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(54) **CANNULA ASSEMBLY FOR ROBOTICALLY ASSISTED PRESSURE REGULATED LAPAROSCOPIC SURGICAL PROCEDURES**

KANÜLENANORDNUNG FÜR ROBOTERGESTÜTZTE DRUCKGEREGELTE LAPAROSKOPISCHE CHIRURGISCHE VERFAHREN

ENSEMBLE DE CANULES POUR CHIRURGIES PAR LAPAROSCOPIE RÉGULÉES PAR PRESSION ASSISTÉE PAR UN ROBOT.

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(73) Proprietor: **CONMED Corporation**
Utica, NY 13502 (US)

(72) Inventors:
- **AUGELLI, Michael, J.**
Prospect, CT 06712 (US)
- **MASTRI, Dominick**
Bridgeport, CT 06606 (US)
- **BLIER, Kenneth**
Cheshire, CT 06410 (US)

(74) Representative: **Hoefer & Partner Patentanwälte mbB**
Pilgersheimer Straße 20
81543 München (DE)

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The subject invention is directed to laparoscopic surgery, and more particularly, to a cannula assembly for use during robotically assisted, pressure regulated laparoscopic surgical procedures to accommodate instruments of different size.

2. Description of Related Art

[0002] Laparoscopic or "minimally invasive" surgical techniques are becoming commonplace in the performance of procedures such as cholecystectomies, appendectomies, hernia repair and nephrectomies. Benefits of such procedures include reduced trauma to the patient, reduced opportunity for infection, and decreased recovery time. Such procedures within the abdominal (peritoneal) cavity are typically performed through a device known as a trocar or cannula, which facilitates the introduction of laparoscopic instruments into the abdominal cavity of a patient.

[0003] Additionally, such procedures commonly involve filling or "insufflating" the abdominal (peritoneal) cavity with a pressurized fluid, such as carbon dioxide, to create what is referred to as a pneumoperitoneum. The insufflation can be carried out by a surgical access device (sometimes referred to as a "cannula" or "trocar") equipped to deliver insufflation fluid, or by a separate insufflation device, such as an insufflation (veress) needle. Introduction of surgical instruments into the pneumoperitoneum without a substantial loss of insufflation gas is desirable, in order to maintain the pneumoperitoneum.

[0004] During typical laparoscopic procedures, a surgeon makes three to four small incisions, usually no larger than about twelve millimeters each, which are typically made with the surgical access devices themselves, typically using a separate inserter or obturator placed therein. Following insertion, the inserter is removed, and the trocar allows access for instruments to be inserted into the abdominal cavity. Typical trocars often provide means to insufflate the abdominal cavity, so that the surgeon has an open interior space in which to work.

[0005] The trocar must provide a means to maintain the pressure within the cavity by sealing between the trocar and the surgical instrument being used, while still allowing at least a minimum freedom of movement of the surgical instruments. Such instruments can include, for example, scissors, grasping instruments, and occluding instruments, cauterizing units, cameras, light sources and other surgical instruments. Sealing elements or mechanisms are typically provided on trocars to prevent the escape of insufflation gas. Sealing elements or mechanisms typically include a duckbill-type valve made of a relatively pliable material, to seal around an outer surface of surgical instruments passing through the trocar.

[0006] Trocars having different working dimeters are also employed during laparoscopic procedures to accommodate different sized instruments. For example, it may be appropriate to use a 12 mm cannula for a surgical stapling device, while an 8 mm trocar may be more appropriate for a grasping instrument.

[0007] It would be beneficial therefore, to provide a single trocar assembly that can be used for differently sized instruments so as to avoid having to use different sized trocars, requiring multiple separate incisions. Moreover, it would be beneficial to provide such a trocar that is uniquely designed for use in robotically assisted laparoscopic surgical procedures, which have become prevalent. Such a trocar typically includes exterior structure that can be engaged or otherwise gripped by a robotic manipulator.

[0008] WO 2014/144771 A1 shows a multi-instrument sealing mechanism including a cannula seal, a cannula cap, an instrument guide, an instrument seal, and door mechanisms in the instrument guide. The cannula seal can include a cross-slit seal. The cannula cap can capture the cannula seal between the instrument guide and the cannula. A door mechanism and instrument seal can be housed in the instrument guide.

[0009] WO 2016/100181 A1 shows an adaptor apparatus which is configured to connect a trocar seal assembly with a robotic trocar cannula and maintain pneumostasis in an insufflated body cavity of a patient.

SUMMARY OF THE INVENTION

[0010] The subject invention is directed to a new and useful cannula assembly as defined by appended independent claim 1 for use in robotically assisted, pressure regulated laparoscopic surgery. More particularly, the cannula assembly of the subject invention is adapted and configured for use in conjunction with the *da Vinci* Surgical System, which his manufactured by Intuitive Surgical, Inc., of Sunnyvale, California, which is a tool that utilizes advanced, robotic technologies to assist a surgeon in performing minimally invasive surgical procedures within the abdominal cavity of a patient.

[0011] The *da Vinci* Surgical System has a 3D high definition (3D-HD) vision system, special instruments and computer software that allow a surgeon to operate with enhanced vision, precision, dexterity and control. The 3D-HD image can be magnified up to 10 times so the surgeon has a close-up view of the area he or she is operating on. The *da Vinci* instruments have mechanical wrists that bend and rotate to mimic the movements of the human wrist - allowing the surgeon to make small, precise movements inside the patient's body. The *da Vinci* software can minimize the effects of a surgeon's hand tremors on instrument movements.

