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(54) **SEAL ANCHOR WITH NON-PARALLEL LUMENS**

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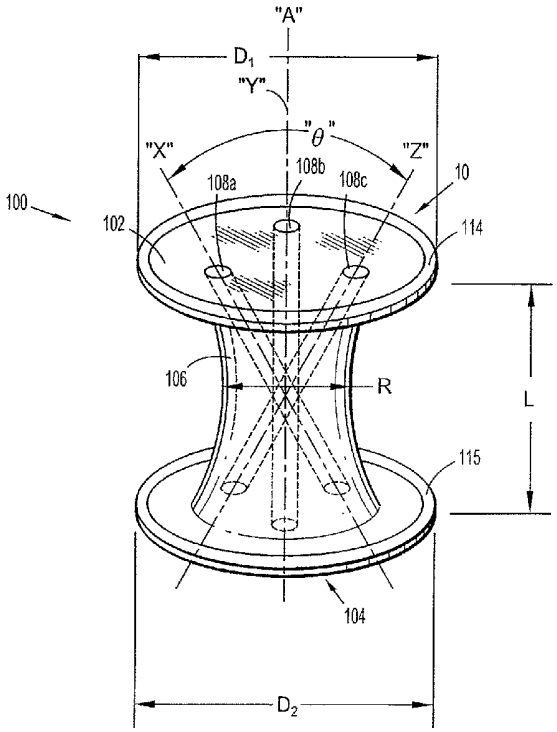
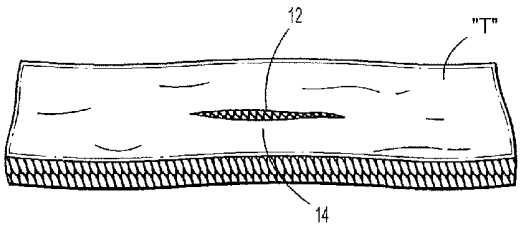
(57) **ABSTRACT**

A seal anchor member defines a housing defining a longitudinal axis, the housing having leading and trailing ends, and including a plurality of lumens extending between the leading and trailing ends, each lumen being adapted for substantially sealed reception of an object therein and defining a longitudinal axis, wherein at least two of the lumens define longitudinal axes that are non-parallel to facilitate angled, at-rest placement of multiple instruments within the seal anchor member.





