,** respectively. Inserted into the input end of inlet tube **112** is wick assembly **114.** Attached to the outlet attachment **120a** is the inlet of one embodiment of a multi-outlet relief valve, in this case a two-way bleed or relief valve, t-tap valve **150.** By two-way valve is meant a valve that has at least two outlets that allow material, such as a gas or liquid fluid, that enters the valve to be directed to one of two or more different outlet flow paths. Also seen is y-connector **124** ("connector **124")** at the end of outlet tube **120.** Persons of skill in the art will recognize that the two-way valves may be connected to outlet tube **120** in any convenient position within the length of outlet tube **120** and that valves having more than two outlets may also be used.

[0041] Figure 3 is an exploded top perspective view of lapevac **100.** Inlet hose 112 is seen attached to inlet attachment **112a.** Inlet assembly **130** includes inlet **131** which covers the fan or pump assembly to include impeller cover **132,** impeller **133,** fan **134,** and fan mount **134a** which are all attached to motor **136.** Battery cover **111a** covers battery (ies) **138** used to power motor **136.** Although a plurality of AA batteries are shown in Figure 3, persons of skill in the art will recognize that a single battery, various appropriate battery assemblies with different capacities, or alternative ac power sources may be used to provide power to motor **136.**

[0042] Outlet **142** covers filter **140** positioned on the downstream side of fan assembly **130**. Preferably the filter **140** includes activated carbon media **141a** as a pre-filter plus ultra low particulate air (ULPA) filter **141b.** Outlet attachment **120a** extends from outlet **142** and is seen connected to t-tap valve **150.** One end of outlet tube **120** is connected to t-tap valve **150,** while the other end is connected to connector **124.** A locking means **126** is positioned on at least one outlet of y-connector **124** to enable y-connector **124** to be securely attached to an additional component. The locking means **126** is a luer lock. Cap **127** is used to block an unused outlet of y-connector **124.** The locking means **116,** such as a luer lock, may be positioned at the input end of inlet tube **112** as shown in Figures 2 and 3. Locking means utilized throughout the invention are defined as connections between two components that prevent the escape of vapor, liquid, or fumes from the connection itself. Examples of locking means are luer locks, tube connections in which one tube is inserted into another tube, interference fittings, Colder couplers and other connectors known t those skilled in the art that prevent the escape of fumes from a connection point.

[0043] Y-connector **124** receives filtered gas from lapevac **100.** One of the two outlets ofy-connector **124** can be connected to an insufflator while the second outlet can be connected to a second inlet into the abdominal cavity enabling gas filtered by lapevac **100** ("filtered gas") to be pumped into the abdominal cavity at two locations to help remove waste vapors generated by the laparoscopic surgical procedures.

[0044] Figure 3A depicts an enlarged view of wick assembly **114** incorporated into inlet tube **112**. Inlet tube **112** is cut way to more clearly show wick **115.** Luer lock **116** is shown at the.inlet end of inlet tube **112.**

[0045] Figure 4 is a top perspective view depicting the components of wick assembly **114** joined together in an assembled condition. Luer lock **116** is shown at the inlet end of inlet tube **112.** Interference fitting **117** ("fitting **117**") is attached to luer lock **116** and wick **115.** Wick assembly **114** is inserted into inlet tube **112** and held in place by the friction of interference fitting **117** against the inner wall of inlet tube **112.** Wick **115** is in the form of a strand or filament that extends into inlet tube **112.** Preferably, wick **115** is fabricated from a hydrophilic material such as polyvinyl alcohol (PVA) or cotton. Wick **115** is sized with a diameter small enough to allow sufficient space for airway **119** between wick **115** and inner wall of inlet tube **112** to form a passage to allow smoke, air and other fluids to be easily drawn into inlet tube **112** and pass through filter **140** of lapevac **100** to outlet tube **120** in the form of filtered gas. By hydrophilic is meant the property of attracting and to at least some extent absorbing liquids and fluids.

[0046] Figure 4A is a top perspective view of partially disassembled wick assembly **114.** Fitting **117** is attached to luer lock **116** and inserted into inlet tube **112.** Luer lock **116** or other locking means used should be hollow in order to allow the flow of fluid, including vapors and gases, into and through inlet tube **112.** Similarly, fitting **117** should also be hollow to allow for sufficient air flow to move incoming vapor and gas without taxing lapevac **100.** Wick **115** is attached to fitting **117** and the luer lock-fitting-wick assembly is inserted into inlet tube **112.** Figure 4B is a side view of wick assembly **114** showing more clearly fitting **117** and wick **115** within inlet tube **112** and airway **119.**

[0047] Figure 5 is a side view of wick **115** fabricated from PVA. The wick **115** is about 50.8cm (20 inches) long. Figure 5A is an end view of wick **115** in which wick **115** possesses a rectangular cross section with a width of about 3.05mm (0.12 inches) and a height of about 2.03mm (0.08 inches). Figure 5B is an isometric view of wick **115.** PVA is one of the preferred materials for fabricating wick **115.** When dry it is rigid hydrophilic foam. In the presence of water or humidity it becomes soft and flexible with good chemical resistance and good water absorption properties.

[0048] Lapevac **100** is used during laparoscopic surgery to keep the field of view while performing surgical

procedures. The inflation creates space within the cavity thereby making it easier to perform surgery. A separate insufflator inflates the abdominal cavity (or other cavity) by pumping air or other gas (es) into the abdominal cavity. To remove surgically generated smoke and other vapors, lapevac **10** removes smoke and other vaporous waste into inlet tube **112** through filter **140** and out outlet tube **120** as filtered gas. The second or downstream end of outlet tube **120** is attached to a hollow channel inserted into the abdominal cavity and to the insufflator by means of connector **124.** Using this system, a recirculating stream of filtered gas or air enters the abdominal cavity as the smoke and waste filled vapors are removed to keep the abdominal cavity under a relatively constant inflation pressure.

[0049] Although lapevac system **100** is effective in maintaining cavity inflation pressure, one problem that occurs during its operation is the clogging of inlet tube **112** and filter **140** by solid waste, water and humidity carried out of the abdominal cavity by the incoming waste stream. Because the cavity is moist and may be heated above normal temperature by some surgical procedures such as cauterization, surgical wastes can be driven off the cavity wall and internal organs in the form of particles, vapor, and liquids from broken cells and tissues. In addition, vapors within the cavity itself can be drawn into the waste stream.

[0050] Because it is hydrophilic, wick **115**, attracts and retains the solid moist waste and the aqueous liquid waste that is drawn into inlet tube **112.** Because it is sized to allow for a large airway **119** between the inner wall of inlet tube **112** and wick **115**, relative to the size of wick **115**, wick assembly **114** allows waste stream vapors and gases to move without substantial additional restriction to filter **140.** A preferred length of wick **115** is about 50.8cm (20 inches) as this provides sufficient length for exposing the waste stream to the hydrophilic attraction of wick **115.** In addition, the preferred rectangular shape provides more surface area to attract and hold waste particles and vapors than supplied by a round cylindrical shape.