[0012] The cannula assembly includes a cannula having a proximal housing portion with an open end and an

elongated tubular portion extending distally from the proximal housing portion. The assembly further includes an adapter configured for reception within the open end of the proximal housing portion of the cannula and including a tubular body with a central passage supporting a main seal. In addition, the assembly includes an insert tube that is dimensioned and configured to extend through the central passage of the body portion of the adapter and the tubular portion of the cannula, wherein the insert tube includes a proximal head portion with a central passage supporting a duckbill seal.

[0013] The adapter includes an upper housing for supporting the main seal within the central passage of the tubular body of the adapter. A connector port extends from the upper housing of the adapter for connecting the adapter to a gas delivery tube. A toggle valve is operatively associated with the connector port for controlling the flow of gas to the adapter. In addition, a clamping collar is operatively associated with the upper housing of the adapter for releasably securing the adapter to the proximal housing portion of the cannula.

[0014] An O-ring seal surrounds the tubular body portion of the adapter below the upper housing for sealingly engaging an interior surface of the proximal housing portion of the cannula. A flat seal is supported within the central passage of the proximal head portion of the insert tube. The flat seal is positioned distal to the secondary duckbill seal. An insert cover encloses the duckbill seal and flat seal within the head portion of the insert tube.

[0015] Preferably, the central passage of the tubular body portion of the adapter is dimensioned and configured to accommodate a surgical instrument having a 12 mm outer diameter, and the central passage of the head portion of the insert tube is dimensioned and configured to accommodate a surgical instrument having an 8 mm outer diameter.

[0016] These and other features of the subject invention and the manner in which it is manufactured and employed will become more readily apparent to those having ordinary skill in the art from the following enabling description of the preferred embodiments of the subject invention taken in conjunction with the several drawings described below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] So that those skilled in the art to which the subject invention appertains will readily understand how to make and use the robotic cannula assembly of the subject invention without undue experimentation, preferred embodiments thereof will be described in detail herein below with reference to certain figures, wherein:

Fig. 1 is an illustration of a robotically assisted laparoscopic surgical procedure involving a plurality of robotic cannula devices;

Fig. 2 is a perspective view of an embodiment of the cannula assembly of the subject invention, which includes a robotic cannula portion having a 12 mm working diameter, an adapter assembly configured for reception in the housing of the robotic cannula, and an insert tube in a partially inserted positon relative to the adapter assembly which has an 8 mm working diameter, and wherein the adapter assembly has a conventional luer fitting for engaging a tube connector;

Fig. 3 is an exploded perspective view of the cannula assembly of Fig. 2, with parts separated for ease of illustration;

Fig. 4 is a perspective view of another embodiment of the cannula assembly of the subject invention, which includes a robotic cannula portion having a 12 mm working diameter, an adapter assembly configured for reception in the housing of the robotic cannula portion, and an insert tube in a partially inserted positon relative to the adapter assembly which has an 8 mm working diameter, and wherein the adapter assembly has a proprietary tube fitting with camming lugs for engaging a tube connector;

Fig. 5 is an exploded perspective view of yet another embodiment of the cannula assembly of the subject invention, which includes a robotic cannula portion having a 12 mm working diameter, an adapter assembly configured for reception in the housing of the robotic cannula portion, and an insert tube having an 8 mm working diameter, and wherein the adapter assembly has a proprietary tube fitting with camming lugs for engaging a tube connector; and

Fig. 6 is an exploded perspective view of the adapter assembly shown in Fig. 5 with parts separated for ease of illustration.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0018] Referring now to the drawings wherein like reference numerals identify similar structural features and/or elements of the subject matter disclosed herein, there is illustrated in Fig. 1 an illustration of a robotically assisted laparoscopic surgical procedure involving a plurality of access devices or cannulas 10 which provide access for surgical instrumentation 12 controlled by robotic manipulators 14. More particularly, the robotic manipulators 14 are part of a system such as the *da Vinci* Surgical System, which is manufactured by Intuitive Surgical, Inc., of Sunnyvale, California, or a similar robotic surgical system.

[0019] Referring now to Fig. 2, there is illustrated a cannula assembly constructed in accordance with a preferred embodiment of the subject invention and designated generally by reference numeral 100. Cannula assembly 100 is particularly adapted and configured for use in robotically assisted, pressure regulated laparoscopic surgery, involving, for example, the *da Vinci* Surgical System.

[0020] Cannula assembly 100 includes a robotic can-

nula portion 112 having a proximal housing portion 114 with an open end and a distally extending tubular body 116, which has a 12 mm working diameter, i.e., the tubular body portion is dimensioned and configured to accommodate a surgical instrument having a 12 mm outer diameter. The housing portion 114 includes an engagement flange 118 configured to be selectively engaged by a robotic manipulator 14, for use as shown for example in Fig. 1. Cannula assembly 100 further includes an adapter assembly 120 configured for reception in the proximal housing portion 114 of the robotic cannula portion 112, and a separable insert tube 130 which has an upper cap 132 with an access port 134 and a distally extending tubular body portion 136 having an 8 mm working diameter, i.e. the tubular body portion 136 is dimensioned and configured to accommodate a surgical instrument having an 8 mm outer diameter. The tubular body portion 136 is configured to extend through the central passage of the tubular body 144 of the adapter assembly 120 and the tubular body 116 of the robotic cannula portion 112. A mechanical seal, such as for example, a duckbill seal or the like, is associated with the access port 134 to support a secondary seal for sealed access to the tubular body portion 136 for an 8 mm surgical instrument. While it is not shown in this embodiment, this seal is shown in the embodiments illustrated in Figs. 3 and 6, e.g., seal 360.