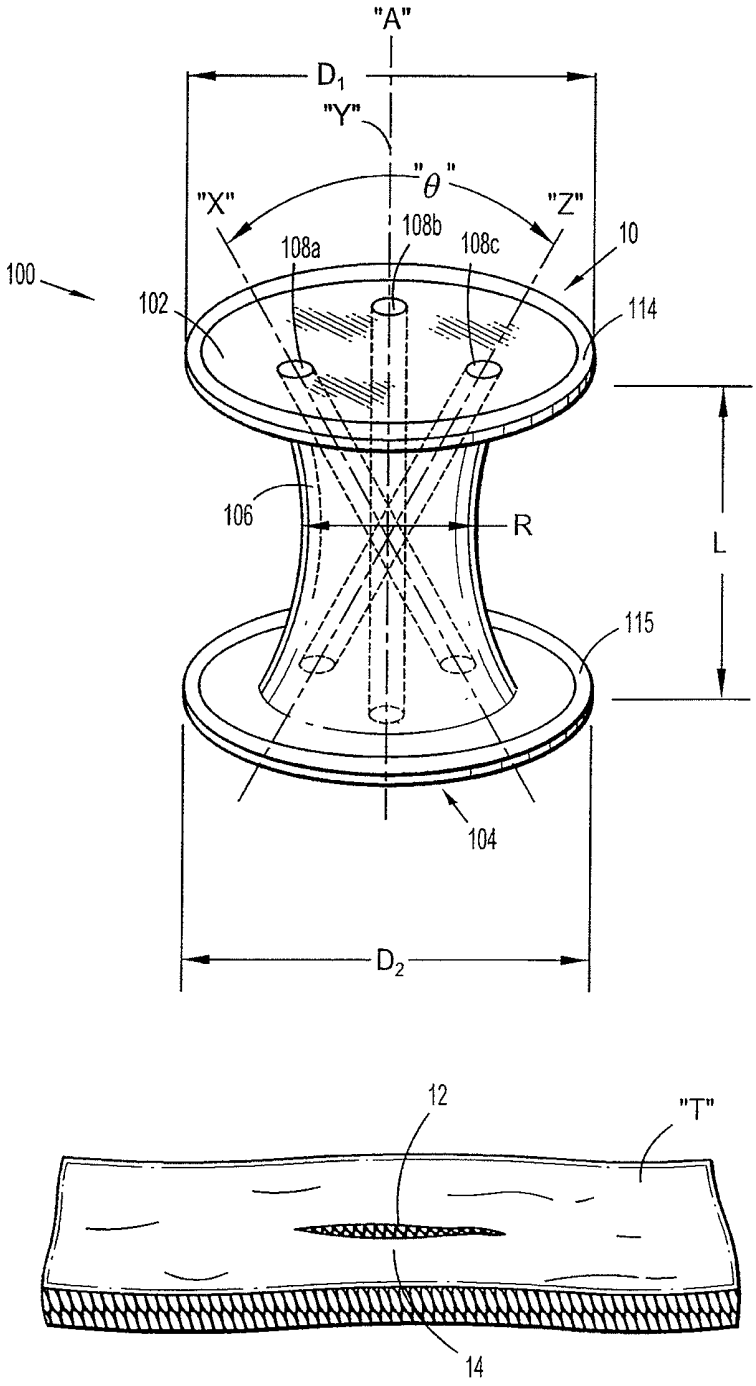


FIG. 1

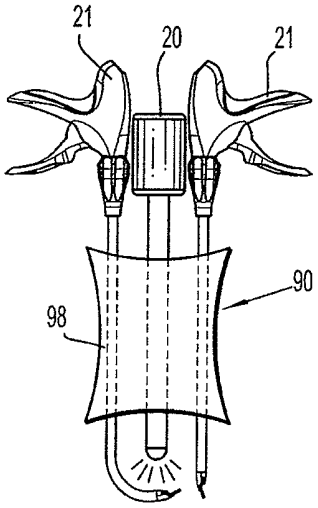


FIG. 2A

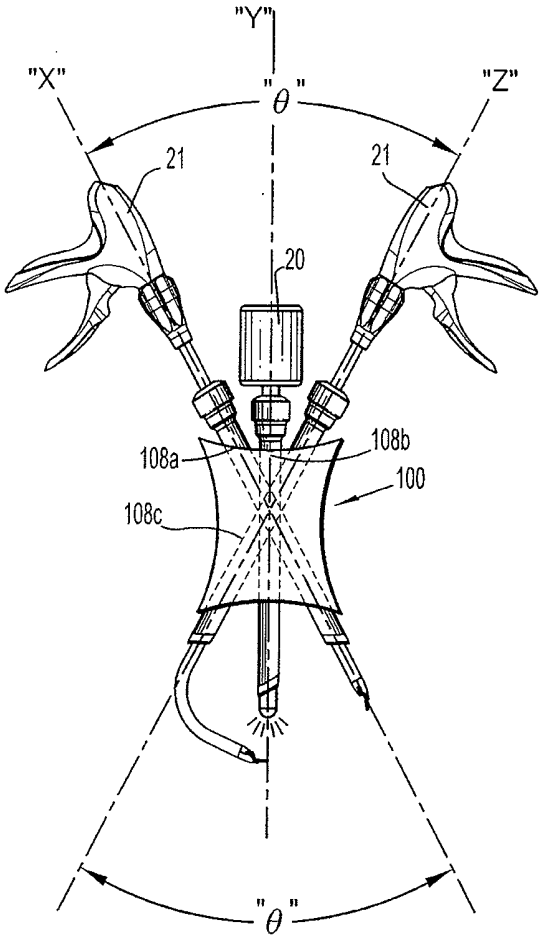


FIG. 2B

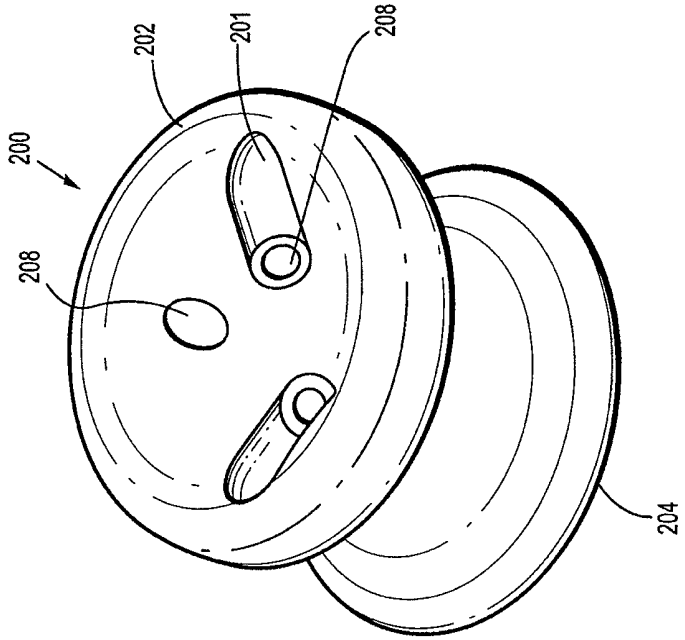


FIG. 3

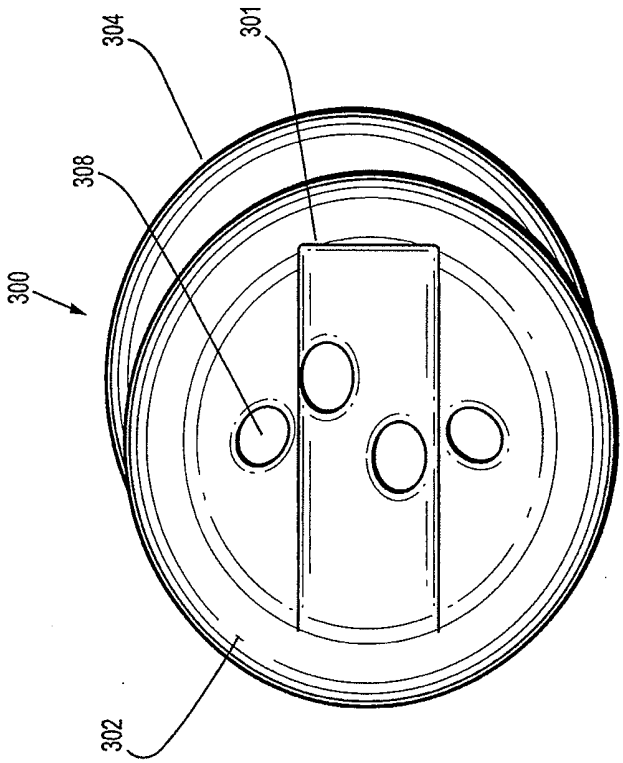


FIG. 4

SEAL ANCHOR WITH NON-PARALLEL LUMENS

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to, and benefit of, U.S. Provisional Application Ser. No. 61/247,654, filed Oct. 1, 2009, the disclosure of which is hereby incorporated by reference in its entirety.

BACKGROUND

[0002] 1. Technical Field

[0003] The present disclosure relates to a seal for use in a surgical procedure. More particularly, the present disclosure relates to a seal anchor member adapted for insertion into an incision in tissue and including a plurality of non-parallel lumens adapted for the sealed reception of one or more surgical objects such that a substantially fluid-tight seal is formed with both the tissue and the surgical object or objects.

[0004] 2. Background of the Related Art

[0005] Today, many surgical procedures are performed through small incisions in the skin, as compared to the larger incisions typically required in traditional procedures, in an effort to reduce both trauma to the patient and recovery time. Generally, such procedures are referred to as "endoscopic", unless performed on the patient's abdomen, in which case the procedure is referred to as "laparoscopic". Throughout the present disclosure, the term "minimally invasive" should be understood to encompass both endoscopic and laparoscopic procedures.