[0051] It will be recognized that wick assembly **114** is also effective with passive laparoscopic filtration systems. A passive laparoscopic filtration system lacks the fan to actively pull waste vapors from the abdominal cavity, but instead relies on pressure supplied by the insufflator to push surgical waste through an inlet and wick assembly and filters.

[0052] Another problem that may occur during laparoscopic surgery is the insufficient removal of waste vapor from the cavity and stratification of water vapor in the cavity which can lead to visualization problems for those observing the procedures within the abdominal cavity. This waste vapor can be purged by means of a two-way relief valve **150** placed in the filtered gas outlet path within outlet tube **120.** Relief valve **150** provides the user with the ability to accelerate clearing and/or removal of stratified laparoscopic filtration waste vapor by opening a divert path while blocking the recirculating filtered gas through the normal outlet path back to the cavity. This diversion provides a sudden pressure change by supplying a rapid evacuation capability.

[0053] Figures 6A-D show t-tap two way valve **150** ("valve **150")** configured in the divert mode. Figure 6A is an isometric view of valve **150** showing valve inlet **151,** divert **152,** outlet **153,** and barrel housing **155.** Figure 6B is a top view of valve **150.** Figure 6C is a side view of valve **150** taken from the side facing outlet **153.** It can be seen that in the divert mode, outlet **153** is closed.

[0054] Figure 6D is a cross section of valve **150** taken along line **H-H** in Figure 6B. The arrow shows fluid flow along valve inlet **151** and through divert **152.** Valve barrel **154** ("barrel **154")** sits within divert **152** and extends past inlet **151** and outlet **153** into barrel housing **155.** In the divert mode shown, barrel passages **154a** are positioned below and blocked from the fluid pathway shown by the arrows. Thus, the filtered gas from lapevac **100** is diverted through barrel channel **154b** and out divert **152** thereby relieving the back pressure situation.

[0055] Figures 7A-D depict t-tap two-way valve **150** configured in the flow through mode allowing filtered gas to return to the abdominal cavity. Figure 7A is an isometric view of valve **150** showing barrel **154** extending from the top of divert **152.** Figure 7B shows a top view of valve **150** in the open position. Figure 7C is a side view facing the side of outlet **153** in which is seen the pass through channel open to outlet **153.**

[0056] Figure 7D is a cross section of valve **150** taken along line I-I in Figure 7B showing the channel configuration when valve **150** is in the open mode. Barrel **154** is shown extended above the top edge of divert **152.** This places barrel passages **154a** into channel **151a** (simultaneous alignment with inlet **151** outlet **153)** and blocks entrance into divert **152.** Filtered gas then exits through outlet **153** into outlet tube 120 (not shown in Figure 7D) and into the abdominal cavity.

[0057] Figure 8A is a top view of a second embodiment of the two-way divert valve, namely stopcock valve **170** ("valve **170**"), in the closed or blocking mode. By blocking is meant that no fluid can enter valve **170.** Figure 7B is a side view of valve **170.** Rotor **172** is seen at the junction of inlet **171,** divert **174,** and outlet **173.** Persons of skill in the art will recognize that rotor **172** comprises three fluid flow passages **175** within a housing (not shown) with two passages **175** on opposite sides of rotor **172** and the third passage **175** at right angles between the other two passages. In the closed (no flow) position, the blocked side, lacking a passage **175,** faces inlet **171.** This configuration closes the passage of filtered gas in any direction through valve **70.** In the divert position, Figure 8C, the blocked side is rotated to face outlet **173.** In this configuration, filtered gas flows through divert **172.** In the flow through mode, Figure 8B, the blocked side is rotated to face divert **172,** forcing the filtered gas to flow through outlet 73.

[0058] It is apparent that by positioning a two-way

valve, such as valves **150** or **170,** in outlet tube **120,** the effects of back pressure from either the insufflator or unfiltered back flow from the abdominal cavity are reduced or eliminated. Filtered air can be diverted from the recirculating waste/filtered gas system until the visualization within the cavity is brought to acceptable conditions.

[0059] Thus, it is seen that the objects of the present invention are efficiently obtained, although modifications and changes to the invention should be readily apparent to those having ordinary skill in the art, which modifications are intended to be within the scope of the invention as defined by the claims.

Claims

1. An inlet means for a smoke removal apparatus comprising:

an inlet tube (112) having a first end and a second end and a hollow locking means (116) at said second end to attach to an inlet of said smoke removal apparatus; and, a hydrophilic assembly (114), said hydrophilic assembly (114) comprising:

a hydrophilic member (115);
a friction fitting (117) attached to said hydrophilic member (115), said friction fitting (117) defining an orifice; and,
said hollow locking means (116) attached to said friction fitting;

characterised in that the hydrophilic member is a hydrophilic wick (115);
wherein said friction fitting (117) is arranged to hold the hydrophilic wick (115) in the inlet tube (112) between the friction fitting (117) and an inner wall of the inlet tube (112) such that an airway (119) is provided alongside the hydrophilic wick (115), between the hydrophilic wick (115) and the inner wall of the inlet tube (112),
the orifice of the friction fitting (117) provides access to the airway (119), and an interior of the hollow locking means (116) is also in fluid communication with the airway (119).

2. The inlet means as recited in Claim 1 wherein said hydrophilic wick (115) is PVA.

3. The inlet means (114) as recited in Claim 1 wherein said hydrophilic wick (115) is cotton.

4. A smoke removal apparatus having a housing (111); inlet means (112) according to claim 1 for defining an inlet pathway for impure gas from a surgical cavity to said housing, said locking means being for connecting said surgical cavity to said inlet pathway; filter means (140) for filtering impurities from impure gas to form filtered gas; outlet means (120) for defining an outlet pathway for said filtered gas from said housing to said surgical cavity, and a fan (134) for drawing impure gas from said surgical cavity through said inlet means (112), and through said filter means (140) to form said filtered gas and for driving said filtered gas through said outlet means (120) into said surgical cavity, wherein said outlet means (120) are adapted to a laparoscopic surgical instrument assembly,
and said hydrophilic wick (115) is inserted into and attached to said locking means of said inlet means.

5. The smoke removal apparatus as recited in Claim 4 wherein said hydrophilic wick (115) is fabricated from polyvinyl alcohol (PVA).

6. The smoke removal apparatus as recited in Claim 4 wherein said hydrophilic wick (115) is fabricated from cotton.

7. The smoke removal apparatus as recited in Claim 4 wherein said hydrophilic wick (115) has a rectangular cross section.

8. The smoke removal apparatus as recited in Claim 4 further comprising a multi-outlet valve (124) incorporated into said outlet means (120).

