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

(11) **EP 2 391 276 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
04.03.2015 Bulletin 2015/10

(21) Application number: **09805983.5**

(22) Date of filing: **30.12.2009**

(51) Int Cl.:
A61B 17/00 *(2006.01)*

(86) International application number:
PCT/US2009/069837

(87) International publication number:
WO 2010/078439 (08.07.2010 Gazette 2010/27)

(54) **TISSUE SEALING SYSTEM**

GEWEBEABDICHTSYSTEM

SYSTÈME DE SCELLEMENT DE TISSU

(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 MK MT NL NO PL PT RO SE SI SK SM TR

(30) Priority: **30.12.2008 US 141437 P**

(43) Date of publication of application:
07.12.2011 Bulletin 2011/49

(73) Proprietors:
- **Baxter International Inc.**
  Deerfield, IL 60015 (US)
- **Baxter Healthcare SA**
  8152 Glattpark (Opfikon) (CH)

(72) Inventors:
- **KHAKPOUR, Zafar**
  A-1210 Vienna (AT)
- **FORTELNY, Rene**
  A-3411 Weidling (AT)
- **REDL, Heinz**
  1070 Vienna (AT)

(74) Representative: **Potter Clarkson LLP**
The Belgrave Centre
Talbot Street
Nottingham, NG1 5GG (GB)

(56) References cited:
EP-A2- 2 000 215
WO-A1-00/09199
WO-A2-2006/076427
JP-A- 5 168 714
US-A- 5 810 885
US-A1- 2004 059 283

EP 2 391 276 B1

Printed by Jouve, 75001 PARIS (FR)

Description

BACKGROUND

Filed of the Disclosure

[0001] This disclosure is generally directed to systems for applying a sealant to a work surface and, more particularly, to an apparatus and system for applying tissue sealant to biological tissue employing structure that facilitates controlled spray application of tissue sealant and passive control of gas pressure.

DESCRIPTION OF THE RELATED ART

[0002] Various apparatus and systems have been disclosed for application of tissue sealants. One such disclosure is U.S. Patent No. 7,537,174, entitled "Hand Triggered Tissue Sealant Spray Apparatus and System," . An effective tissue sealant is a two-component tissue sealant made up of fibrinogen and thrombin. Because these two components react quickly with one another to cause clotting, it is desirable to isolate the two components from one another for as long as possible, until they are sprayed onto a target tissue site, such as a bodily organ.

[0003] A trocar device, which is known for use in laparoscopic surgical procedures, may be employed with an elongate delivery tube to deliver the two components, e.g., fibrinogen and thrombin, from a double-barrel syringe to a target tissue site. In order to spray the components of the tissue sealant onto a target tissue site, gas is introduced, such as through a Y-shaped spray adapter, as described in the aforementioned U.S. Patent No. 7,537,174.

[0004] US 2004/0059283 discloses a device for applying a biocompatible material to a tissue surface having chambers for receiving one or more biocompatible materials and one or more sources of a pressurized medical gas for delivering those materials to the tissue surface via a delivery nozzle.

[0005] US 5,810,885, WO 00/09199, WO 2006/076427 and JP 5168714 each disclose a liquid delivery device having first and second syringes for separately holding the liquid components to be delivered, a delivery nozzle and an adapter having fluid conveying passages for connecting the syringes and the nozzle together so that liquids expelled from the syringes can be directed through the adapter and conveyed down the delivery nozzle. The devices also comprise a tube attached to the adapter for conveying a gas, such as air, from a source to the delivery nozzle for discharge with the liquid components.

[0006] EP A-2,000,215 discloses a liquid delivery device having first and second syringes for separately holding the liquid components to be delivered, a delivery nozzle and an adapter having fluid conveying passages for connecting the syringes and the nozzle together so that liquids expelled from the syringes can be directed through the adapter and conveyed down the delivery nozzle. The device also comprises a gas tube for conveying a gas from a source to the delivery nozzle for discharge with the liquid components. The gas tube is connected to the device via an on/off valve which is opened by pressing an actuator that drives the syringe plungers so that the gas can enter the delivery device for discharge from the nozzle.

[0007] While such tissue sealing systems have been described and used, these systems limit the ability of the surgeon to direct the spray. With existing laparoscopically-introduced tissue spray systems, the surgeon can apply tissue sealant to a particular portion of a target tissue site, but then needs to withdraw the delivery tube at least partially into, or completely from, the trocar, reposition the delivery tube, then apply more tissue sealant to another portion of the target tissue site. This interrupted application of tissue sealant undesirably increases procedure time.

[0008] Another disadvantage of existing gas driven tissue delivery systems is the need for the surgeon or other medical professionals to carefully monitor the gas pressure introduced via the trocar to a bodily cavity. To perform most endoscopic, and in particular, laparoscopic procedures, the abdomen or other bodily cavity is filled with CO_2 gas, controlled by a special controller device where the pressure range is preset and maintained by monitoring, automatically delivering more CO_2 gas as needed. With certain newer controller devices, the release of gas from the bodily cavity may also be controlled. With such gas driven tissue delivery systems, an unacceptable increase of intracavity pressure may be realized if no venting is performed. In order not to overdistend the abdomen or other bodily cavity, and to avoid excessive pressure increase, the amount of gas employed for spraying should be limited. Moreover, the pressure on the surface of the target tissue to be sprayed should not exceed the pressure in small blood vessels, so as to avoid a gas embolism in the vasculature.

[0009] Venting can be accomplished by the surgeon by opening of a manually-operated valve at the trocar. Alternately, certain newer laparoscopic gas controller devices can actively control the supply of gas introduced into, or released from, the bodily cavity. However, these solutions require nearly-constant monitoring of intracavity pressure and pressure of gas, such as CO_2 or helium, used in the spray device or otherwise introduced into the bodily cavity.

[0010] It would therefore be desirable to provide a laparoscopic tissue sealant spray delivery system and apparatus that speeds up procedure time and reduces the need for monitoring of the pressure of gas introduced into the bodily cavity, thereby permitting the surgeon or other medical professionals to pay more attention to other matters relating to the procedure.

SUMMARY OF THE DISCLOSURE

[0011] The present invention provides a tissue sealant spray applicator according to claim 1.

[0012] Various embodiments of a laparoscopic tissue sealant spray delivery system and apparatus are described below. In one embodiment, the laparoscopic tissue sealant spray assembly is provided with an elongate delivery tube having a rounded distal end. In another embodiment, the elongate delivery tube is provided with an angled end, such as in a range of 30° to 45°. In either of these embodiments, the elongate delivery tube is preferably provided with separate passageways, one for each component of a two component fluid, such as a tissue sealant, and these separate sealant component passageways are surrounded by a gas passageway. The sealant component passageways and the gas passageway terminate at a ring member provided at the distal end of the elongate delivery tube, with the ring member having a plurality of teeth projecting radially inwardly from an inner diameter thereof.

[0013] The inner diameter of the ring member, the teeth, and an outer wall of the sealant component passageways define a plurality of apertures at the distal end of the elongate delivery tube for gas in the passageway to first be exposed to the two components as the components are simultaneously ejected from the elongate delivery tube, thereby spraying the tissue sealant onto a target tissue site. The rounded or angled distal end may be easily repositioned by simply rotating the elongate delivery tube to direct a conical spray of tissue sealant to a different portion of a target tissue site.