[0006] During a typical minimally invasive procedure, surgical objects, such as surgical access devices (e.g., trocar and cannula assemblies) or endoscopes, are inserted into the patient's body through an incision in tissue. In general, prior to the introduction of the surgical object or instrument into the patient's body, insufflation gasses are used to enlarge the area surrounding the target surgical site to create a larger, more accessible work area. Accordingly, the maintenance of a substantially fluid-tight seal is desirable so as to prevent the escape of the insufflation gases and the deflation or collapse of the enlarged surgical site.

[0007] To this end, various valves and seals are used during the course of minimally invasive procedures and are widely known in the art. Various seals have been developed including lumens for the reception of surgical instruments. Depending upon the needs of a particular surgical procedure, instruments may need to be angled with respect to one another for extended periods of time. Holding the instruments at angles with respect to one another and/or overcoming the internal biases of the seal anchor member through which the instruments are inserted may fatigue the surgeon and/or breach the fluid-tight barrier between the seal anchor member and surrounding tissue.

[0008] Accordingly, a continuing need exists for new seal anchor members that can be inserted directly into the incision in tissue and that can accommodate a variety of surgical objects or instruments while maintaining the integrity of an insufflated workspace.

SUMMARY

[0009] Disclosed herein is a seal anchor member including a housing including leading and trailing ends, and one or more lumens extending therethrough. Each of the lumens is adapted for receiving a surgical instrument in a substantially sealed reception. The one or more lumens are angled with respect to a longitudinal axis of the housing. At least two of the lumens define axes that are non-parallel with respect to one another. In an embodiment, the housing may include a plurality of lumens, e.g., three lumens, in which one of the lumens is parallel with respect to the longitudinal axis and the other two lumens are non-parallel with respect to each other and the longitudinal axis. As described herein, the lumens, while defining axes that are intersecting, do not cross each other since the lumens are laterally spaced apart, e.g., the axes, not the lumens, are intersecting when the housing is viewed in a side cross-sectional view. This arrangement of the lumens facilitates the simultaneous, non-parallel placement of multiple surgical objects or instruments within the seal anchor member. However, in other embodiments, the lumens may be intersecting.

[0010] Furthermore, the lumens may define openings at the leading end that are radially spaced apart about the trailing end. Alternatively, the lumens may define openings at the leading end that are spaced along a diameter of the trailing end. The openings defined by the lumens may be staggered about an axis of the trailing end or may be positioned along a diameter but offset from that diameter. Alternatively, the openings defined by the lumens may be positioned on a chord or a diameter of the trailing end.

[0011] The housing may be formed from a compressible material to facilitate adjusting the angles between instruments inserted within the lumens and with respect to the longitudinal axis of the housing. In the absence of a force, e.g, a radial force, upon the instruments inserted within the lumens, the lumens are angled, i.e., non-parallel, with respect to each other. During use, the angles of the lumens are adjustable by applying a force.

[0012] The leading end may include a groove, cut-out, or recess that is positioned adjacent to the proximal end of at least one of the lumens. The groove is configured and adapted to facilitate the insertion of the instrument into the lumen by stabilizing the instrument and leading the instrument into the lumen. The groove may be generally arcuate. The groove may narrow from the proximal end to the distal end of the groove. The groove may extend radially outward from the proximal end of the at least one lumen.

[0013] Furthermore, the housing of the seal anchor may be adapted to transition between a first compressed condition to facilitate at least partial insertion of the seal anchor member within a tissue tract, and a second expanded condition to facilitate securing of the seal anchor member within the tissue tract and in substantial sealed relation with tissue surfaces defining the tissue tract. In an embodiment, the housing may be formed from a compressible material or from a foam material. In an embodiment, the foam material may be at least partially constituted of a material selected from the group consisting of polyisoprene, urethane, and silicone. In another embodiment, the housing may be formed from a gel material.

[0014] The housing may also define a substantially arcuate configuration. The housing may define a substantially hour glass shape. Furthermore, the lumens may define openings at the leading end that are radially spaced apart about the trailing end. Alternatively, the lumens may define openings at the leading end that are spaced along a diameter of the trailing end. The openings defined by the lumens may be staggered about an axis of the trailing end or may be positioned along a diameter but offset from that diameter. Alternatively, the

openings defined by the lumens may be positioned on a chord or a diameter of the trailing end.