9. The smoke removal apparatus as recited in Claim 8 wherein said multi-outlet (124) is a two-way outlet valve.

10. The smoke removal apparatus as recited in Claim 9 wherein said two-way relief valve is a t-tap valve.

11. The smoke removal apparatus as recited in Claim 9 wherein said two-way relief valve is a stop cock having two outlets.

12. The smoke removal apparatus as recited in Claim 4 wherein said filter means (140) includes a pre-filter (141a).

13. An inlet means according to any of claims 1 to 3, in which the hydrophilic wick (115) is in the form of a filament.

14. A smoke removal apparatus according to any of claims 4 to 12, in which the hydrophilic wick (115) is in the form of a filament.

Patentansprüche

1. Einlassvorrichtung für einen Apparat zum Entfernen

von Rauch, umfassend:

einen Einlassschlauch (112) mit einem ersten Ende und einem zweiten Ende und einer hohlen Verschließvorrichtung (116) am zweiten Ende zur Verbindung mit einem Einlass des Apparates zum Entfernen von Rauch; und eine hydrophile Baugruppe (114), wobei die hydrophile Baugruppe (114) umfasst:

ein hydrophiles Bauteil (115);
ein Reibungsanschlussstück (117), das an dem hydrophilen Bauteil (115) angebracht ist, wobei das Reibungsanschlussstück (117) eine Öffnung definiert; und

eine hohle Verschließvorrichtung (116), die an dem Reibungsanschlussstück angebracht ist;
dadurch gekennzeichnet dass, das hydrophile Bauteil ein hydrophiler Docht (115) ist;
wobei das Reibungsanschlussstück (117) so angeordnet ist, dass es den hydrophilen Docht (115) in dem Einlassschlauch (112) zwischen dem Reibungsanschlussstück (117) und einer Innenwand des Einlassschlauchs (112) hält, sodass ein Luftweg (119) entlang des hydrophilen Dochts (115) gebildet wird zwischen dem hydrophilen Docht (115) und der Innenwand des Einlassschlauchs (112),
wobei die Öffnung des Reibungsanschlussstücks (117) einen Zugang zu dem Luftweg (119) bildet und ein Inneres der hohlen Verschließvorrichtung (116) in Fließverbindung mit dem Luftweg (119) steht.

2. Die Einlassvorrichtung gemäß Anspruch 1, worin der hydrophile Docht (115) PVA ist.

3. Die Einlassvorrichtung (114) gemäß Anspruch 1, worin der hydrophile Docht (115) Baumwolle ist.

4. Apparat zum Entfernen von Rauch, umfassend ein Gehäuse (111); eine Einlassvorrichtung (112) gemäß Anspruch 1, um einen Einlassweg für unreines Gas aus einer chirurgischen Höhle zu dem Gehäuse zu definieren, wobei die Verschließvorrichtung die chirurgische Höhle mit dem Einlassweg verbindet; eine Filtervorrichtung (140), um Verunreinigungen aus dem unreinen Gas zu filtrieren, um gefiltertes Gas zu bilden; eine Auslassvorrichtung (120), die einen Auslassweg für das gefilterte Gas aus dem Gehäuse zu der chirurgischen Höhle zu definieren, und ein Gebläse (134), um unreines Gas aus der chirurgischen Höhle durch die Einlassvorrichtung (112) anzusaugen und durch die Filtervorrichtung (140), um das gefilterte Gas zu bilden, und um das gefilterte Gas durch die Auslassvorrichtung (120) in die chirurgische Höhle zu befördern, wobei die Auslassvorrichtung (120) für ein laparoskopisches chirurgisches Instrument angepasst ist,
und der hydrophile Docht (115) in die Verschließvorrichtung der Einlassvorrichtung eingeführt und daran befestigt ist.

5. Der Apparat zum Entfernen von Rauch gemäß Anspruch 4, worin der hydrophile Docht (115) aus Polyvinylalkohol (PVA) hergestellt ist.

6. Der Apparat zum Entfernen von Rauch gemäß Anspruch 4, wobei der hydrophile Docht (115) aus Baumwolle hergestellt ist.

7. Der Apparat zum Entfernen von Rauch gemäß Anspruch 4, wobei der hydrophile Docht (115) einen rechteckigen Querschnitt aufweist.

8. Der Apparat zum Entfernen von Rauch gemäß Anspruch 4, ferner umfassend ein Auslassventil mit mehreren Ausgängen (124), das in die Auslassvorrichtung (120) eingebaut ist.

9. Der Apparat zum Entfernen von Rauch gemäß Anspruch 8, worin das Auslassventil mit mehreren Ausgängen (124) ein Auslassventil mit zwei Ausgängen ist.

10. Der Apparat zum Entfernen von Rauch gemäß Anspruch 9, wobei das Auslassventil mit zwei Ausgängen ein T-Hahnventil ist.

11. Der Apparat zum Entfernen von Rauch gemäß Anspruch 9, wobei das Ventil mit zwei Ausgängen ein Absperrhahn mit zwei Ausgängen ist.

12. Der Apparat zum Entfernen von Rauch gemäß Anspruch 4, worin die Filtervorrichtung (140) einen Vorfilter (141a) umfasst.

13. Einlassvorrichtung gemäß einem der Ansprüche 1 bis 3, worin der hydrophile Docht (115) in Form eines Filaments vorliegt.

14. Der Apparat zum Entfernen von Rauch gemäß einem der Ansprüche 4 bis 12, worin der hydrophile Docht (115) in Form eines Filaments vorliegt.

Revendications

1. Moyen d'admission pour un appareil de retrait de fumée comprenant :

un tube d'admission (112) ayant une première extrémité et une seconde extrémité et un moyen de verrouillage creux (116) à ladite seconde extrémité pour la fixation à une admission dudit

appareil de retrait de fumée ; et
un ensemble hydrophile (114), ledit ensemble hydrophile (114) comprenant :

un élément hydrophile (115) ;
un raccord de frottement (117) fixé audit élément hydrophile (115), ledit raccord de frottement (117) définissant un orifice ; et
ledit moyen de verrouillage creux (116) étant fixé audit raccord de frottement ;
caractérisé en ce que l'élément hydrophile est une mèche hydrophile (115) ;
où ledit raccord de frottement (117) est agencé pour retenir la mèche hydrophile (115) dans le tube d'admission (112) entre le raccord de frottement (117) et une paroi interne du tube d'admission (112) de telle sorte qu'un chemin d'air (119) est réalisé le long de la mèche hydrophile (115), entre la mèche hydrophile (115) et la paroi intérieure du tube d'admission (112),
l'orifice du raccord de frottement (117) réalisant l'accès au chemin d'air (119), et l'intérieur du moyen de verrouillage creux (116) est également en communication fluidique avec le chemin d'air (119).