[0021] Referring now to Fig. 3, the adapter assembly 120 is configured for reception within the open end of the proximal housing portion 114 and includes an upper housing 122 and a lower housing 124. The upper housing 122 includes a cover 126 that defines an access port 128 for receiving a 12 mm instrument as well as the tubular portion 136 of insert tube 130. The cover 126 encloses a pair of diametrically opposed latches 142a and 142b which form a clamping collar operatively associated with the upper housing 122 for releasably securing the adapter assembly 120 to the open end of the proximal housing portion 114 and which interact with corresponding diametrically opposed locking tabs 138a and 138b on the upper cap 132 of insert 130 for selectively securing the insert tube 130 to the adapter assembly 120 during use.

[0022] The upper housing 122 of the adapter assembly 120 further includes a tubular body 144 with a central passage that supports, encloses or otherwise houses a primary seal 150. In this embodiment, the primary seal assembly 150 includes a four-part double lipped duckbill seal, for example, and can include a main seal above the duckbill seal. The primary seal 150 includes an upper flange portion 152 that is dimensioned and configured to be captured and retained between the upper and lower housing 122 and 124 of the adapter assembly 120 and more particularly between the top of the tubular body 144 and the bottom of lower housing 124 which seats against the cover 126 inside the lower housing 122 as oriented in Fig. 3. The tubular body 144 supports an O-ring seal 154 that functions to seal the interface between the inner diameter of the open end of the proximal housing 114 of the robotic cannula portion 112 and the outer diameter of the tubular body 144 of the of the adapter assembly 120.

[0023] The upper housing 122 of the adapter assembly 120 also includes a valve assembly 160 that includes a rotatable toggle valve stem 162 and an inlet port 164 in the form of a luer lock connection port extending from the adapter assembly 120. Those skilled in the art will readily appreciate that any other suitable type of connection port can be used. This port is configured to connect with a gas delivery tube that could be associated with a source of insufflation gas.

[0024] Referring now to Fig. 4, there is illustrated another cannula assembly constructed in accordance with a preferred embodiment of the subject invention and designated generally by reference numeral 200. Cannula assembly 200 is substantially similar to cannula assembly 100 in that it includes a robotic cannula portion 212 having a proximal housing portion 214 and a distally extending tubular body portion 216, which has a 12 mm working diameter. The housing portion 214 includes an engagement flange 218 configured to be selectively engaged by a robotic manipulator 14, for use as shown in Fig. 1.

[0025] Cannula assembly 200 further includes an adapter assembly 220 configured for reception in the proximal housing portion 214 of the robotic cannula portion 212, and a separable insert tube 230 which has an upper cap 232 with an access port 234 and a distally extending tubular body portion 236 having an 8 mm working diameter.

[0026] Cannula assembly 200 differs from cannula assembly 100 in that the valve assembly 260 that includes an over-sized inlet port with unique proprietary configuration that includes a plurality of circumferentially spaced apart camming lugs 266 for engagement with a proprietary coupling, such as for example, the type of coupling disclosed in commonly assigned U.S. Patent Application Publication No. 2014/0171855, and its progeny.

[0027] Referring now to Figs. 5 and 6, there is illustrated another embodiment of the cannula assembly of the subject invention, which is designated generally by reference numeral 300. As illustrated, cannula assembly 300 includes a robotic cannula portion 312 having a proximal housing portion 314 and a distally extending tubular body portion 316, which has a 12 mm working diameter. The proximal housing portion 314 includes an engagement flange 318 configured to be selectively engaged by a robotic manipulator 14, for use as shown in Fig. 1.

[0028] Cannula assembly 300 further includes an adapter assembly 320 configured for reception in the proximal housing portion 314 of the robotic cannula portion 312, and a separable insert tube 330 which has an upper cover 332 with an access port 334 and a distally extending tubular body portion 336 having an 8 mm working diameter. The adapter assembly 320, which is best seen in Fig. 6, includes a 12 mm two-part single lipped duckbill seal 350 and a valve assembly 360 that includes an over-sized toggle valve 362 and inlet port 364 with a

unique proprietary configuration. The insert tube 330 also includes a secondary 8 mm duckbill seal 360 and a secondary 8 mm flat seal 363 supported within the central passage or access port 334 of the upper cup or cover 332 of the tube insert 330 for sealed access into the tubular portion 336. The flat seal 363 is positioned proximal to the duckbill seal 360. The upper cover 332 encloses the duckbill seal 360 and flat seal 363 within a proximal head portion of the insert tube 330.

[0029] While the subject invention has been shown and described with reference to preferred embodiments, those skilled in the art will readily appreciate that various changes and/or modifications may be made thereto without departing from the scope of the appended claims.

Claims

1. A cannula assembly for use in robotically assisted laparoscopic surgery, comprising:

   a) an adapter assembly (120) configured for reception within an open end of a proximal housing portion (114) of a robotic cannula (112) and including a tubular body (144) with a central passage supporting a primary seal (150); and
   b) an insert tube (130) dimensioned and configured to extend through the central passage of the tubular body (144) of the adapter assembly (120) and a tubular portion (116) of the robotic cannula portion (112), the insert tube (130) including an upper cup (132) with an access port (134) supporting a secondary seal,

   wherein the adapter assembly (120) includes an upper housing (122) for supporting the primary seal (150) within the central passage of the tubular body (144) of the adapter assembly (120),
   characterized in that
   an inlet port (164) extends from the upper housing (122) of the adapter assembly (120) for connecting the adapter assembly (120) to a gas delivery tube.

2. The cannula assembly of Claim 1, wherein a toggle valve (162) is operatively associated with the inlet port (164) for controlling the flow of gas to the adapter assembly (120).

3. The cannula assembly of Claim 1, further comprising a clamping collar (142a, 142b) operatively associated with the upper housing (122) of the adapter assembly (120) for releasably securing the adapter assembly (120) to a proximal housing portion (114) of the robotic cannula (112).