[0015] These and other features of the apparatus disclosed herein will become more readily apparent to those skilled in the art from the following detailed description of various embodiments of the present disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] Various embodiments of the present disclosure are described hereinbelow with references to the drawings, wherein:

[0017] FIG. **1** is a front perspective view of a seal anchor in accordance with the present disclosure shown relative to tissue;

[0018] FIG. **2**A is a front perspective view of a seal anchor member having lumens therein that are parallel to one another;

[0019] FIG. **2**B is a front perspective view of the seal anchor of FIG. **1** shown with medical instruments inserted therein;

[0020] FIG. **3** is another embodiment of a seal anchor in accordance with the present disclosure; and

[0021] FIG. **4** is a yet another embodiment of a seal anchor in accordance with the present disclosure.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0022] In the drawings and in the description which follows, in which like references numerals identify similar or identical elements, the term "proximal" will refer to the end of the apparatus which is closest to the clinician during use, while the term "distal" will refer to the end which is furthest from the clinician, as is traditional and known in the art. A seal anchor for use in a surgical procedure is shown and described in U.S. Pat. Pub. 2009-0093752, the entire contents of which are hereby incorporated by reference. The seal anchor member may be used during a minimally invasive procedure in which the seal anchor is inserted into an incision. Alternatively, the seal anchor may be used through a naturally occurring opening (e.g., anus or vagina) or any incision in a patient's skin.

[0023] The use and function of seal anchor member **100** will be discussed during the course of a typical minimally invasive procedure. Initially, the peritoneal cavity (not shown) is insufflated with a suitable biocompatible gas such as, e.g., CO_2 gas, such that the cavity wall is raised and lifted away from the internal organs and tissue housed therein, providing greater access thereto. The insufflation may be performed with an insufflation needle or similar device, as is conventional in the art. Either prior or subsequent to insufflation, a tissue tract **12** is created in tissue "T", the dimensions of which may be varied dependent upon the nature of the procedure.

[0024] A seal anchor **100** will now be described with reference to FIGS. **1** and **2**. The seal anchor **100** defines a longitudinal axis "A" and has respective trailing (or proximal) and leading (or distal) ends **102**, **104** and an intermediate portion **106** disposed between the trailing and leading ends **102**, **104**. Seal anchor member **100** includes one or more lumens (or ports) **108***a*, **108***b*, **108***c* disposed between the trailing and leading ends **102**, **104** that define corresponding longitudinal axes "X", "Y", "Z". As seen in FIG. **1**, the axes "X", "Y", "Z" defined by the lumens **108***a*, **108***b*, **108***c*, respectively, are non-parallel with respect to one another. To facilitate the simultaneous placement of instruments into each of the lumens **108***a*, **108***b*, **108***c*, the lumens **108***a-c* do not cross one another. The lumens **108***a-c* are laterally spaced apart such that, although the lumens **108***a-c* are angled with respect to one another, the lumens **108***a-c* do not intersect one another. In other embodiments, however, lumens may be arranged to cross one another. In contrast to seal anchor **100**, a seal anchor **90** having parallel, non-intersecting lumens **98** is illustrated in FIG. **2**A.

[0025] As seen in FIG. **2**B, the lumens **108***a-c* are adapted to receive instrumentation therein in a substantially sealed manner. The lumens **108***a-c* are adapted to inhibit the escape of insufflation gasses within a body cavity with or without instrumentation being inserted therein. Accordingly, the lumens **108***a-c* have diameters that are adapted to contract in the absence of a surgical instrument inserted therein and are adapted to expand to accommodate instrumentation in a substantially sealed manner.