2. Moyen d'admission selon la revendication 1, dans lequel ladite mèche hydrophile (115) est en PVA.

3. Moyen d'admission selon la revendication 1, dans lequel ladite mèche hydrophile (115) est en coton.

4. Appareil de retrait de fumée comportant un boîtier (111) ; un moyen d'admission (112) selon la revendication 1 pour définir un chemin d'admission pour des gaz impurs d'une cavité chirurgicale audit boîtier, ledit moyen de verrouillage est destiné à la connexion de ladite cavité chirurgical audit chemin d'admission ; un moyen de filtre (140) pour filtrer les impuretés des gaz impurs pour former des gaz filtrés ; un moyen d'évacuation (120) pour définir un chemin d'évacuation pour lesdits gaz filtrés dudit boîtier à ladite cavité chirurgicale, et un ventilateur (134) pour aspirer les gaz impurs de ladite cavité chirurgicale à travers ledit moyen d'admission (112), et à travers ledit moyen de filtre (140) pour former lesdits gaz filtrés et pour entraîner lesdits gaz filtrés à travers ledit moyen d'évacuation (120) dans ladite cavité chirurgicale, où lesdits moyens d'évacuation (120) sont conçus pour un ensemble d'instrument chirurgical laparoscopique,
et ladite mèche hydrophile (115) est insérée dans et fixée audit moyen de verrouillage dudit moyen d'admission.

5. Appareil de retrait de fumée selon la revendication 4, dans lequel ladite mèche hydrophile (115) est fabriquée en polyvinyle alcool (PVA).

6. Appareil de retrait de fumée selon la revendication 4, dans lequel ladite mèche hydrophile (115) est fabriquée en coton.

7. Appareil de retrait de fumée selon la revendication 4, dans lequel ladite mèche hydrophile (115) a une section transversale rectangulaire.

8. Appareil de retrait de fumée selon la revendication 4, comprenant en outre une vanne à sorties multiples (124) incorporée dans ledit moyen de sortie (120).

9. Appareil de retrait de fumée selon la revendication 8, dans lequel ladite sortie multiple (124) est une vanne de sortie à deux voies.

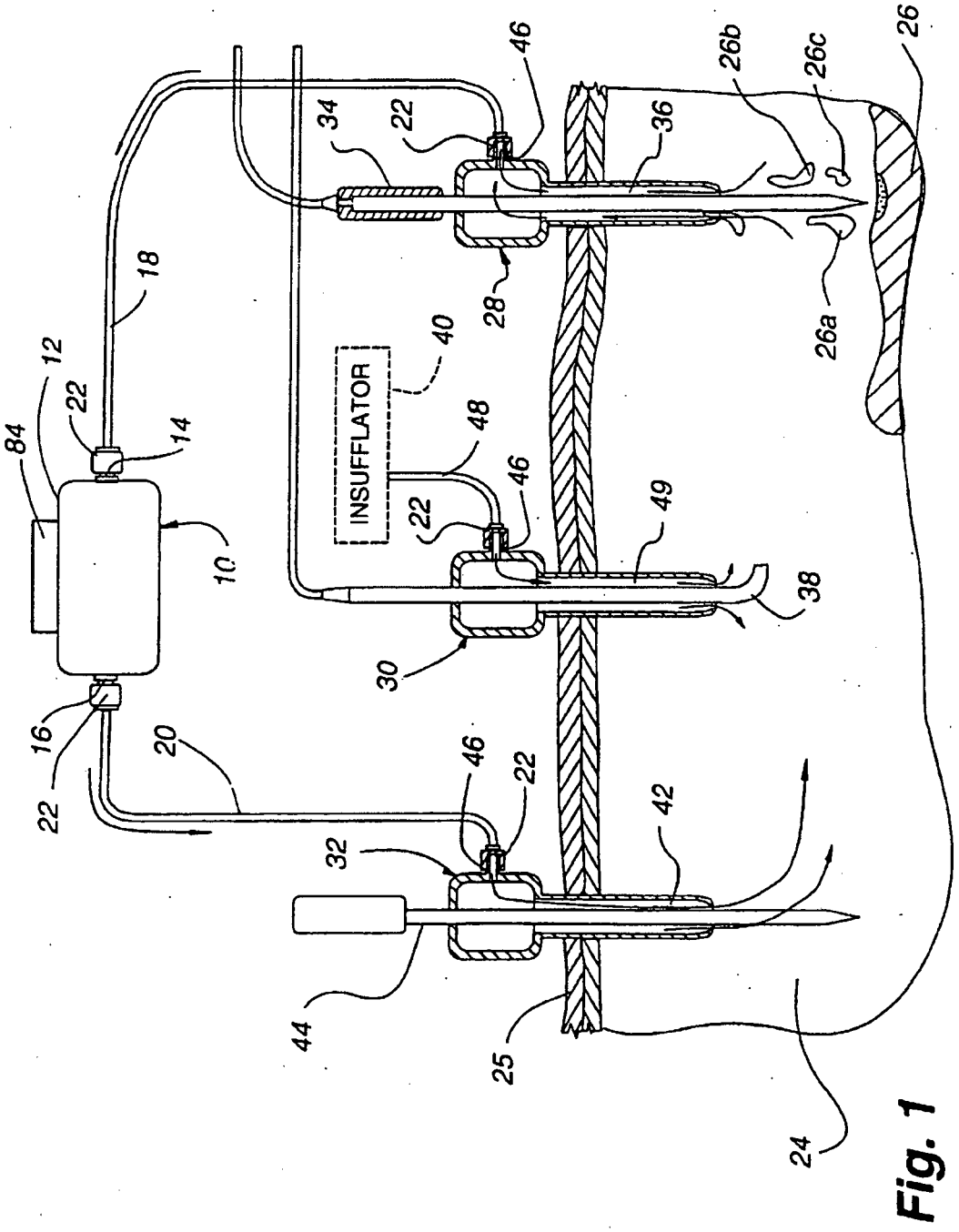
10. Appareil de retrait de fumée selon la revendication 9, dans lequel ladite vanne de détente à deux voies est une vanne à boisseau en t.

11. Appareil de retrait de fumée selon la revendication 9, dans lequel ladite vanne de détente à deux voies est un robinet d'arrêt avec deux sorties.

12. Appareil de retrait de fumée selon la revendication 4, dans lequel ledit moyen de filtre (140) comprend un pré-filtre (141a).

13. Moyen d'admission selon l'une quelconque des revendications 1 à 3, dans lequel la mèche hydrophile (115) est sous la forme d'un filament.

14. Appareil de retrait de fumée selon l'une quelconque des revendications 4 à 12, dans lequel la mèche hydrophile (115) est sous la forme d'un filament.



