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(54) IMPLANTABLE MEDICAL CONNECTOR FOR MEDICAL TUBING WITH ANCHORING FEATURES

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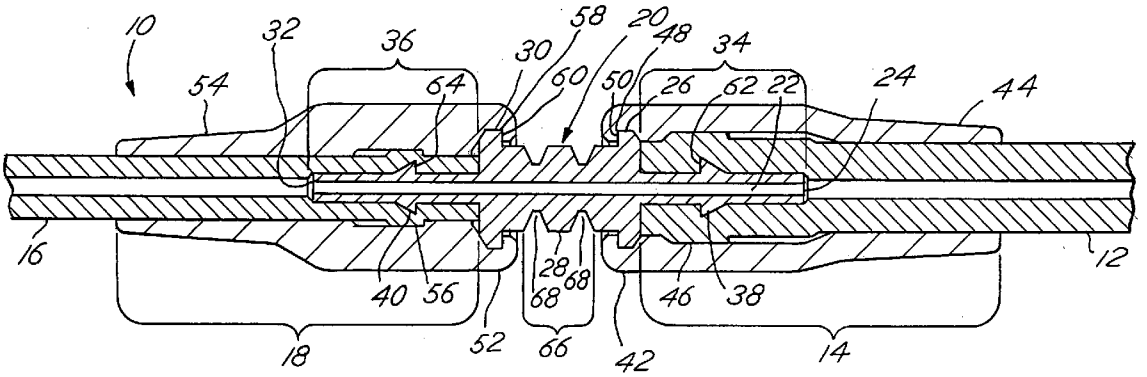
(57) **ABSTRACT**

A connector and method of medical tubing is disclosed. The connector defines a fluid passageway, and the connector includes a first end, a first intermediate portion, a middle portion, a second intermediate portion, and a second end. The middle portion is located between the first intermediate portion and the second intermediate portion, and the first end is adapted to fit inside a proximal connector-receiving portion, and the second end is adapted to fit inside a distal connector-receiving portion. The connector includes at least a first protrusion and a second protrusion projecting from the connector, wherein a first protrusion is located between the first end and the first intermediate portion, and the second protrusion is located between the second intermediate portion and the second end. The connector includes a first tubular strain relief having an extending first portion that extends past the first end of the connector and is adapted to fit over a proximal connection section, and a second tubular strain relief having an extending second portion that extends past the second end of the connector and is adapted to fit over a distal connection section. When the first end of the connector is inserted into a proximal connector-receiving portion a first interlock fit is formed therebetween, and when the second end of the connector is inserted into the distal connector-receiving portion a second interlock fit is formed therebetween, resulting in a fluid tight connection between the proximal connector-receiving portion and the distal connector-receiving portion, and wherein at least the middle portion of the connector is exposed. The middle portion of the connector can include a suture receiving section that can be sutured to tissue of patient.