[0026] As shown in FIG. **2**B, the instrumentation inserted within the lumens **108** may include, but are not limited to, a camera **20** that may be inserted within one of the lumens **108** and a pair of surgical instruments **21** that are inserted into two of the other lumens **108**. Since the axes "X" and "Z" of the two lumens **108***a*, **108***c*, through which the pair of surgical instruments **21** are inserted, cross one another, the distance between the distal ends of the surgical instruments **21** is greater than it would be if the axes "X", "Z" were parallel to one another. Since the lumens **108***a*, **108***c* define non-parallel axes, manipulation of the surgical instruments **21** is facilitated since there is a lesser probability of the instruments **21** interfering with each other's use. Furthermore, since the at-rest state for the lumens **108***a-c* is at angles with respect to one another, surgeon fatigue is reduced for those procedures necessitating such positioning for an extended duration of time. Adjustment of the angles of the lumens with respect to one another is facilitated by overcoming the internal biasing force of the seal anchor member **100** by applying a radial force to the surgical instrumentation placed within the lumens **108***a-c*.

[0027] As previously discussed, FIG. **2**A illustrates a seal anchor **90** including lumens **98** that are parallel to one another. Inserted within lumens **98** are surgical instruments **21** and camera **20**. As seen in FIG. **2**A, the parallel configuration of the lumens **98** hinder camera **20** in obtaining a clear view of the surgical site. It will be appreciated that the non-parallel, intersecting configuration of the lumens **108***a-c* of seal anchor **100** facilitate obtaining a lesser obstructed field of view than would be obtainable using seal anchor **90**. In particular, as shown in FIG. **2**B, axes "X" and "Z" define an angle "θ" therebetween. The greater the value of angle "θ", the lesser the probability of surgical instruments **21** obstructing the view of camera **20**. Moreover, the greater the angle "θ", the lesser the probability of interference between instruments **21** during the procedure. In addition, the greater the angle "θ", the greater the number of internal structures included within the surgical field and within reach of instruments **21**.

[0028] Proximal end **102** of seal anchor member defines a first diameter D_1 and distal end **104** defines a second diameter D_2. In one embodiment of seal anchor member **100**, the respective first and second diameters D_1, D_2 of the proximal and distal ends **102**, **104** are substantially equivalent, as seen in FIG. **1**, although an embodiment of seal anchor member **100** in which diameters D_1, D_2 are different is also within the

scope of the present disclosure. As depicted in FIG. **1**, proximal and distal ends **102**, **104** define substantially planar surfaces. However, embodiments are also contemplated herein in which either or both of proximal and distal ends **102**, **104**, respectively, define surfaces that are substantially arcuate to assist in the insertion of seal anchor member **100** within a tissue tract **12** defined by tissue surfaces **14** and formed in tissue "T", e.g., an incision, as discussed in further detail below.

[0029] Intermediate portion **106** defines a radial dimension "R" and extends longitudinally between proximal and distal ends **102**, **104**, respectively, to define an axial dimension or length "L". The radial dimension "R" of intermediate portion **106** varies along the axial dimension, or length, "L" thereof. Accordingly, seal anchor member **100** defines a cross-sectional dimension that varies along its length "L", which facilitates the anchoring of seal anchor member **100** within tissue "T", as discussed in further detail below. However, an embodiment of seal anchor member **100** in which the radial dimension "R" remains substantially uniform along the axial dimension "L" thereof is also within the scope of the present disclosure.

[0030] The radial dimension "R" of intermediate portion **106** is appreciably less than the respective diameters D_1, D_2 of proximal and distal ends **102**, **104** such that seal anchor member **100** defines an "hour-glass" shape or configuration to assist in anchoring seal anchor member **100** within tissue "T", as discussed in further detail below. However, in an alternate embodiment, the radial dimension "R" of intermediate portion **106** may be substantially equivalent to the respective diameters D_1, D_2 of proximal and distal ends **102**, **104**. In cross section, intermediate portion **106** may exhibit any suitable configuration, e.g., substantially circular, oval or oblong.

[0031] The seal anchor **100** may be adapted to transition from an expanded condition to a compressed condition so as to facilitate the insertion and securement thereof within tissue tract **12** in tissue "T". In the expanded condition, seal anchor **100** is at rest and the respective radial dimensions D_1, D_2 of the proximal and distal ends **102**, **104** of seal anchor **100**, as well as the radial dimension R of the intermediate portion **106** are such that the seal anchor **100** cannot be inserted within tissue tract **12**. However, the seal anchor **100** may transition to a compressed condition such that proximal and distal ends **102**, **104**, as well as intermediate portion **106** are dimensioned for insertion into tissue tract **12**.