PRIOR ART

Fig. 1

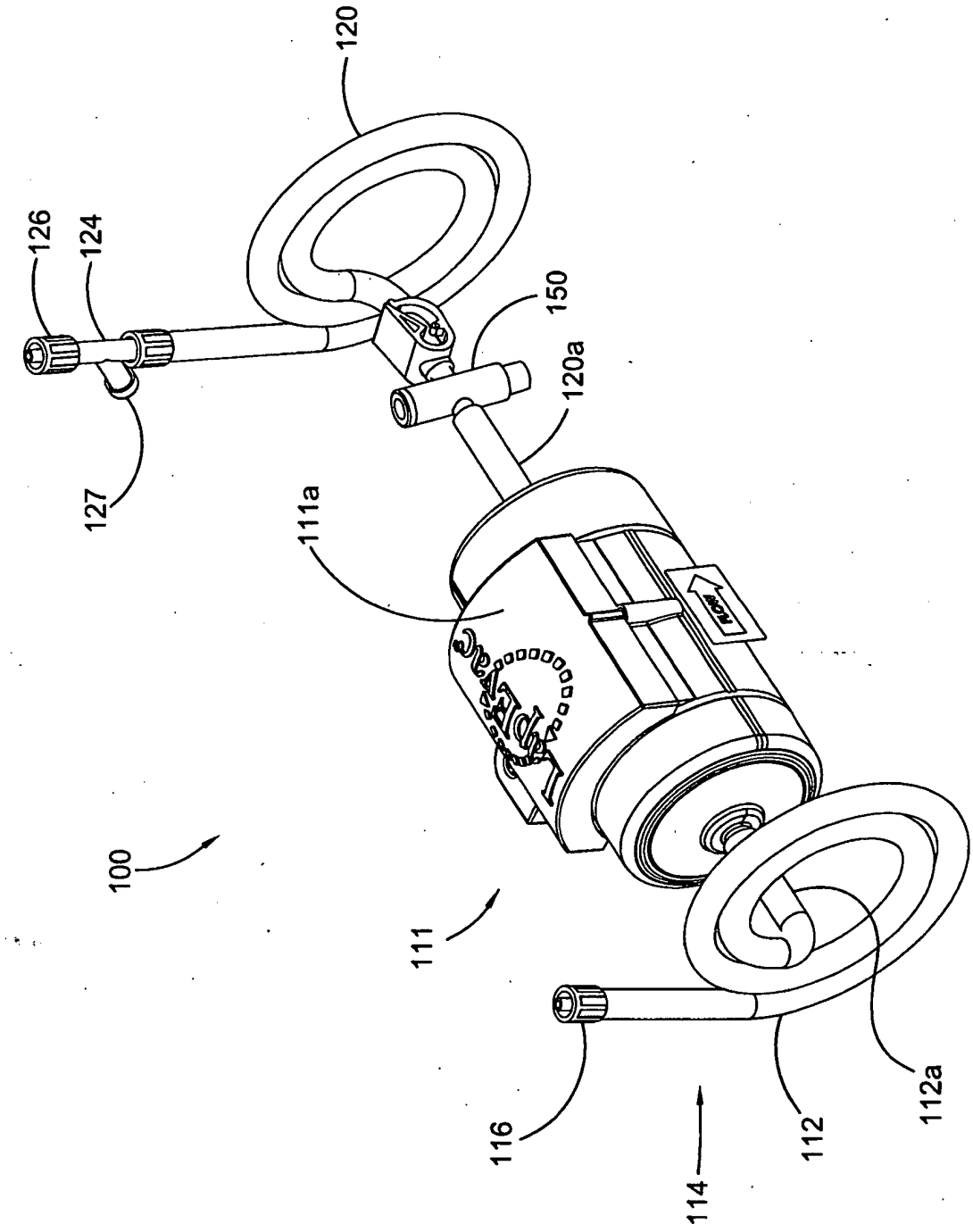
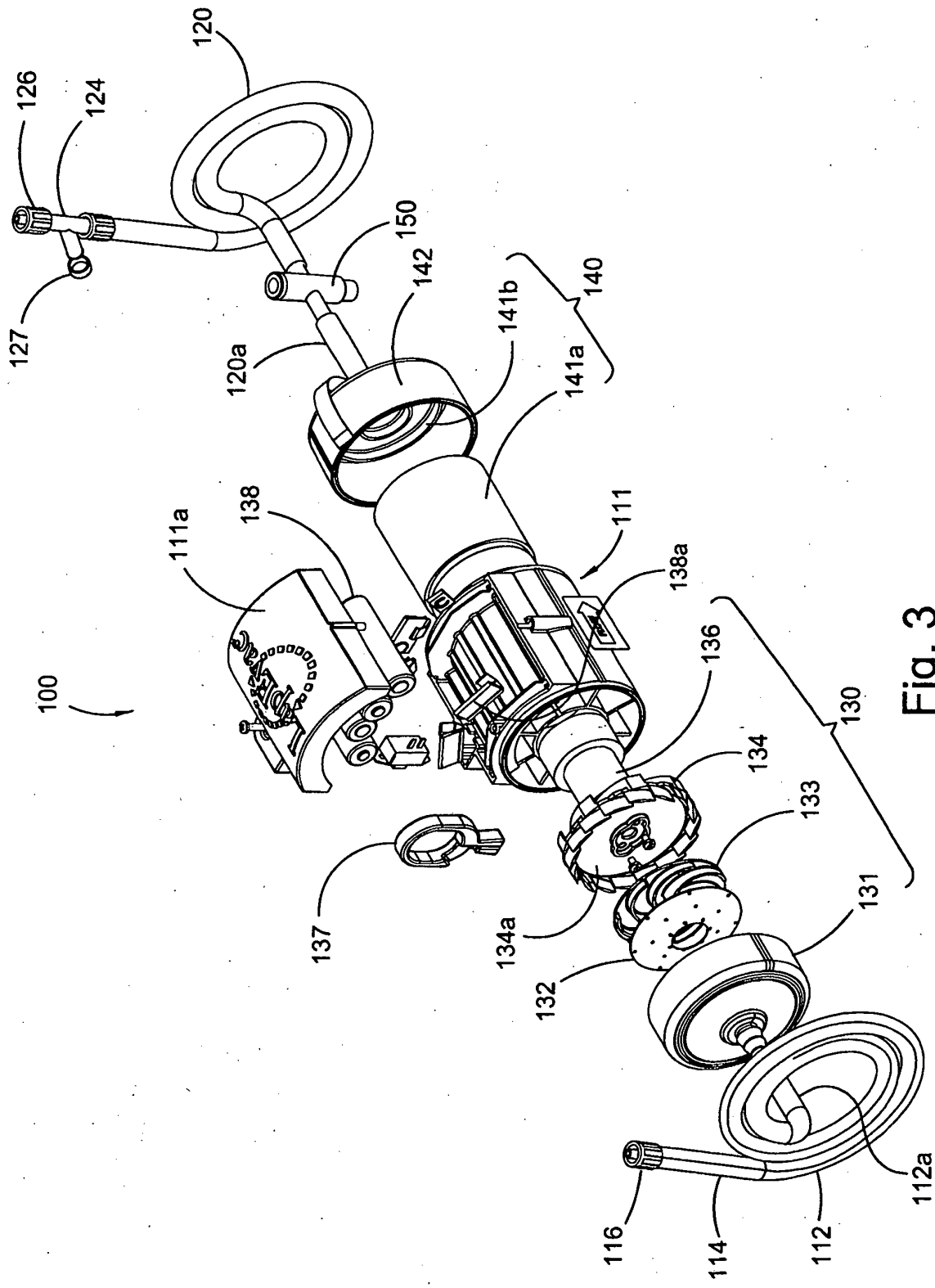