[0014] In an embodiment, the venting valve assembly has a gas inlet in fluid communication with a gas passageway branched off from the gas supply passageway that delivers gas to the tissue sealant spray assembly. A valve within the venting valve member is biased by a spring in the direction of the gas inlet, closing a vent path within the venting valve member. When the tissue sealant spray system is in operation, pressurized gas entering the gas inlet of the venting valve member urges the valve therein against the spring, thereby opening the vent path and permitting gas to be vented from a bodily cavity, through a trocar tube and vent opening of the trocar assembly, and out through the venting valve member.

[0015] In an embodiment, the venting valve assembly includes a movable valve rod having a first axially-extending section of a diameter sufficient to block the vent path, and a second axially-extending section of a smaller diameter, permitting gas to pass through the vent path, around the second axially-extending section of the valve rod. The first axially-extending section of the valve rod may include a hollowed interior cavity to accommodate the spring that biases the valve rod toward a sealed condition in which the first axially-extending section closes the vent path. The second axially-extending section includes an end cap in sealed communication with an interior of a valve conduit within the venting valve member, thereby permitting gas pressure from the pressurized gas P to build up and exert a force sufficient to overcome the biasing force of the spring. The sealed communication also serves to isolate the pressurized gas employed to actuate the valve rod from the gas being vented from the bodily cavity. The venting valve member significantly diminishes gas build-up within the bodily cavity during the laparoscopic tissue spray procedure. These and other aspects of the present disclosure will now be described in more detail, with reference to the following drawings.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0016]

Fig. 1 is a perspective view of a laparoscopic tissue sealant spray apparatus and system of a first embodiment of the present disclosure;

Fig. 1A is an enlarged end view of a portion of the laparoscopic tissue sealant spray apparatus and system of Fig. 1, taken along lines 1A-1A of Fig. 1, showing the distal end of an elongate delivery tube surrounded by a trocar;

Fig. 1B is a cross-sectional view of the distal end of the elongate delivery tube of Fig. 1A, taken along lines 1B-1B of Fig. 1A;

Fig. 2 is a perspective view of a laparoscopic tissue sealant spray assembly with an elongate delivery tube, partially broken away, and prior to insertion into a trocar assembly;

Fig. 3 is a perspective view of the laparoscopic tissue sealant spray assembly of Fig. 2, in combination with a trocar assembly having a venting valve member of the present disclosure provided on a valve opening of the trocar assembly;

Fig. 4 is a plan view of an elongate delivery tube of a laparoscopic tissue sealant spray apparatus of the first embodiment of the present disclosure, with a segment of the elongate delivery tube and most of the laparoscopic tissue sealant spray assembly broken away for clarity;

Fig. 4A is an end view of the elongate delivery tube shown in Fig. 4, taken along the lines 4A-4A of Fig. 4;

Fig. 5 is an environmental view of a bodily cavity, showing the distal end portion of the elongate delivery tube shown in Fig. 4, illustrating the manner in which the elongate delivery tube of the laparoscopic tissue sealant spray apparatus of the first embodiment of the present disclosure may be manipulated within the bodily cavity and without being pulled back

into the trocar in order to direct tissue sealant to distinct portions of a target site;

Fig. 6 is a perspective view, in cross-section, of a venting valve member of the present disclosure; and

Fig. 7 is a plan view of the venting valve member of Fig. 6, taken along directional lines 7-7 of Fig. 6.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0017] The laparoscopic tissue sealant spray apparatus and system 10 of the present disclosure includes a tissue sealant spray assembly 12, a trocar assembly 14, and a network of gas supply tubing 16. The tissue sealant spray assembly 12 has a barrel assembly 18 defining a compartment for a tissue sealant. The fluid to be delivered is preferably a tissue sealant, and is most preferably a multi-component tissue sealant, such as a two-component sealant including thrombin and fibrinogen. Much of the tissue sealant spray apparatus and system, up to and including a generally Y-shaped spray adapter member, may be as described in U.S. Patent No. 7,537,174, wherein the components of the apparatus and system are described in greater detail than is provided here.

[0018] In the case of a two-component sealant where the components must be isolated from one another until their application to a target site, the barrel assembly 18 includes two interior bores 20, 22, with each component stored in one of the interior bores 20, 22. Pistons 24, 26 are movably positioned in each of the respective interior bores 20, 22. Each of the pistons 24, 26 is provided with a plunger member 28, 30 at the distal end thereof, each of the plunger members 28, 30 forming a seal with an inner wall of the respective interior bore 20, 22, such that advancement of the pistons 24, 26 toward a distal end 32 of the barrel assembly 18 ejects the components of the tissue sealant from the interior bores 20, 22.

[0019] In order to provide simultaneous ejection of the two components of the tissue sealant, a pusher member 34 that bridges both of the pistons 24, 26 is operatively associated with the pistons 24, 26. The pusher member 34 may be provided with a proximal platform 36 slidably attached to a frame 38. Each of the plunger members 28, 30 terminates in a flanged end 40, 42 received in a corresponding slot 44, 46 of the proximal platform 36.

[0020] A gas passageway 48 connects to the pusher member 34. An opening 50 on the proximal platform 36 is restricted as the user actuates the pusher member 34. This blockage of the opening 50 causes the gas pressure to increase to the static pressure of the gas and generates a supply signal to a gas supplying device (not shown). This signal operates a valve on the gas supplying device which in turn operatively supplies gas to the network of gas supply tubing 16. In an embodiment this gas may be carbon dioxide, but such gas may be any gas which is suitable for the application.

[0021] At the distal end 32 of the barrel assembly 18, each of the interior bores 20, 22 is in fluid communication with a respective tissue sealant inlet 52, 54 of a generally Y-shaped spray adapter member 56. The generally Y-shaped spray adapter member 56 also includes a gas inlet connection 58, to which a gas supply tube 60 that one branch of the network of supply tubing 16 connects. Thus activation of the valve on the gas supplying device by selective blockage of the opening 50 provides a flow of gas into the network 16 and thereby the supply tubing 16 and such gas flows into the gas inlet connection 58 of the Y-shaped adapter member 56.

Elongate Delivery Tube

[0022] The generally Y-shaped spray adapter member 56 is provided with a connection outlet 62 in fluid communication with both the gas inlet connection 58 and the tissue sealant inlets 52, 54. The connection outlet 62 is in fluid communication with an elongate delivery tube 64, which extends through a trocar tube 66 of the trocar assembly 14.