[0032] To facilitate the transition between an expanded and a compressed condition, the seal anchor **100** may be formed from a compressible material having an internal biasing force such that the seal anchor **100** will transition back to an expanded condition upon insertion of the seal anchor **100** within tissue tract **12**, thereby ensuring a seal between the seal anchor **100** and the tissue tract **12**. Seal anchor **100** may be formed from a shape memory material, a foam material, or a gel material, or the like, but may also be formed from other materials. In an embodiment, the seal anchor **100** may be formed from a material selected from the group consisting of polyisoprene, urethane, and silicone.

[0033] Positioning members **114**, **115** of the trailing and leading ends **102**, **104**, respectively, may engage the walls defining the body cavity of the tissue tract **12** to facilitate securement of seal anchor member **100** within the body tissue. For example, positioning member **114** at leading end **104** may engage the internal peritoneal wall and positioning member **114** adjacent trailing end **102** may engage the outer epidermal tissue adjacent the incision **12** within tissue "T". In another embodiment of seal anchor member **100**, one or more additional positioning members **114** may be associated with intermediate portion **106**.

[0034] The use and function of seal anchor member **100** will be discussed during the course of a typical minimally invasive procedure. Initially, the peritoneal cavity (not shown) is insufflated with a suitable biocompatible gas such as, e.g., CO_2 gas, such that the cavity wall is raised and lifted away from the internal organs and tissue housed therein, providing greater access thereto. The insufflation may be performed with an insufflation needle or similar device, as is conventional in the art. Either prior or subsequent to insufflation, a tissue tract **12** is created in tissue "T", the dimensions of which may be varied dependent upon the nature of the procedure.

[0035] Different embodiments of seal anchors will be described with reference to FIGS. **2** and **3**. Seal anchors **200**, **300** are substantially similar to seal anchor **100**, except in the configuration of lumens and further include structures to stabilize instrumentation inserted within the lumens. Both seal anchor **200** and seal anchor **300**, shown in FIGS. **2** and **3**, include lumens defining intersecting axes. Seal anchor **200** includes a trailing end **202** and a distal end **204**. A plurality of lumens **208** is disposed between the trailing and leading ends **202**, **204**. Lumens **208** define openings in the trailing end **202** that are radially positioned along the trailing end **202**. A cut-out or groove **201** in the leading end extending outward from at least one lumen **208** facilitates stabilization of instrumentation inserted within the lumen **208**.

[0036] In an alternative embodiment, a seal anchor **300** including plurality of lumens disposed between leading and trailing ends **302**, **304** is shown in FIG. **4**. A cut-out or groove **301** in an arcuate or half-cylindrical configuration is disposed in the trailing end. At least one lumen **308** is disposed within the groove **301**. Groove **301** is adapted to facilitate stabilization of instrumentation inserted within the at least one of the lumens **308** that is disposed within the area defined by the groove **301**.

[0037] Although the illustrative embodiments of the present disclosure have been described herein with reference to the accompanying drawings, the above description, disclosure, and figures should not be construed as limiting, but merely as exemplifications of particular embodiments. It is to be understood, therefore, that the disclosure is not limited to those precise embodiments, and that various other changes and modifications may be effected therein by one skilled in the art without departing from the scope or spirit of the disclosure.

1-13. (canceled)

14. A surgical device comprising:

a housing defining a longitudinal axis, the housing having leading and trailing ends;

the housing defining at least two lumen extending between the leading and trailing ends, at least a portion of each lumen being adapted to expand to accommodate instrumentation in a substantially sealed manner; and

the housing defining an arcuate cut-out positioned adjacent to, and extending outward from, the proximal end of the at least two lumen, the arcuate cut-out configured and adapted to facilitate the insertion of an instrument into the lumen by leading the instrument into the lumen.

15. The surgical device of claim **14**, wherein the at least two lumen each define a respective axis, and wherein, in the

absence of a force applied to the housing, the axes of the at least two lumen are nonparallel with respect to each other and with respect to the longitudinal axis of the housing.