Fig. 2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134a
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112a
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114
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Fig. 3

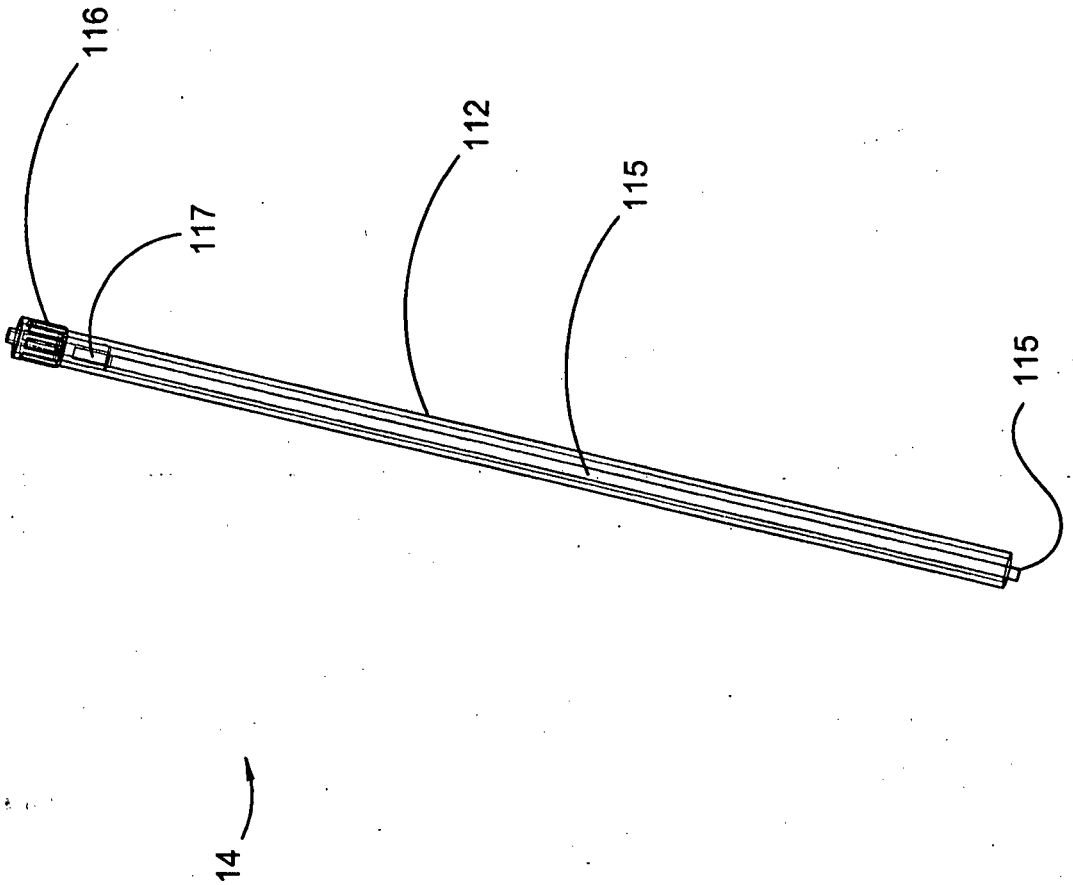

Fig. 3A

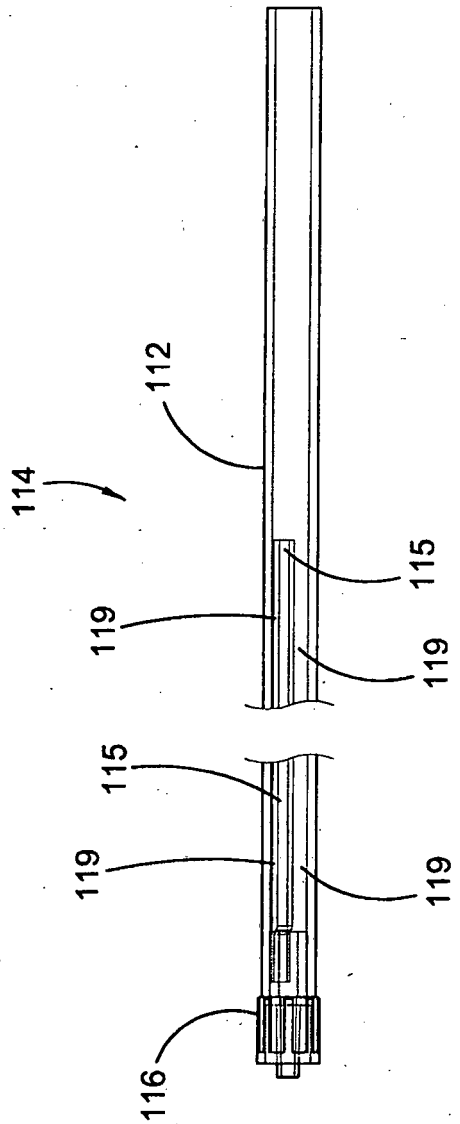

Fig. 4B

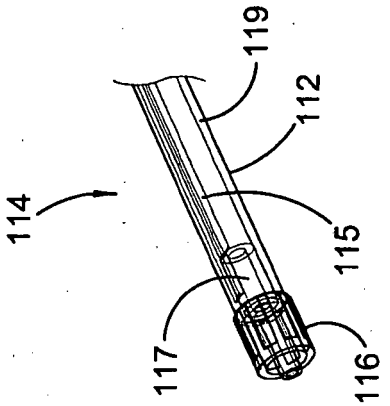

Fig. 4

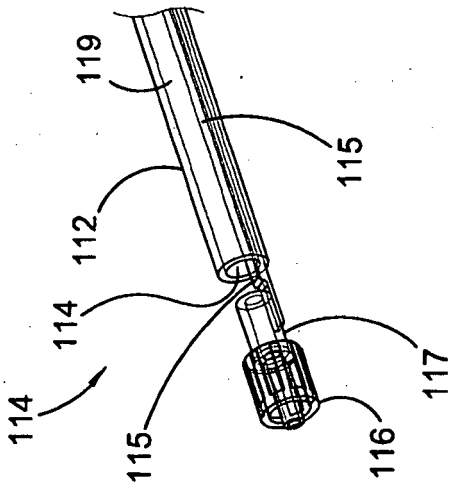

Fig. 4A

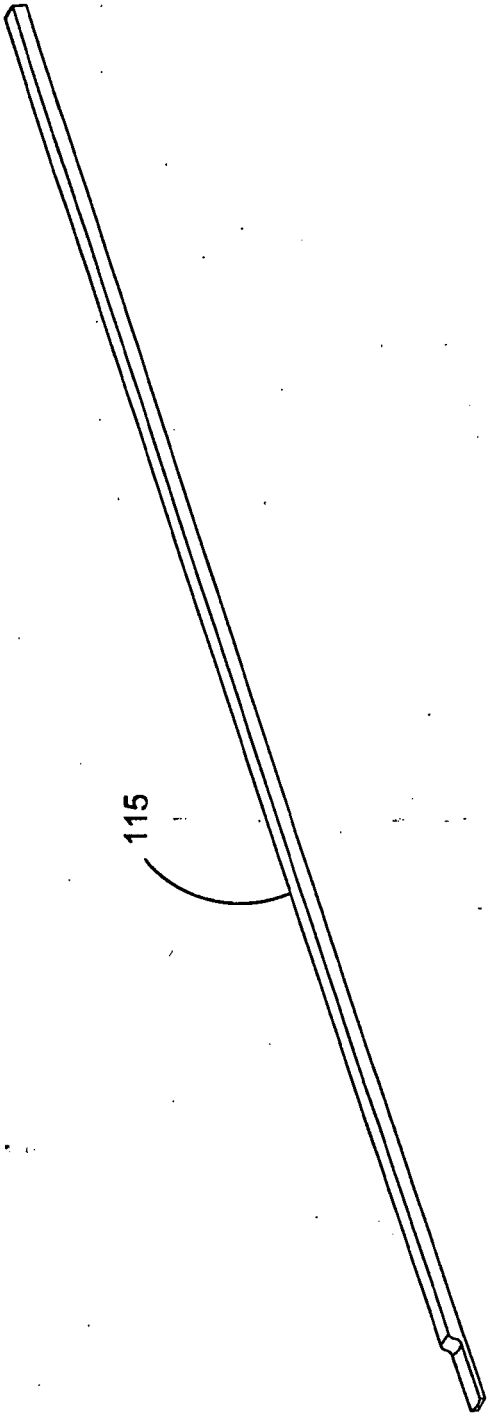

Fig. 5B

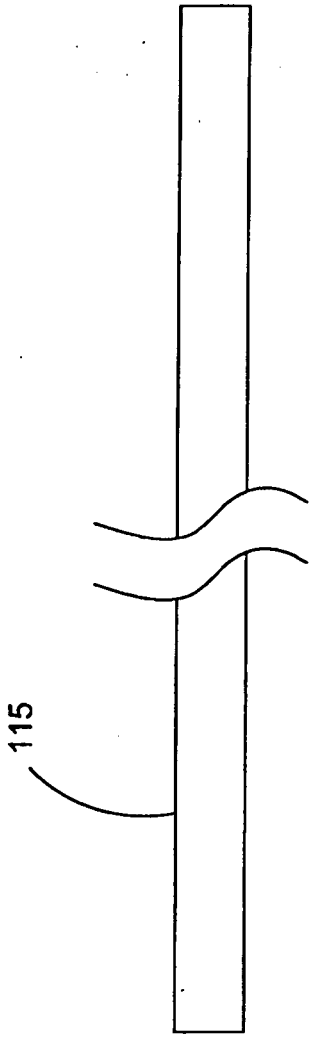

Fig. 5

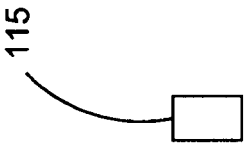

Fig. 5A

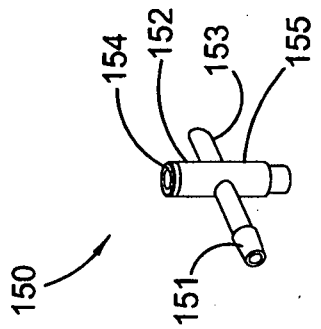

Fig. 6A