4. The cannula assembly of Claim 1, further comprising an O-ring seal (154) surrounding the tubular body portion (144) of the adapter assembly (120) below the upper housing (122) for sealingly engaging an interior surface of a proximal housing portion (114) of the robotic cannula (112).

5. The cannula assembly of Claim 1, wherein a flat seal (363) is supported within a central passage (334) of the upper cup (332) of the insert tube (330).

6. The cannula assembly of Claim 5, wherein the flat seal (363) is positioned proximal to the secondary seal (360).

7. The cannula assembly of Claim 5, further comprising an upper cover (332) for enclosing the secondary seal and flat seal (363) within a proximal head portion of the insert tube (330).

8. The cannula assembly of Claim 1, wherein the central passage of the tubular body portion (144) of the adapter assembly (320) is dimensioned and configured to accommodate a surgical instrument (12) having a 12 mm outer diameter, and the access port (334) of the upper cup (332) of the insert tube (330) is dimensioned and configured to accommodate a surgical instrument (12) having an 8 mm outer diameter.

9. The cannula assembly of Claim 1, further comprising a robotic cannula portion (312) having a proximal housing portion (314) with an open end and an elongated tubular portion (316) extending distally from the proximal housing portion (314).

Patentansprüche

1. Kanülenanordnung zur Verwendung in der robotergestützten laparoskopischen Chirurgie, umfassend:

   a) eine Adapteranordnung (120), die zur Aufnahme in einem offenen Ende eines proximalen Gehäuseabschnitts (114) einer Roboterkanüle (112) eingerichtet ist und einen rohrförmigen Körper (144) mit einem zentralen Durchgang umfasst, der eine primäre Dichtung (150) abstützt; und
   b) ein Einsatzrohr (130), das dimensioniert und eingerichtet ist, um sich durch den zentralen Durchgang des rohrförmigen Körpers (144) der Adapteranordnung (120) und einen rohrförmigen Abschnitt (116) des Roboterkanülenabschnitts (112) zu erstrecken, wobei das Einsatzrohr (130) eine obere Schale (132) mit einer Zugangsöffnung (134) umfasst, die eine sekundäre Dichtung abstützt,

   wobei die Adapteranordnung (120) ein oberes Gehäuse (122) zum Abstützen der primären Dichtung

(150) im zentralen Durchgang des rohrförmigen Körpers (144) der Adapteranordnung (120) umfasst,
dadurch gekennzeichnet, dass
sich eine Einlassöffnung (164) vom oberen Gehäuse (122) des Adapters (120) zum Verbinden der Adapteranordnung (120) zu einem Gaszufuhrrohr erstreckt.

2. Kanülenanordnung nach Anspruch 1, wobei ein Umschaltventil (162) mit der Einlassöffnung (164) wirkverbunden ist, um den Gasfluss zur Adapteranordnung (120) zu steuern.

3. Kanülenanordnung nach Anspruch 1, die ferner eine Klemmschelle (142a, 142b) aufweist, die mit dem oberen Gehäuse (122) der Adapteranordnung (120) zum lösbaren Befestigen der Adapteranordnung (120) an einem proximalen Gehäuseabschnitt (114) der Roboterkanüle (112) wirkverbunden ist.

4. Kanülenanordnung nach Anspruch 1, die ferner eine O-Ring-Dichtung (154) aufweist, die den rohrförmigen Körperabschnitt (144) der Adapteranordnung (120) unterhalb des oberen Gehäuses (122) umgibt, um abdichtend mit einer Innenfläche eines proximalen Gehäuseabschnitts (114) der Roboterkanüle (112) in Eingriff zu stehen.

5. Kanülenanordnung nach Anspruch 1, wobei eine flache Dichtung (363) in einem zentralen Durchgang (334) der oberen Schale (332) des Einsatzrohrs (330) abgestützt wird.

6. Kanülenanordnung nach Anspruch 5, wobei die flache Dichtung (363) proximal zur sekundären Dichtung (360) positioniert ist.

7. Kanülenanordnung nach Anspruch 5, die ferner eine obere Abdeckung (332) zum Umschließen der sekundären Dichtung und der flachen Dichtung (363) in einem proximalen Kopfabschnitt des Einsatzrohrs (330) aufweist.

8. Kanülenanordnung nach Anspruch 1, wobei der zentrale Durchgang des rohrförmigen Körperabschnitts (144) der Adapteranordnung (320) dimensioniert und eingerichtet ist, um ein chirurgisches Instrument (12) mit einem Außendurchmesser von 12 mm aufzunehmen, und die Zugangsöffnung (334) der oberen Schale (332) des Einsatzrohrs (330) dimensioniert und eingerichtet ist, um ein chirurgisches Instrument (12) mit einem Außendurchmesser von 8 mm aufzunehmen.

9. Kanülenanordnung nach Anspruch 1, die ferner einen Roboterkanülenabschnitt (312) mit einem proximalen Gehäuseabschnitt (314) mit einem offenen Ende und einem länglichen rohrförmigen Abschnitt (316) aufweist, der sich distal vom proximalen Gehäuseabschnitt (314) erstreckt.

Revendications

1. Ensemble canule pour une utilisation en chirurgie laparoscopique assistée par robot, comprenant :

a) un ensemble adaptateur (120) configuré pour être reçu dans une extrémité ouverte d'une partie de boîtier proximal (114) d'une canule robotique (112) et comportant un corps tubulaire (144) avec un passage central supportant un joint d'étanchéité primaire (150) ; et
b) un tube d'insertion (130) dimensionné et configuré pour s'étendre à travers le passage central du corps tubulaire (144) de l'ensemble adaptateur (120) et une partie tubulaire (116) de la partie de canule robotique (112), le tube d'insertion (130) comportant une coupelle supérieure (132) avec un orifice d'accès (134) supportant un joint d'étanchéité secondaire,

dans lequel l'ensemble adaptateur (120) comporte un boîtier supérieur (122) pour supporter le joint d'étanchéité primaire (150) dans le passage central du corps tubulaire (144) de l'ensemble adaptateur (120),
caractérisé en ce que
un orifice d'entrée (164) s'étend à partir du boîtier supérieur (122) de l'ensemble adaptateur (120) pour relier l'ensemble adaptateur (120) à un tube de distribution de gaz.