[0023] In the embodiment shown in Figs. 1, 1A and 1B, a spray outlet 68 at the distal end of the elongate delivery tube 64 is rounded. The elongate delivery tube 64 defines a conduit therein with separate sealant component passageways 70, 72, one for each of the tissue sealant components. A ring member 74 having a plurality of teeth 76 projecting radially inwardly is provided at the rounded spray outlet 68 at the distal end of the elongate delivery tube 64. The elongate delivery tube 64 also includes a gas passageway 78 in fluid communication with the connection outlet 62 of the generally Y-shaped spray adapter member 56. The gas passageway 78 surrounds the sealant component passageways 70, 72 and terminates at the rounded spray outlet 68 at the distal end of the elongate delivery tube 64. Gas in the gas passageway 78 is able to pass through the rounded spray outlet 68 of the elongate delivery tube 64 via apertures 80 defined by the teeth 76, the inner diameter of the ring 74, and an exterior wall 82 of the sealant component passageways 70, 72.

[0024] The connection between the generally Y-shaped spray adapter member 56 and the elongate delivery tube 64 is such that gas from the gas supply tube 60 enters the gas inlet connection 58 of the generally Y-shaped spray adapter member 56, but rather than mixing with the tissue sealant components in the spray adapter member 56, the gas remains isolated from the components, and the components remain isolated from one another, down the entire length of the elongate delivery tube 64. The gas is only exposed to the tissue sealant components at the spray outlet 68, simultaneously with the tissue sealant components first being exposed to one another, when the gas passes through the apertures 80. Distributing gas delivery via a plurality of apertures 80, as is achieved with the ring member 74, advantageously significantly reduces the pressure and flow rate of the gas necessary to achieve the desired spray mixing of the

components as the mixed components are applied at the target tissue surface. The present design also reduces gas volume which is emitted from the delivery tube compared to existing laparoscopic spray systems, and results in a more defined spray cone diameter, enabling more precision in the location of sealant application.

[0025] The ring member 74 and the openings 70', 72' at the distal end of the separate sealant component passageways 70, 72 are preferably displaced slightly from the rounded distal end 68 and inclined at an angle α in the range of 30° - 45° relative to a main axis of the elongate delivery tube, and inclined preferably at a 45° angle. By so positioning the ring member 74, the spray cone may be easily re-directed during operation of the laparoscopic tissue sealant spray apparatus and system 10, by simply rotating the elongate delivery tube 64. Moreover as the openings 70', 72' are displaced slightly from the spray outlet 68 the spray outlet 68 forms a smooth surface that upon contacting the tissue of a patient provides a touch control to the surgeon without irritating the tissue. In addition, when the spray outlet 68 is in contact with the patient tissue, the displacement of the openings 70', 72' prevents the tissue from blocking the openings thereby lessening the potential for clogs.

[0026] Turning to Figs. 4, 4A and 5, the laparoscopic tissue sealant spray apparatus and system is substantially the same as in the previous embodiment, but the rounded spray outlet 82 at the distal end of the elongate delivery tube 64 includes an angled portion 82' that extends at least short distance beyond an outer perimeter of the ring member 74.

[0027] As illustrated in Fig. 5, a benefit of the angled portion of the rounded spray outlet 82 is that the spray cone 84 formed when the gas disperses the combined tissue sealant components may be redirected within a bodily cavity 86 from a first portion of a target tissue site to a second portion of the target tissue site by simply manipulating the elongate delivery tube 64 by rotation, as indicated by the directional arrow R. As is the case with the elongate delivery tube 64 illustrated in Figs. 1, 1A and 1B, a ring member 74 is provided in the spray outlet 82, having teeth 76 projecting radially-inwardly from an inner diameter of the ring member 74, defining a plurality of apertures 80 for gas to eject from the gas passageway within the elongate delivery tube 64 surrounding the separate passageways 70, 72 for the tissue sealant components.

Venting Valve Member

[0028] Referring to Figs. 1 and 3 in conjunction with Figs. 6 and 7, a venting valve member 90 is connected to a gas passageway 92 of the network of supply tubing 16. The gas passageway 92 and the gas supply tube 60 branch off from a main gas tube 94 at a connector 97. The gas passageway 92 is secured to a gas connecting end 96 of the venting valve member 90. The venting valve member 90 includes a movable valve rod 98 biased by a spring 100 in a direction toward the gas connecting end 96 and a vent path 102 in fluid communication with a valve opening 104 of the trocar assembly 14. The vent path 102 is selectively opened by gas pressure P from the gas passageway 90 urging the valve rod 98 against the restoring force of the spring 100, as indicated by the arrow V in Fig. 7. Fig. 7 also illustrates in phantom lines the position of the valve rod 98 when displaced by the gas pressure P, against the spring 100, to the position in which the vent path 102 is open.

[0029] The vent path 102 is selectively opened by gas pressure P from the gas passageway 92 urging the valve rod 98 against the spring 100, as indicated by the arrow V in Fig. 7. Fig. 7 also illustrates in phantom lines the position of the valve rod 98 when displaced by the gas pressure P, against the spring 100, to the position in which the vent path 102 is open. The geometry of the valve rod 98 of the venting valve member 90 is such that a first axially-extending section 108 is of a sufficient diameter to block the vent path 102 when the valve rod 98 is in the closed position, as illustrated in solid lines in Fig. 7. A second axially-extending section 110 of the valve rod 98 has a narrower diameter than the first axially-extending section, such that when the valve rod 98 is actuated by gas pressure P from the gas passageway 92, gas may be vented through the vent path 102, around the second axially-extending section.

[0030] The second axially-extending section 110 of the valve rod 98 terminates at a solid end cap 112 opposite the first axially-extending section 108. The end cap 112 is in sealed, yet axially-movable, communication with a valve conduit 114 within the venting valve member 90 in which the valve rod 98 is seated. This sealed engagement permits gas pressure from the pressurized gas P to build up and exert a force sufficient to overcome the biasing force of the spring, and isolates pressurized gas P from the gas passageway from gas in the bodily cavity being vented through the vent path 102. The end cap 112 also serves to limit the travel of the valve rod 98. As illustrated in Figs. 6 and 7, the valve conduit 114 is stepped radially inwardly (from right-to-left in the drawing figures), from a first inner diameter approximately equal to an outer diameter of the end cap 112, to a second inner diameter that is less than the outer diameter of the end cap 112, but large enough to accommodate the first axially-extending section 108 of the valve rod 98. A gasket 116, such as an O-ring, is preferably provided at an end of the first inner diameter region of the valve conduit 114 adjacent the step radially inwardly to the first inner diameter region. The gasket 116 dampens vibrations and reduces noise resulting from impact between the end cap 112 and the stepped portion of the valve conduit 114 as the pressurized gas P forces the valve rod 98 against the spring 100.

[0031] The first axially-extending section 108 of the valve rod 98 preferably includes a hollowed interior cavity 118 to accommodate a portion of the spring 100.

[0032] When, as described previously, the opening 50

(Fig. 3) is blocked to signal the 60 gas delivery device (not shown) to supply gas under pressure to the supply tubing 60 (and therefore the gas inlet connection 58), this flow of gas also pressurizes the gas within the gas passageway 92. This gas pressure within the gas passageway 92 forms pressure P within the gas connecting end 96, which urges the valve rod 98 against the restoring force of the spring 100, thereby opening the vent path 102. This opening of the vent path 102 thereby coincides with the supply of gas through the Y-shaped adapter member 56, gas passageway 78 and apertures 80 into the patient. This allows for the selective venting or evacuation of this volume of gas from the bodily cavity (e.g., the abdominal cavity), as it is being supplied, through the trocar tube 66 and the valve opening 104 of the trocar assembly 14, and to the atmosphere, with the end result being very minimal net pressure increase or increase in volume of gas in the patient's cavity, during continuous spraying of tissue sealant. When the opening 50 is uncovered, spraying is stopped, gas flow into the patient is interrupted, and the gas pressure P ceases to be supplied to the gas connecting end 96 of the venting valve member 90, upon which the valve rod 98 of the venting valve member 90 is closed by the restoring force of the spring 100.