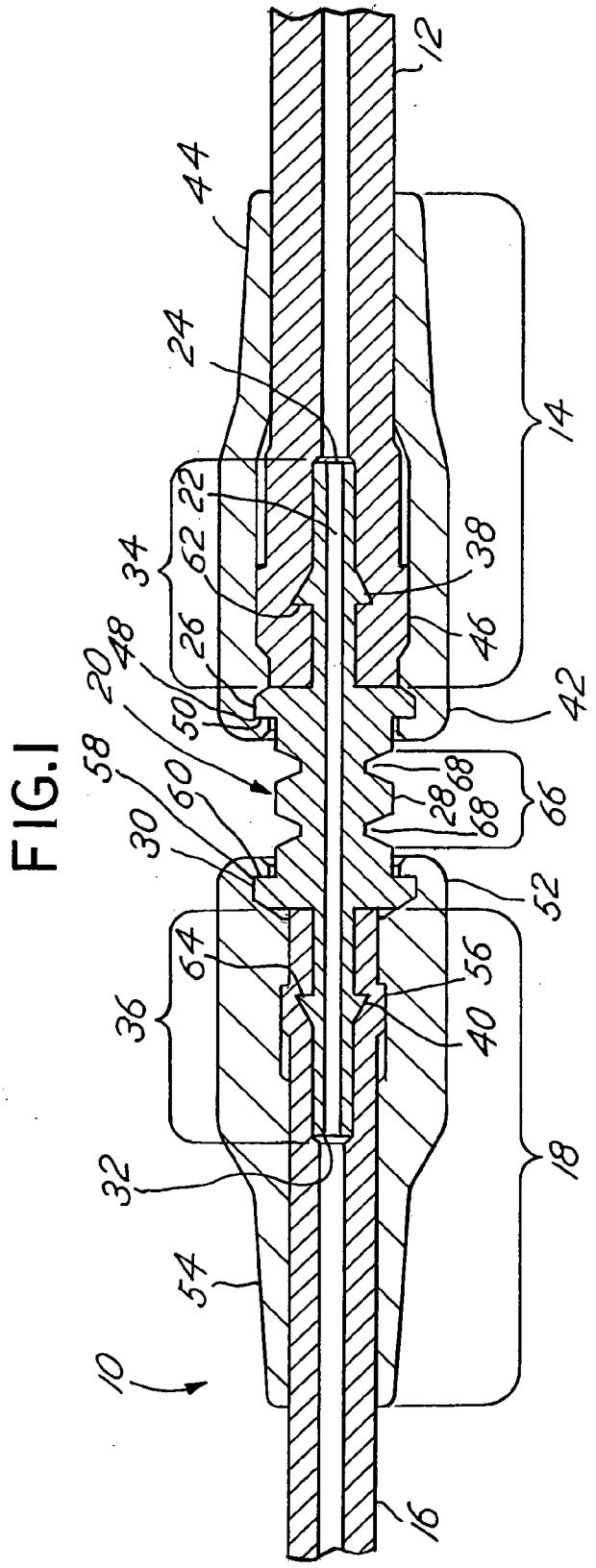

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FIG.1

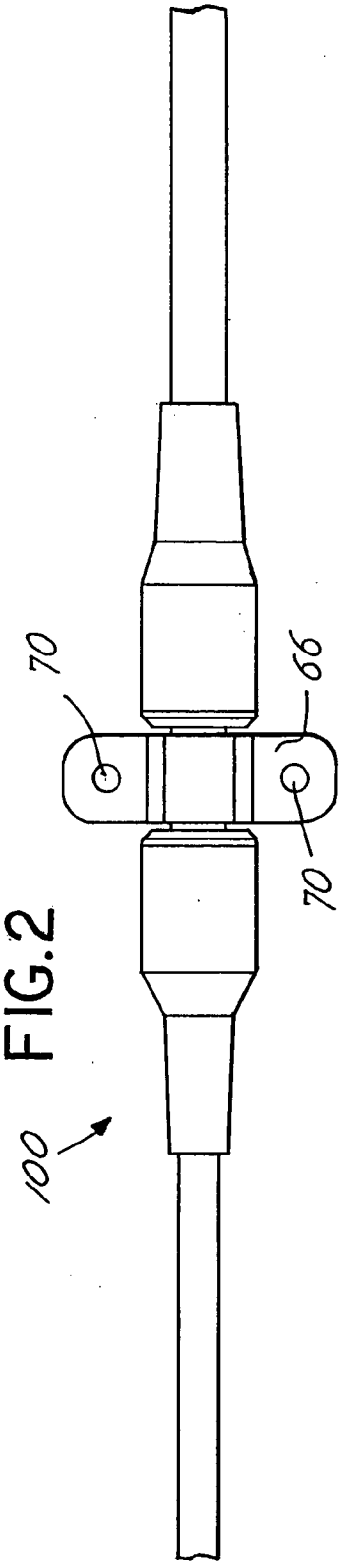
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FIG.2

IMPLANTABLE MEDICAL CONNECTOR FOR MEDICAL TUBING WITH ANCHORING FEATURES

RELATED APPLICATION

[0001] This application is a divisional of U.S. application Ser. No. 10/127,853, filed on Apr. 23, 2002, which is herein referenced in its entirety.

FIELD OF THE INVENTION

[0002] This invention relates to medical device connectors used for connecting medical tubing. More particularly, the invention is directed to a medical connector for connecting sections of a catheter.

BACKGROUND OF THE INVENTION

[0003] In numerous medical applications it becomes necessary to connect one section of tubing to another. In such situations it is important that the connection be secure so that it will not pull apart and that there be no leakage of fluid at the site of the connection. This is especially critical in applications where the tubing sections are implanted in the human body.