2. Ensemble canule de la revendication 1, dans lequel une soupape à bascule (162) est associée de manière fonctionnelle à l'orifice d'entrée (164) pour réguler le flux de gaz vers l'ensemble adaptateur (120).

3. Ensemble canule de la revendication 1, comprenant en outre un collier de serrage (142a, 142b) associé de manière fonctionnelle au boîtier supérieur (122) de l'ensemble adaptateur (120) pour fixer de manière amovible l'ensemble adaptateur (120) à une partie de boîtier proximal (114) de la canule robotique (112).

4. Ensemble canule de la revendication 1, comprenant en outre un joint torique (154) entourant la partie de corps tubulaire (144) de l'ensemble adaptateur (120) en-dessous du boîtier supérieur (122) pour s'engager de manière étanche avec une surface interne d'une partie de boîtier proximal (114) de la canule robotique (112).

5. Ensemble canule de la revendication 1, dans lequel un joint d'étanchéité plat (363) est supporté dans un

passage central (334) de la coupelle supérieure (332) du tube d'insertion (330).

6. Ensemble canule de la revendication 5, dans lequel le joint d'étanchéité plat (363) est positionné à proximité du joint d'étanchéité secondaire (360).

7. Ensemble canule de la revendication 5, comprenant en outre un couvercle supérieur (332) pour enfermer le joint d'étanchéité secondaire et le joint d'étanchéité plat (363) dans une partie de tête proximale du tube d'insertion (330).

8. Ensemble canule de la revendication 1, dans lequel le passage central de la partie de corps tubulaire (144) de l'ensemble adaptateur (320) est dimensionné et configuré pour recevoir un instrument chirurgical (12) ayant un diamètre externe de 12 mm, et l'orifice d'accès (334) de la coupelle supérieure (332) du tube d'insertion (330) est dimensionné et configuré pour recevoir un instrument chirurgical (12) ayant un diamètre externe de 8 mm.

9. Ensemble canule de la revendication 1, comprenant en outre une partie de canule robotique (312) ayant une partie de boîtier proximal (314) avec une extrémité ouverte et une partie tubulaire allongée (316) s'étendant de manière distale à partir de la partie de boîtier proximal (314).