[0033] The vent path 102 of the venting valve member 90 may be secured to the valve opening 104 of the trocar assembly by a locking member 106, which may be internally threaded and may engage external threads (not shown) on the valve opening 104 of the trocar assembly 14. In an embodiment this locking member 106 and valve opening 104 may be formed as a standard luer fitting. A vent path connector end 120 is configured to attach to a vent outlet at the valve opening 104 of the trocar assembly, the vent path 102 being in fluid communication with the vent path connector end 120. The venting valve member 90 further includes a vent opening 122 at a terminus of the vent path 102 and in fluid communication with the second inner diameter region of the valve conduit 114.

[0034] While various aspects of the present disclosure have been described, it will be understood by those of ordinary skill in the art that variations may be made thereto that are still within the scope of the appended claims.

Claims

1. A tissue sealant spray applicator (12) for applying a multi-component fluid into a body cavity through a trocar assembly (14) extending into the body cavity, the trocar assembly (14) having a trocar tube (66) for introducing an elongate delivery tube (64) into the body cavity, a vent outlet (104) and forming a vent passageway for placing the vent outlet in fluid communication with the body cavity, said tissue sealant spray applicator comprising:

a barrel assembly (18) containing the multi-component fluid, the barrel assembly including a distinct chamber (20, 22) for each of the components and a piston (24, 26) movably positioned in a proximal end of the barrel assembly,
a spray adapter member (56) having:

a gas inlet connection (58);
a plurality of fluid inlets (52, 54), with at least one of the fluid inlets in corresponding fluid communication with one of the chambers; and
an adapter member outlet (62) in fluid communication with the gas inlet connection and the plurality of fluid inlets;

an elongate delivery tube (64) having a proximal end connected to the adapter member outlet of the adapter member, an opposite distal end region forming a spray outlet (68) in fluid communication with the gas inlet connection and the plurality of fluid inlets, the elongate delivery tube being receivable in the trocar tube of the trocar assembly, and sized to extend through the trocar tube with the distal end region of the elongate delivery tube exposed and the elongate delivery tube being rotatable relative to the trocar tube;
a main gas tube (94) in fluid communication with the gas inlet connection;
a gas supply tube (92) in fluid communication with the main gas tube;
a venting valve assembly (90) including a gas connecting end (96) attached to the gas supply tube, a valve conduit (114) in fluid communication with the gas connecting end, a vent path connector end (120) configured to attach to the vent outlet (104) of the trocar assembly and a vent path (102) in fluid communication with the vent path connector end, the venting valve assembly also including a biased movable valve rod (98) slidably located within the valve conduit and configured to provide a seal within the vent path, the valve rod being operable by gas pressure within the valve conduit to slide against the bias and provide a selective opening for gas to pass from the vent path to the atmosphere; and
a vent opening (122), wherein the vent opening is in fluid communication with the vent path upon said selective opening of the valve rod.

2. The tissue sealant spray applicator of claim 1, wherein the elongate delivery tube (64) includes a gas passageway (78) in fluid communication with the adapter member outlet (62) of the spray adapter member (56).

3. The tissue sealant spray applicator of claim 2, wherein the gas passageway (78) of the elongate delivery tube (64) surrounds separate passageways (70, 72) for the components of the tissue sealant.

4. The tissue sealant spray applicator claim 3, wherein the gas passageway (78) and the separate passageways (70, 72) for the components of the tissue sealant terminate at a distal end of the elongate delivery tube (64) at a ring member (74) having a plurality of teeth (76) projecting radially inwardly from an inner diameter of the ring member, the teeth extending across an outlet end of the gas passageway and around an outer wall (82) of the separate passageways, whereby the outer wall of the separate passageways, the teeth, and the inner diameter of the ring member define a plurality of apertures (80) in the distal end of the elongate delivery tube.

5. The tissue sealant spray applicator of claim 4, wherein the distal end of the elongate delivery tube (64) is rounded, and the ring member (74) is off-center on the rounded distal end.

6. The tissue sealant spray applicator of any one of the preceding claims, wherein the valve rod (98) is biased by a spring (100) in a direction toward the gas connecting end (96), the vent path (102) being selectively openable by gas pressure urging the valve rod against the spring.

7. The tissue sealant spray applicator of any one of the preceding claims, wherein the venting valve assembly (90) further comprises a locking member (106) selectively securable to an exterior of the vent outlet (104) of the trocar assembly (14).

8. The tissue sealant spray applicator of claim 7, wherein locking member (106) is threaded.

9. The tissue sealant spray applicator of any one of the preceding claims, wherein the spray outlet (68) at the distal end of the elongate delivery tube (64) is angled relative to a main axis of the elongate delivery tube.

10. The tissue sealant spray applicator of claim 9, wherein the angle is in a range of from 30° to 45°.

Patentansprüche

1. Gewebedichtungsmittel-Sprühapplikator (12) zum Einbringen eines Mehrkomponentenfluids in einen Körperhohlraum durch eine Trokarbaugruppe (14), die sich in den Körperhohlraum erstreckt, wobei die Trokarbaugruppe (14) eine Trokarröhre (66) zum Einführen einer länglichen Abgaberöhre (64) in den Körperhohlraum, einen Belüftungsauslass (104) aufweist und einen Belüftungsdurchgang zum Anordnen des Belüftungsauslasses in einer Fluidverbindung mit dem Körperhohlraum bildet, wobei der Gewebedichtungsmittel-Sprühapplikator umfasst:

eine Zylinderbaugruppe (18), die das Mehrkomponentenfluid enthält, wobei die Zylinderbaugruppe eine einzelne Kammer (20, 22) für jede der Komponenten und einen Kolben (24, 26) einschließt, der bewegbar in einem proximalen Ende der Zylinderbaugruppe angeordnet ist,
ein Sprühadapterelement (56) mit:

einer Gaseinlassverbindung (58),
einer Mehrzahl von Fluideinlässen (52, 54), wobei mindestens einer der Fluideinlässe in einer entsprechenden Fluidverbindung mit einer der Kammern steht, und
einem Adapterelementauslass (62) in Fluidverbindung mit der Gaseinlassverbindung und der Mehrzahl von Fluideinlässen,