16. The surgical device of claim **14**, wherein the housing defines a third lumen extending between the leading and trailing ends, the third lumen defining an axis that, in the absence of a force applied to the housing, is parallel to the longitudinal axis of the housing.

17. The surgical device of claim **14**, wherein the housing is compressible so as to transition from an expanded condition to a compressed condition for insertion and securement of the housing within an opening.

18. The surgical device of claim **14**, wherein the housing has a proximal section that tapers inwardly in a distal direction and a distal section that tapers outwardly in a distal direction.

19. The surgical device of claim **14**, further comprising an insufflation tube.

20. A surgical device comprising:

a compressible housing defining a longitudinal axis, the compressible housing having a leading end, a trailing end, and an intermediate portion that has a proximal section that tapers inwardly in a distal direction and a distal section that tapers outwardly in a distal direction;

the compressible housing defining at least two lumen extending between the leading and trailing ends, at least a portion of each lumen being adapted to expand to accommodate an instrument in a substantially sealed manner; and

the compressible housing including at least one insertion feature positioned adjacent to the proximal end of at least one of the lumen adapted to lead the instrument into the lumen.

21. The surgical device of claim **20**, wherein at least one of the leading end and the trailing end of the compressible housing is arcuate.

22. The surgical device of claim **20**, wherein the at least one insertion feature is one of a cut-out and a groove.

23. The surgical device of claim **20**, wherein each one of the at least two lumen define a respective axis, and wherein, in the absence of a force applied to the compressible housing, the axes of the at least two lumen are nonparallel with respect to each other and with respect to the longitudinal axis of the compressible housing.

24. The surgical device of claim **20**, wherein the compressible housing defines a third lumen extending between the leading and trailing ends, the third lumen defining an axis that, in the absence of a force applied to the compressible housing, is parallel to the longitudinal axis of the compressible housing.

25. The surgical device of claim **20**, further comprising an insufflation tube.

26. A surgical device comprising:

a compressible housing defining a longitudinal axis, the compressible housing having arcuate leading and trailing ends;

the compressible housing defining four lumen extending between the leading and trailing ends, each lumen defining an axis, wherein at least a portion of each lumen is adapted to expand to accommodate an instrument in a substantially sealed manner, and wherein, in an at-rest condition, the axes of a first and second lumen are nonparallel with respect to each other and with respect to the longitudinal axis of the compressible housing and a third lumen is parallel to the longitudinal axis of the compressible housing;

the compressible housing comprising a leading structure positioned on at least one of the leading and trailing ends of the compressible housing and configured to lead an instrument into at least one of the four lumen.

27. The surgical device of claim **26**, wherein the compressible housing comprises an intermediate portion has a proximal section that tapers inwardly in a distal direction and a distal section that tapers outwardly in a distal direction.

28. The surgical device of claim **26**, wherein the leading structure is at least one of a groove and a cut-out.

29. The surgical device of claim **26**, wherein the leading structure extends outward from the first and second lumen.

30. The surgical device of claim **26**, wherein the compressible housing is formed from at least one of a foam and a gel.

31. The surgical device of claim **30**, wherein the compressible housing is formed from polyisoprene, urethane or silicone.

32. The surgical device of claim **26**, wherein the compressible housing is configured to help maintain insufflation pressure in a body cavity during a minimally invasive laparoscopic surgical procedure.

33. The surgical device of claim **26**, further comprising an insufflation tube.

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专利名称(译)	用非平行流明密封锚		
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申请号	US14/248534	申请日	2014-04-09
[标]申请(专利权)人(译)	柯惠有限合伙公司		
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优先权	61/247654 2009-10-01 US		
其他公开文献	US8932213		
外部链接	Espacenet USPTO		

摘要(译)

密封锚定构件限定了限定纵向轴线的壳体，壳体具有前端和尾端，并且包括在前端和后端之间延伸的多个腔，每个腔适于基本上密封接收其中的物体并限定纵向。轴，其中至少两个内腔限定不平行的纵向轴线，以便于多个器械在密封锚定构件内成角度的，静止放置。