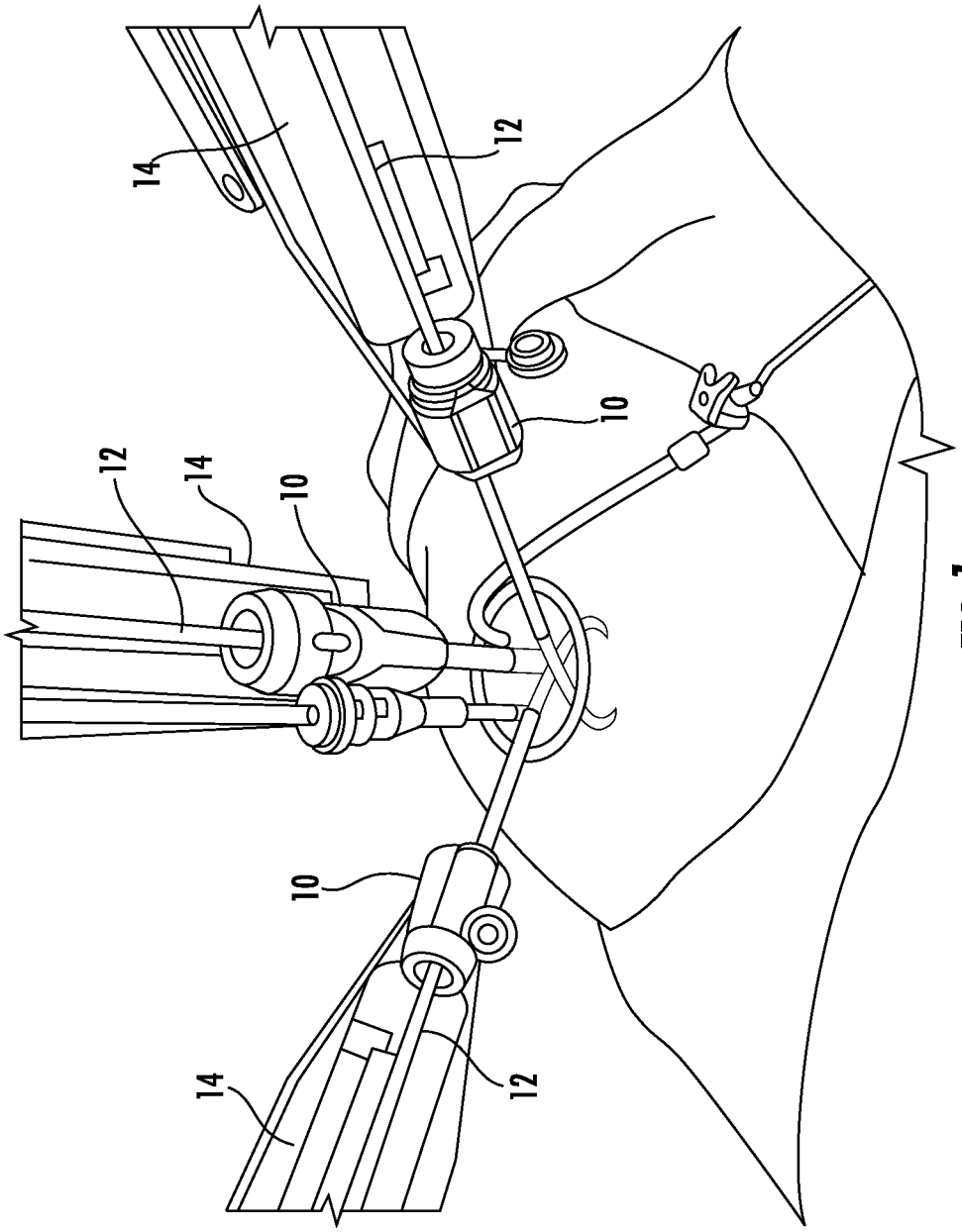

FIG. 1

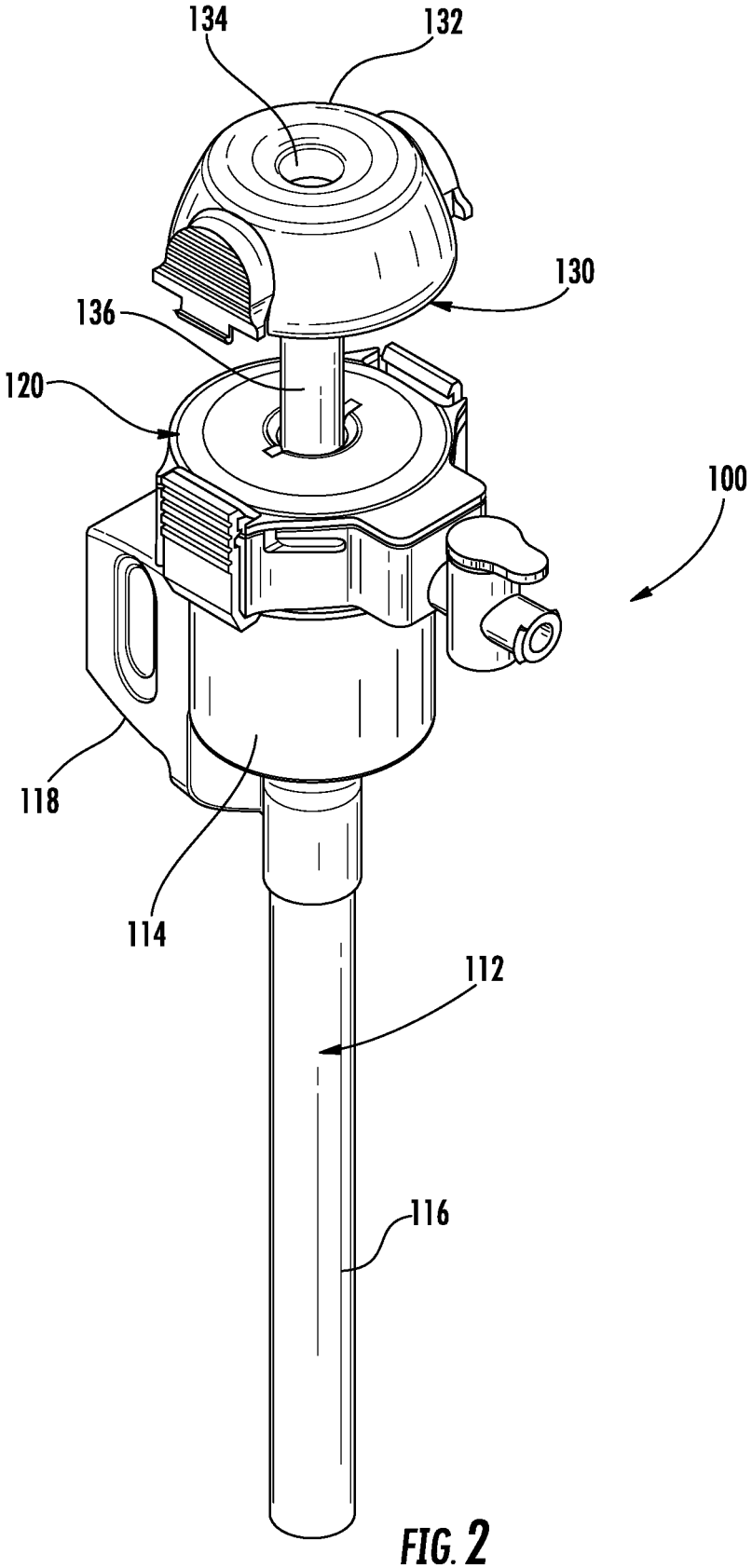

FIG. 2