eine längliche Abgaberöhre (64) mit einem proximalen Ende, das mit dem Adapterelementauslass des Adapterelements verbunden ist, einem gegenüber liegenden distalen Endbereich, der einen Sprühauslass (68) bildet, der in Fluidverbindung mit der Gaseinlassverbindung und der Mehrzahl von Fluideinlässen steht, wobei die längliche Abgaberöhre in der Trokarröhre der Trokarbaugruppe aufgenommen werden kann und eine Größe aufweist, die derart ist, dass sie sich durch die Trokarröhre erstreckt, wobei der distale Endbereich der länglichen Abgaberöhre freiliegt und die längliche Abgaberöhre relativ zu der Trokarröhre drehbar ist,
eine Hauptgasröhre (94) in Fluidverbindung mit der Gaseinlassverbindung,
eine Gaszuführungsröhre (92) in Fluidverbindung mit der Hauptgasröhre,
eine Belüftungsventilbaugruppe (90), die ein Gasverbindungsende (96), das an der Gaszuführungsröhre angebracht ist, einen Ventilkanal (114) in Fluidverbindung mit dem Gasverbindungsende, ein Belüftungspfadverbindungsstückende (120), das zum Anbringen an den Belüftungsauslass (104) der Trokarbaugruppe ausgebildet ist, und einen Belüftungspfad (102) in Fluidverbindung mit dem Belüftungspfadverbindungsstückende einschließt, wobei die Belüftungsventilbaugruppe auch eine vorgespannte bewegbare Ventilstange (98) umfasst, die so innerhalb des Ventilkanals angeordnet ist, dass sie gleiten kann, und die so ausgebildet ist, dass sie eine Abdichtung innerhalb des Belüftungspfads bereitstellt, wobei die Ventilstange durch Gasdruck innerhalb des Ventilkanals so betätigt werden kann, dass sie gegen die Vorspannung gleitet und eine selektive Öffnung für Gas bereitstellt, so dass es von dem Belüftungspfad zur Atmosphäre strömt, und
eine Belüftungsöffnung (122), wobei die Belüftungsöffnung beim selektiven Öffnen der Ven-

tilstange mit dem Belüftungspfad in Fluidverbindung steht.

2. Gewebedichtungsmittel-Sprühapplikator nach Anspruch 1, bei dem die längliche Abgaberöhre (64) einen Gasdurchgang (78) in Fluidverbindung mit dem Adap- terelementauslass (62) des Sprühadapterelements (56) einschließt.

3. Gewebedichtungsmittel-Sprühapplikator nach Anspruch 2, bei dem der Gasdurchgang (78) der länglichen Abgaberöhre (64) separate Durchgänge (70, 72) für die Komponenten des Gewebedichtungsmittels umgibt.

4. Gewebedichtungsmittel-Sprühapplikator nach Anspruch 3, bei dem der Gasdurchgang (78) und die separaten Durchgänge (70, 72) für die Komponenten des Gewebedichtungsmittels an einem distalen Ende der länglichen Abgaberöhre (64) an einem Ringelement (74) enden, das eine Mehrzahl von Zähnen (76) aufweist, die von einem Innendurchmesser des Ringelements radial einwärts vorragen, wobei sich die Zähne über ein Auslassende des Gasdurchgangs und um eine Außenwand (82) der separaten Durchgänge erstrecken, wodurch die Außenwand der separaten Durchgänge, die Zähne und der Innendurchmesser des Ringelements eine Mehrzahl von Öffnungen (80) in dem distalen Ende der länglichen Abgaberöhre festlegen.

5. Gewebedichtungsmittel-Sprühapplikator nach Anspruch 4, bei dem das distale Ende der länglichen Abgaberöhre (64) gerundet ist und sich das Ringelement (74) außermittig auf dem gerundeten distalen Ende befindet.

6. Gewebedichtungsmittel-Sprühapplikator nach einem der vorhergehenden Ansprüche, bei dem die Ventilstange (98) durch eine Feder (100) in einer Richtung zu dem Gasverbindungsende (96) vorgespannt ist, wobei der Belüftungspfad (102) durch Gasdruck, der die Ventilstange gegen die Feder drückt, selektiv geöffnet werden kann.

7. Gewebedichtungsmittel-Sprühapplikator nach einem der vorhergehenden Ansprüche, bei dem die Belüftungsventilbaugruppe (90) ferner ein Verriegelungselement (106) umfasst, das selektiv an einem Äußeren des Belüftungsauslasses (104) der Trokarbaugruppe (14) angebracht werden kann.

8. Gewebedichtungsmittel-Sprühapplikator nach Anspruch 7, bei dem das Verriegelungselement (106) ein Gewinde aufweist.

9. Gewebedichtungsmittel-Sprühapplikator nach einem der vorhergehenden Ansprüche, bei dem der Sprühauslass (68) an dem distalen Ende der länglichen Abgaberöhre (64) bezogen auf eine Hauptachse der länglichen Abgaberöhre gewinkelt ist.

10. Gewebedichtungsmittel-Sprühapplikator nach Anspruch 9, bei dem der Winkel in einem Bereich von 30° bis 45° liegt.

Revendications

1. Applicateur de pulvérisation d'agent de scellement de tissu (12) destiné à appliquer un fluide à plusieurs composants dans une cavité corporelle à travers un ensemble formant trocart (14) s'étendant dans la cavité corporelle, l'ensemble formant trocart (14) comportant un tube formant trocart (66) destiné à introduire un tube d'administration allongé (64) dans la cavité corporelle, une sortie de mise à l'air (104) et formant une voie de passage de mise à l'air afin de placer la sortie de mise à l'air en communication fluidique avec la cavité corporelle, ledit applicateur de pulvérisation d'agent de scellement de tissu comprenant :

un ensemble formant fût (18) contenant le fluide à plusieurs composants, l'ensemble formant fût comportant une chambre distincte (20, 22) pour chacun des composants et un piston (24, 26) positionné de manière à pouvoir se déplacer sur une extrémité proximale de l'ensemble formant fût,
un élément d'adaptation de pulvérisation (56) comportant :

un raccord d'entrée de gaz (58) ;
une pluralité d'entrées de fluide (52, 54), au moins l'une des entrées de fluide étant en communication fluidique correspondante avec l'une des chambres ; et
une sortie d'élément d'adaptation (62) en communication fluidique avec le raccord d'entrée de gaz et la pluralité d'entrées de fluide ;

un tube d'administration allongé (64) présentant une extrémité proximale raccordée à la sortie d'élément d'adaptation de l'élément d'adaptation, une zone d'extrémité distale opposée, formant une sortie de pulvérisation (68) en communication fluidique avec le raccord d'entrée de gaz et la pluralité d'entrées de fluide, le tube d'administration allongé pouvant être reçu dans le tube formant trocart de l'ensemble formant trocart, et étant dimensionné de manière à s'étendre à travers le tube formant trocart, la zone d'extrémité distale du tube d'administration allongé étant exposée et le tube d'administration

allongé pouvant tourner par rapport au tube formant trocart ;
un tube de gaz principal (94) en communication fluidique avec le raccord d'entrée de gaz ;
un tube d'alimentation de gaz (92) en communication fluidique avec le tube de gaz principal ;
un ensemble de vanne de mise à l'air (90) comportant une extrémité de raccordement de gaz (96) fixée sur le tube d'alimentation de gaz, un conduit de vanne (114) en communication fluidique avec l'extrémité de raccordement de gaz, une extrémité formant raccord de trajet de mise à l'air (120) configurée de manière à fixer la sortie de mise à l'air (104) de l'ensemble formant trocart et un trajet de mise à l'air (102) en communication fluidique avec l'extrémité formant raccord de trajet de mise à l'air, l'ensemble de vanne de mise à l'air comportant aussi une tige de vanne mobile préchargée (98) située de manière à pouvoir coulisser à l'intérieur du conduit de vanne et étant configuré de manière à assurer une étanchéité à l'intérieur du trajet de mise à l'air, la tige de vanne pouvant être commandée par une pression de gaz à l'intérieur du conduit de vanne de manière à coulisser contre la précharge et à assurer une ouverture sélective permettant d'assurer le passage du gaz à partir du trajet de mise à l'air vers l'atmosphère ; et
une ouverture de mise à l'air (122), dans lequel l'ouverture de mise à l'air est en communication fluidique avec le trajet de mise à l'air lors de ladite ouverture sélective de la tige de vanne.