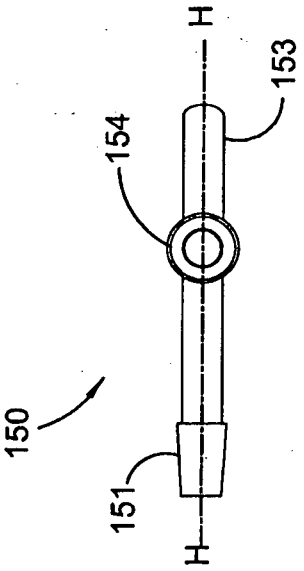

Fig. 6B

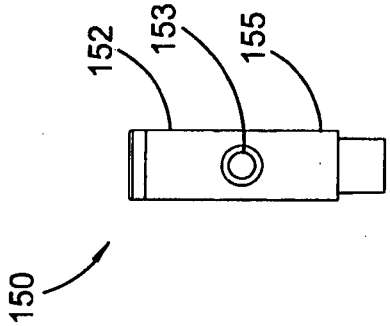

Fig. 6C

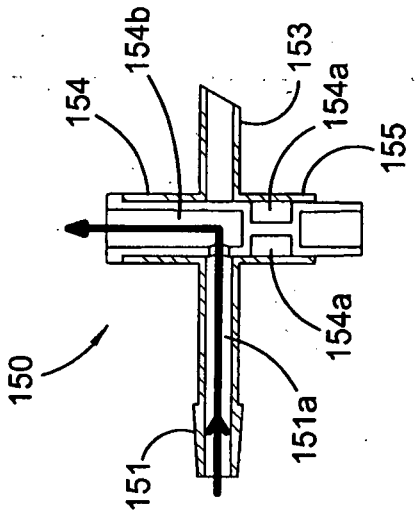

Fig. 6D

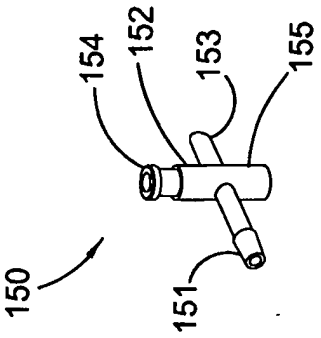

Fig. 7A

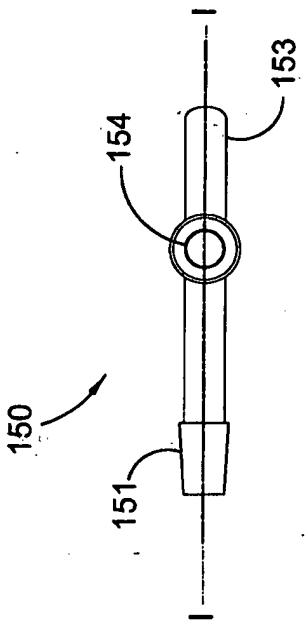

Fig. 7B

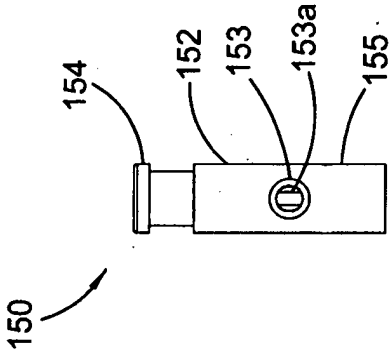

Fig. 7C

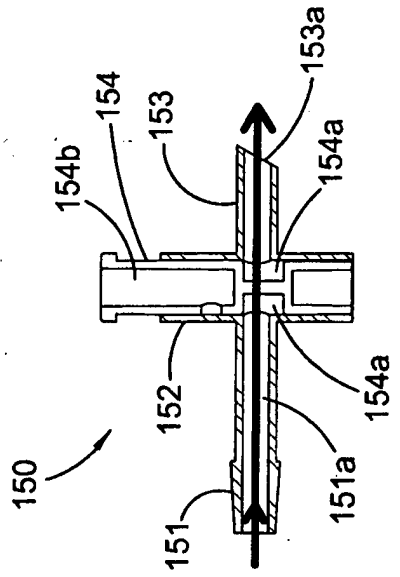

Fig. 7D

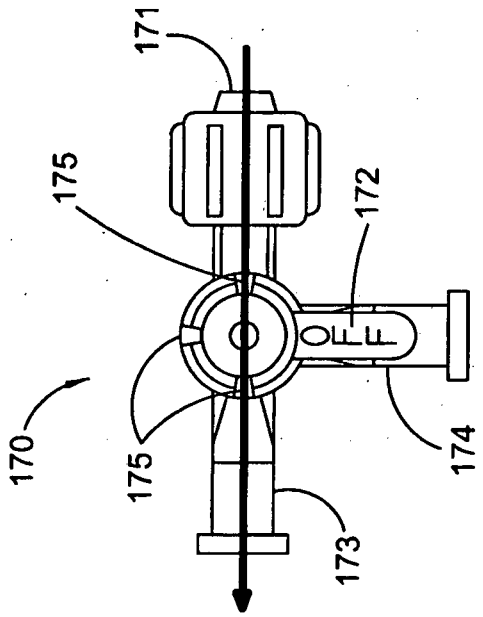

Fig. 8B

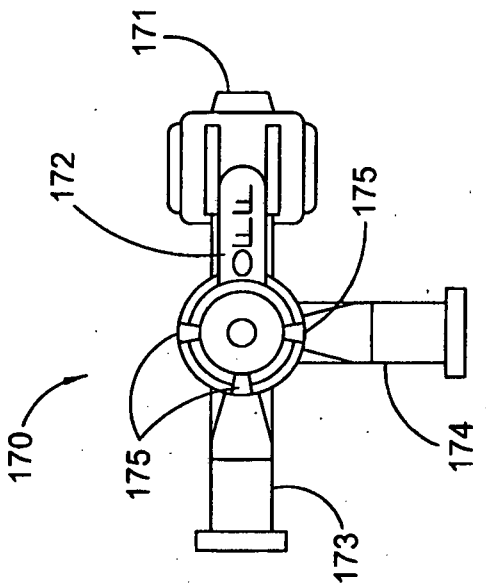

Fig. 8A

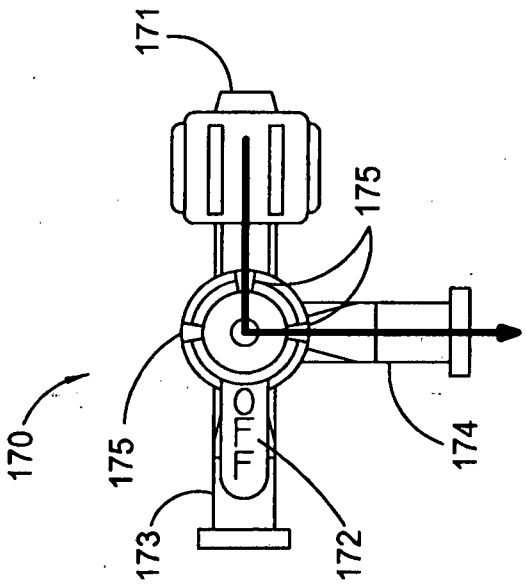

Fig. 8C

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 90427007 P **[0001]**
- US 6544210 B **[0009] [0040]**
- US 2005000196 A **[0009]**

专利名称(译)	用于一次性腹腔镜排烟系统的吸液阀和安全阀		