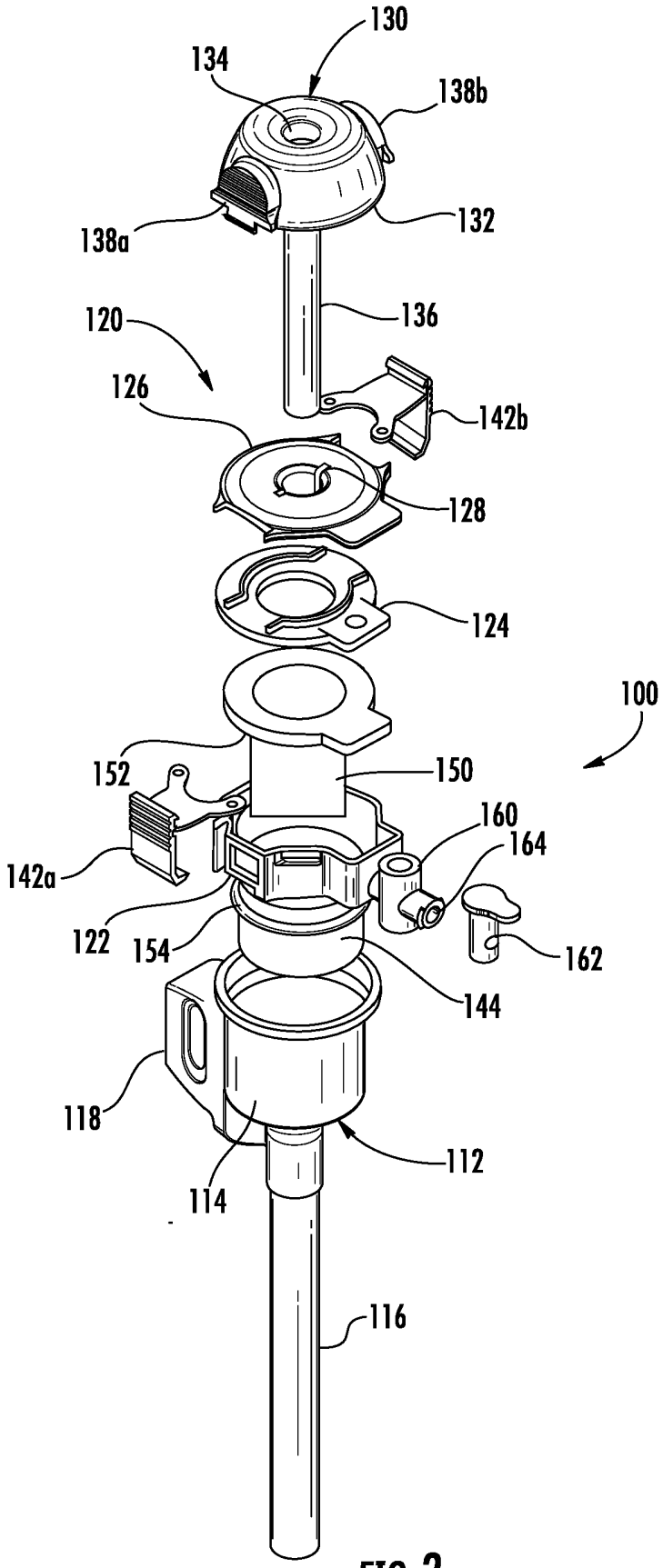
130
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FIG. 3