2. Applicateur de pulvérisation d'agent de scellement de tissu selon la revendication 1, dans lequel le tube d'administration allongé (64) comporte une voie de passage de gaz (78) en communication fluidique avec la sortie d'élément d'adaptation (62) de l'élément d'adaptation de pulvérisation (56).

3. Applicateur de pulvérisation d'agent de scellement de tissu selon la revendication 2, dans lequel la voie de passage de gaz (78) du tube d'administration allongé (64) entoure des voies de passage séparées (70, 72) pour les composants de l'agent de scellement de tissu.

4. Applicateur de pulvérisation d'agent de scellement de tissu selon la revendication 3, dans lequel la voie de passage de gaz (78) et les voies de passages séparées (70, 72) pour les composants de l'agent de scellement de tissu s'achèvent à une extrémité distale du tube d'administration allongé (64) au niveau d'un élément annulaire (74) présentant une pluralité de dents (76) s'étendant radialement vers l'intérieur à partir d'un diamètre interne de l'élément annulaire, les dents s'étendant à travers une extrémité de sortie de la voie de passage de gaz et autour d'une paroi externe (82) des voies de passage séparées, de telle sorte que la paroi externe des voies de passage séparées, les dents, et le diamètre interne de l'élément annulaire définissent une pluralité d'ouvertures (80) sur l'extrémité distale du tube d'administration allongé.

5. Applicateur de pulvérisation d'agent de scellement de tissu selon la revendication 4, dans lequel l'extrémité distale du tube d'administration allongé (64) est arrondie, et l'élément annulaire (74) est excentré sur l'extrémité distale arrondie.

6. Applicateur de pulvérisation d'agent de scellement de tissu selon l'une quelconque des revendications précédentes, dans lequel la tige de vanne (98) est appliquée par un ressort (100) dans une direction orientée vers l'extrémité de raccordement de gaz (96), le trajet de mise à l'air (102) pouvant être ouvert de manière sélective par une pression de gaz appliquant la tige de vanne contre le ressort.

7. Applicateur de pulvérisation d'agent de scellement de tissu selon l'une quelconque des revendications précédentes, dans lequel l'ensemble de vanne de mise à l'air (90) comprend en outre un élément de verrouillage (106) pouvant être fixé de manière sélective sur une partie extérieure de la sortie de mise à l'air (104) de l'ensemble formant trocart (14).

8. Applicateur de pulvérisation d'agent de scellement de tissu selon la revendication 7, dans lequel l'élément de verrouillage (106) est fileté.

9. Applicateur de pulvérisation d'agent de scellement de tissu selon l'une quelconque des revendications précédentes, dans lequel la sortie de pulvérisation (68) au niveau de l'extrémité distale du tube d'administration allongé (64) est inclinée par rapport à l'axe principal du tube d'administration allongé.

10. Applicateur de pulvérisation d'agent de scellement de tissu selon la revendication 9, dans lequel l'angle est compris dans une plage de 30° à 45°.