公开(公告)号	EP2117621B1	公开(公告)日	2013-11-06
申请号	EP2008726317	申请日	2008-02-29
[标]申请(专利权)人(译)	MEDTEK DEVICES公司的DBA BUFFALO过滤器		
申请(专利权)人(译)	MEDTEK DEVICES，INC.，DBA BUFFALO FILTER		
当前申请(专利权)人(译)	BUFFALO FILTER LLC		
[标]发明人	DEAN ROBERT O KAJDAS JAY T		
发明人	DEAN, ROBERT, O. KAJDAS, JAY, T.		
IPC分类号	B01D46/10 A61B18/00 B01D46/00		
CPC分类号	A61B18/00 A61B2218/008 B01D46/0036 B01D46/10 Y10T137/87708		
优先权	60/904270 2007-03-01 US		
其他公开文献	EP2117621A4 EP2117621A2		
外部链接	Espacenet		

摘要(译)

本发明涉及一种用于腹腔镜手术的改进的排烟装置。一种改进是位于烟雾装置的入口系统内的亲水性吸液芯，用于吸收水分并捕获进入烟雾排出装置的外科手术废物。第二个改进是插入烟雾排出装置的出口系统中的多出口阀，以使手术部位能够快速减压。

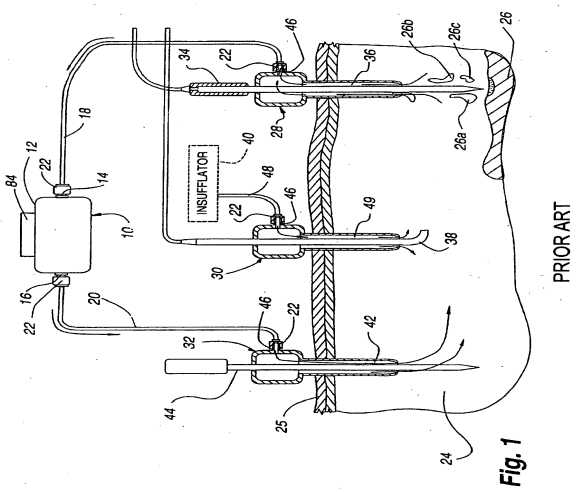

Fig. 1