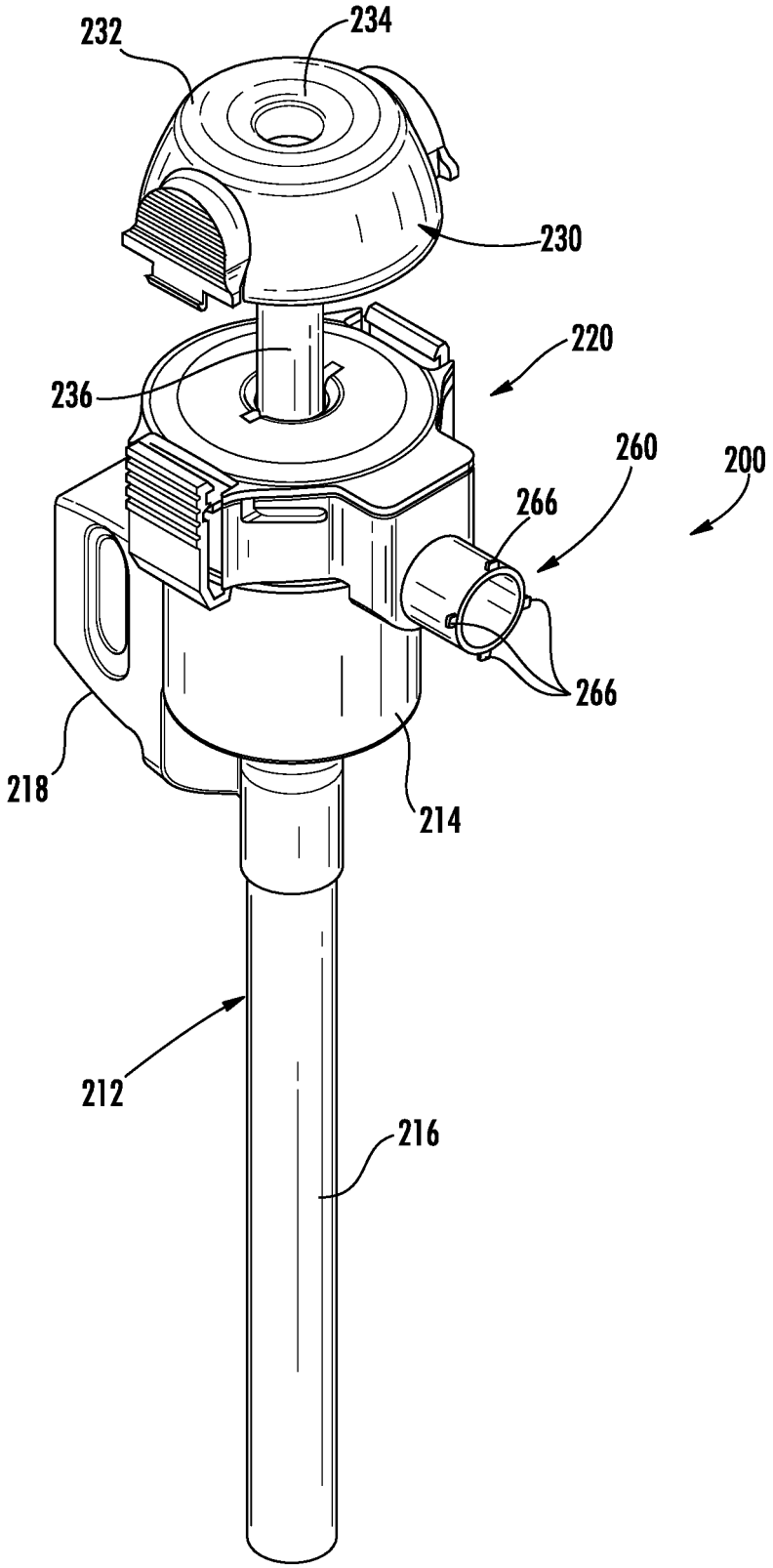

FIG. 4

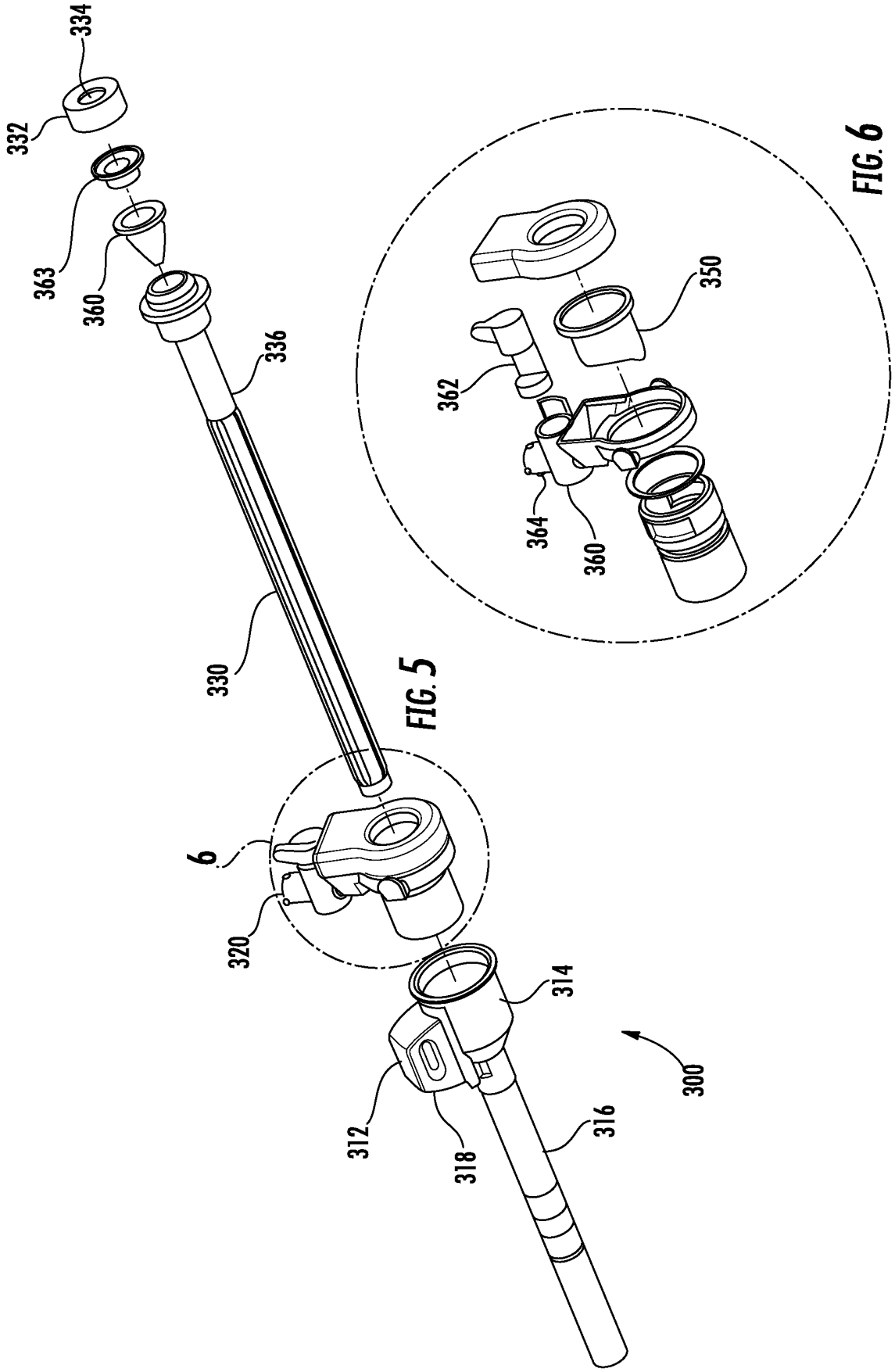

FIG. 5

FIG. 6

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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- WO 2016100181 A1 **[0009]**
- US 20140171855 **[0026]**

专利名称(译)	用于机器人辅助压力的套管组件调节腹腔镜手术程序		
公开(公告)号	EP3481313A1	公开(公告)日	2019-05-15
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[标]申请(专利权)人(译)	康曼德公司		
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当前申请(专利权)人(译)	CONMED CORPORATION		
[标]发明人	AUGELLI MICHAEL J MASTRI DOMINICK BLIER KENNETH		
发明人	AUGELLI, MICHAEL, J. MASTRI, DOMINICK BLIER, KENNETH		
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摘要(译)

公开了一种用于机器人外科手术的插管组件，其包括机器人插管，该机器人插管具有带有开口端的壳体和从壳体向远侧延伸的管状部分，该管状部分的尺寸适于容纳直径为12mm的外科器械的通过。 适配器组件，其构造成接合在套管壳体的开口端内，并且包括：管状主体，其具有支撑主密封件的通道，该主密封件的尺寸适于容纳直径为12 mm的外科器械的通道；以及插入管，尺寸设计成可延伸穿过该通道。 在适配器组件的主体部分和机器人套管的管状部分中，插入管包括头部，头部具有通道，该通道支撑辅助密封件，该辅助密封件的尺寸适于容纳直径为8 mm的手术器械。