Fig. 1

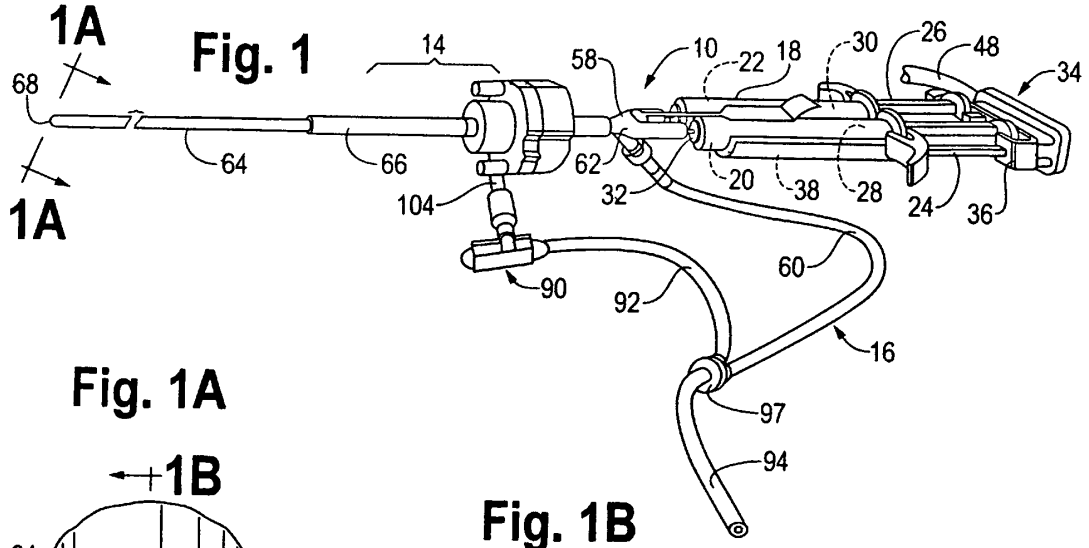


Fig. 1A

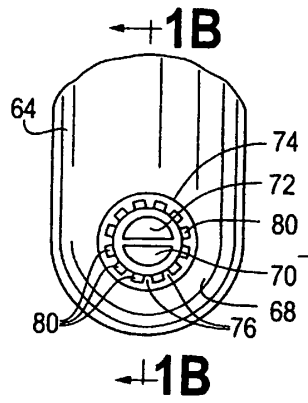


Fig. 1B

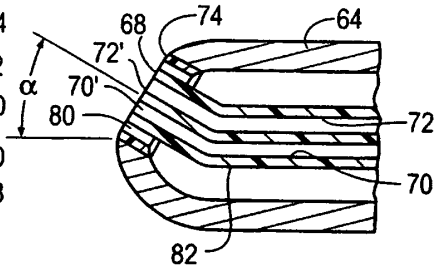


Fig. 2

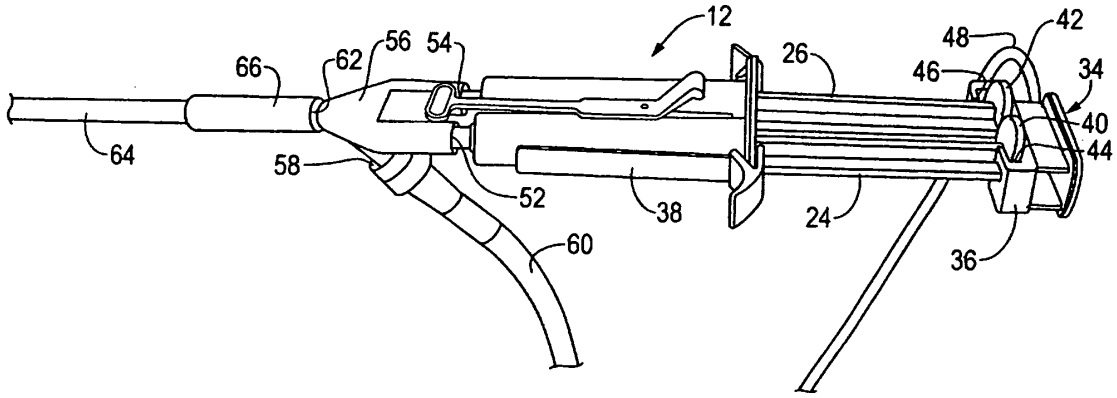


Fig. 3

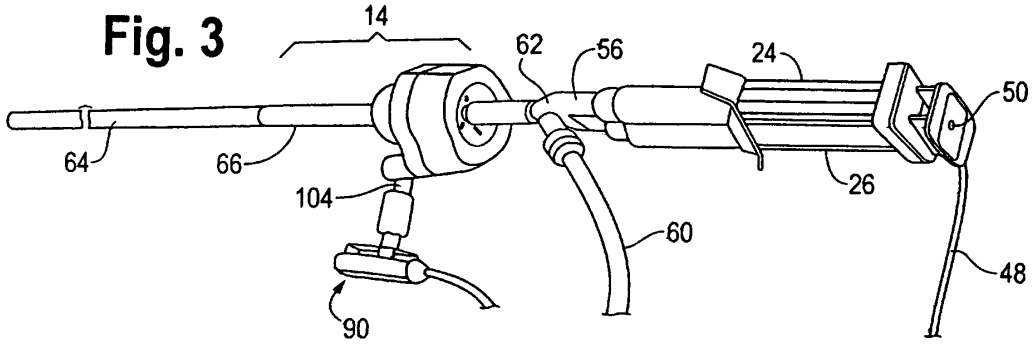


Fig. 4

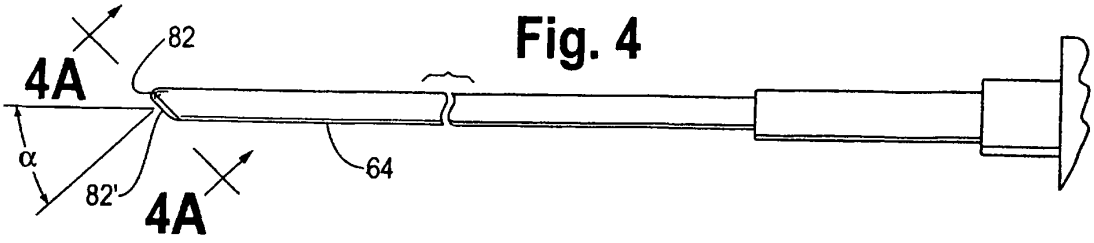


Fig. 4A

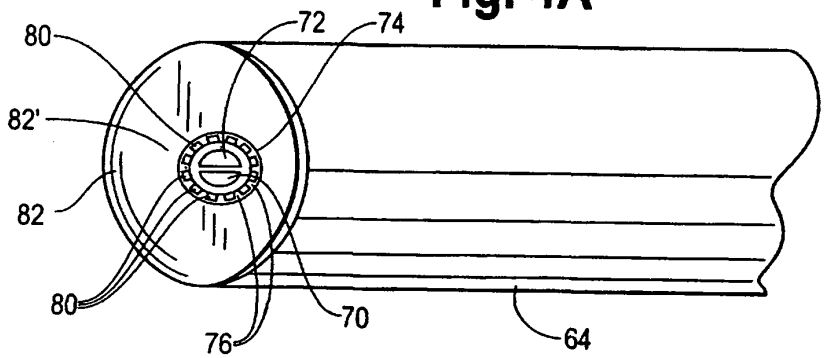


Fig. 5

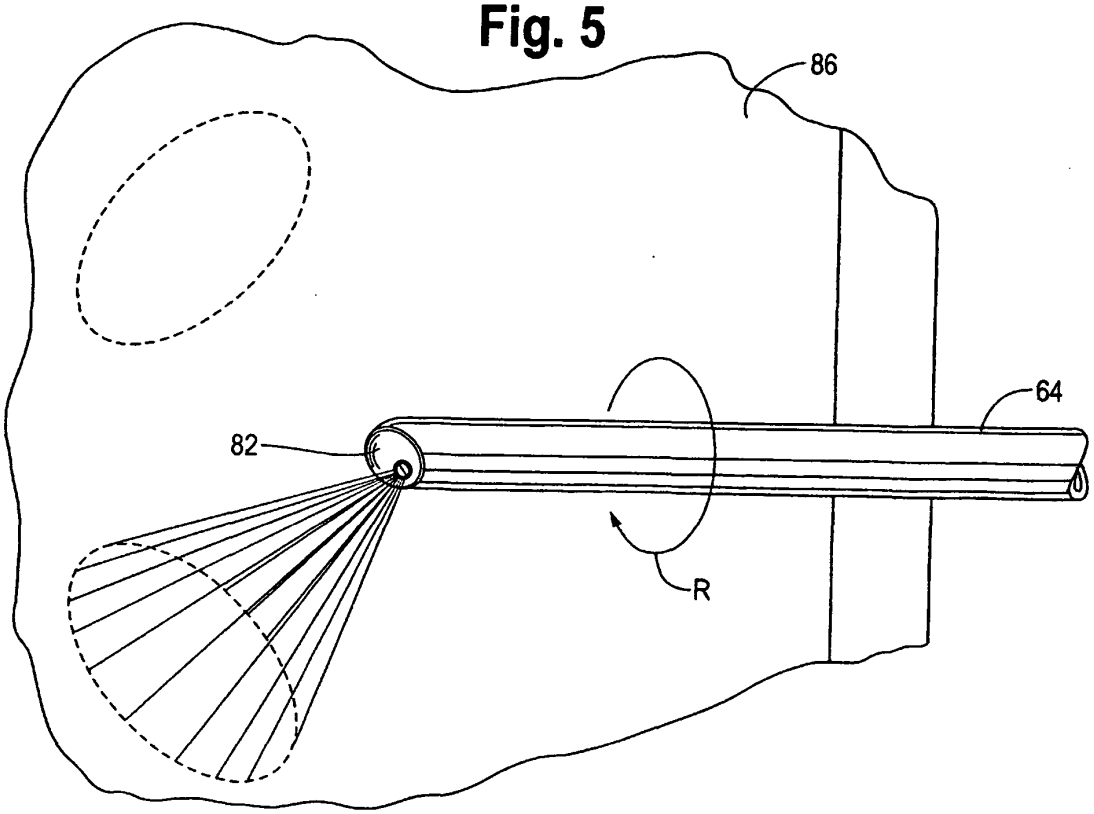


Fig. 6

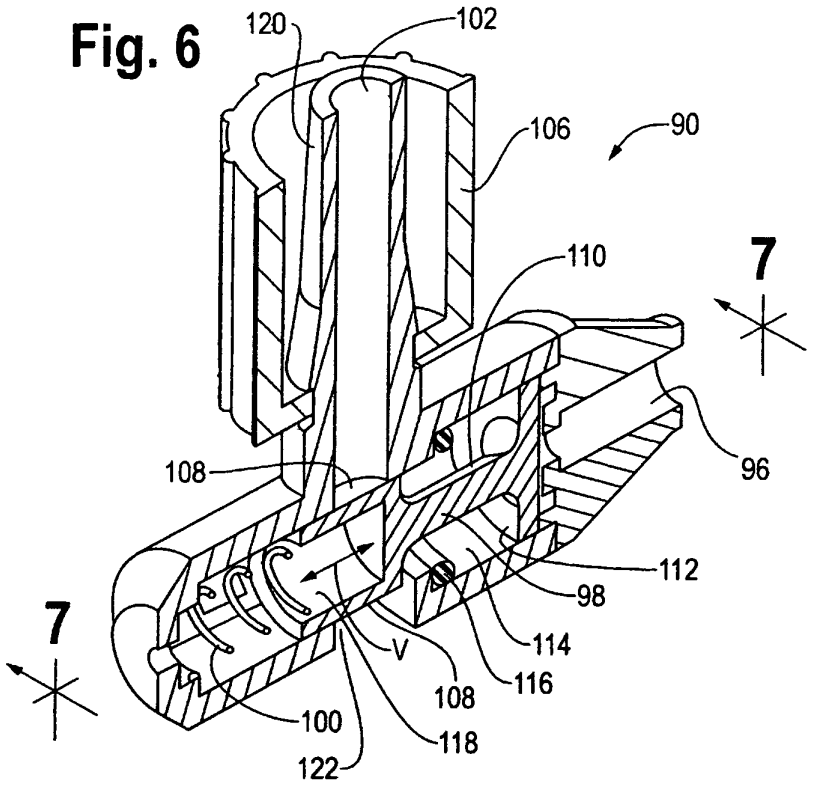
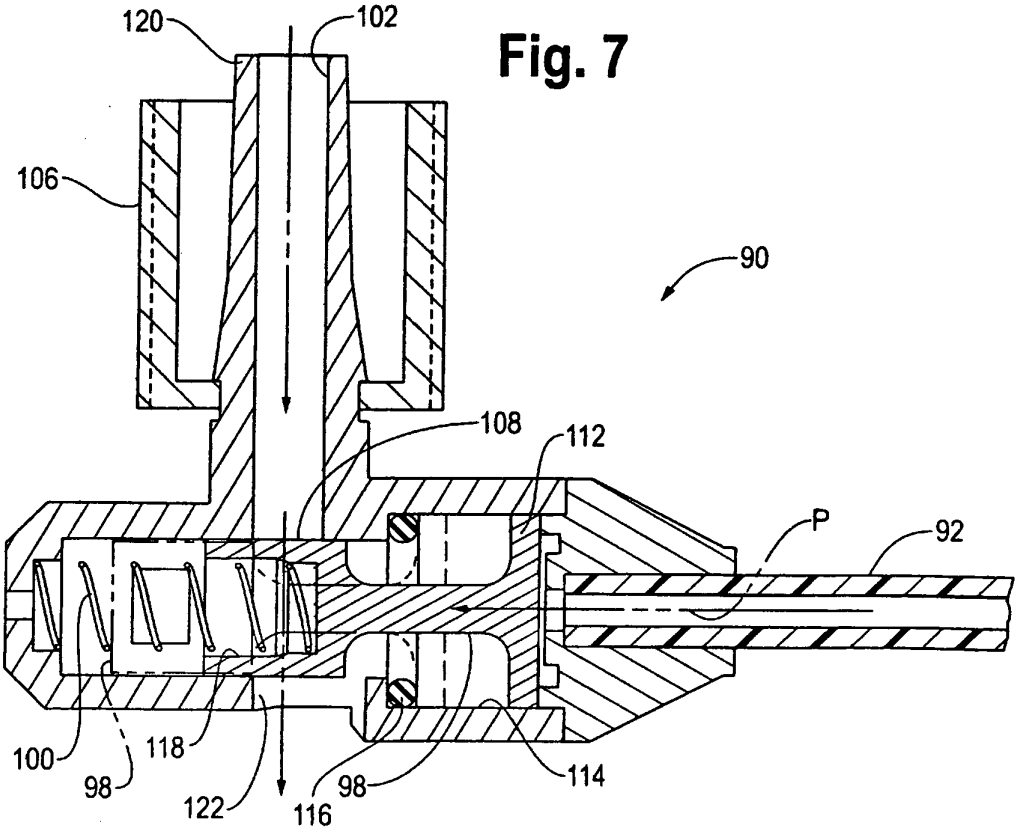

120
102
106
90
110
7
96
108
112
98
7
V
114
116
108
100
118
122

Fig. 7


120
102
106
90
108
112
P
92
100
98
118
122
116
98
114

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 7537174 B **[0002] [0003] [0017]**
- US 20040059283 A **[0004]**
- US 5810885 A **[0005]**
- WO 0009199 A **[0005]**
- WO 2006076427 A **[0005]**
- JP 5168714 B **[0005]**
- EP 2000215 A **[0006]**

专利名称(译)	组织密封系统		
公开(公告)号	EP2391276B1	公开(公告)日	2015-03-04
申请号	EP2009805983	申请日	2009-12-30
[标]申请(专利权)人(译)	巴克斯特国际公司 巴克斯特医疗保健股份有限公司		
申请(专利权)人(译)	百特国际有限公司. 百特医疗用品SA		
当前申请(专利权)人(译)	百特国际有限公司. 百特医疗用品SA		
[标]发明人	KHAKPOUR ZAFAR FORTELNY RENE REDL HEINZ		
发明人	KHAKPOUR, ZAFAR FORTELNY, RENE REDL, HEINZ		
IPC分类号	A61B17/00		
CPC分类号	A61B17/00491 A61B17/3474 A61B2017/00495 A61B2017/00522		
代理机构(译)	POTTER CLARKSON LLP		
优先权	61/141437 2008-12-30 US		
其他公开文献	EP2391276A1		
外部链接	Espacenet		

摘要(译)

一种腹腔镜组织密封剂喷雾装置和系统，其具有与套管针组件结合的腹腔镜组织密封剂喷雾组件，该组织密封剂喷雾组件具有细长的输送管。细长输送管的远端处的喷射出口可以是圆形的或成角度的。设置在细长输送管的远端处的环构件将喷雾锥导向目标组织部位的一部分，并且可通过细长输送管的旋转将喷雾锥重新定位到目标组织部位的不同部分。套管针组件包括通气开口，该通气开口连接到通气阀构件，该通气阀构件提供通气路径，该通气路径在组织密封剂喷雾组件的操作时被动地打开，从而避免在体腔内积聚过多的压力。