[0004] U.S. Pat. No. 5,405,339, which is incorporated herein by reference, teaches connector for connecting sections of medical tubing and a method for using the connector. The connector has an enlarged middle portion between first and second end portions. The end portions have a smaller diameter than the enlarged middle portion and are adapted to be inserted into the ends of the medical tubing sections. The connector can be grasped at the enlarged middle portion, thus simplifying the process of inserting the end portions into the tubing sections. Additionally, the opposing edges of the enlarged middle portion act as tubing stop surfaces that provide a positive indication that the connector is properly aligned.

[0005] While the invention described in U.S. Pat. No. 5,405,339 has solved numerous difficulties in the manufacture and use of the prior art medical devices, there is still certain areas for further improvement. For example, FIG. 3 of U.S. Pat. No. 5,405,339 teaches an addition of a circumferential suture groove in the surface of the enlarged middle portion that can only be used as a place at which the catheter may be anchored by suturing it to surrounding tissue if the connector is used without a strain relief. Col. 5, lines 37-43.

[0006] It would be desirable to provide a connector that provides a place at which the catheter may be anchored by suturing it to surrounding tissue, while at the same time providing a strain relief. It would also be desirable to provide a connector that provides stronger connections with greater useful life, and which is simple to use.

SUMMARY OF THE INVENTION

[0007] In accordance with the present invention there is disclosed an implantable medical device comprising a connector for connecting sections of medical tubing and a method for using the connector. The connector is shaped in a manner that solves the problems associated with prior art connectors and methods of connecting medical tubing.

[0008] More specifically, the present invention comprises a connector for medical tubing, the connector defining a fluid passageway, the connector having a first end, a first intermediate portion, a middle portion, a second intermediate portion, and a second end. The middle portion located between the first intermediate portion and the second intermediate portion. The end is adapted to fit inside a proximal connector-receiving portion of a proximal medical tube, the second end is adapted to fit inside a distal connector-receiving portion of a distal medical tube. The connector also has a least a first protrusion and a second protrusion projecting from the connector, wherein a first protrusion is located between the first end and the first intermediate portion, and the second protrusion is located between the second intermediate portion and the second end. The connector also includes a first tubular strain relief having an extending first portion that extends past the first end of the connector and is adapted to fit over a proximal connection section of a proximal medical tube, and a second tubular strain relief having an extending second portion that extends past the second end of the connector is and adapted to fit over a distal connection section of a distal medical tube. When the first end of the connector is inserted into the proximal connector-receiving portion a first interlock fit is formed therebetween, and when the second end of the connector is inserted into the distal connector-receiving portion a second interlock fit is formed therebetween. The result is a fluid tight connection between the proximal connector-receiving portion and the distal connector-receiving portion, and wherein at least the middle portion of the connector is exposed. In one embodiment, the first intermediate portion can include a first lip, and the second intermediate portion can include a second lip. Thus, when the first tubular strain relief fits over the first lip of the first intermediate portion, a third interlock fit is formed therebetween. Further, when the second tubular strain relief fits over the second lip of the second intermediate portion, a fourth interlock fit is formed therebetween.

[0009] In one embodiment, the middle portion further comprises a suture receiving portion. The suture receiving portion has a suitable structure that can be anchored by suturing to surrounding tissue or fascia of a patient. For example, but not by way of limitation, the suture receiving structure can have a suture receiving groove or hole. Preferably, the suture receiving portion has at least two locations to receive sutures so as to reduce rotation of the connector.

[0010] In one embodiment, the extending first portion of the first tubular strain relief is more flexible than a remainder of the first tubular strain relief and/or the extending second portion of the second tubular strain relief is more flexible than a remainder of the second tubular strain relief.

[0011] In one embodiment, the extending first portion of the first tubular strain relief tapers to a smaller outside diameter as it extends away from the first end of the connector and/or the extending second portion of the second tubular strain relief tapers to a smaller outside diameter as it extends away from the second end of the connector.

[0012] In one embodiment, at least the first intermediate portion of the connector is exposed and/or at least the second intermediate portion of the connector is exposed. Thus, the first intermediate portion and/or the second intermediate portion of the connector can be used as a convenient place to anchor the catheter to the tissue or fascia of a patient.

[0013] In one embodiment, the connector comprises a metal or metal alloy.

[0014] In one embodiment, the first tubular strain relief fits over the proximal connection section and a proximal fit is formed therebetween.

[0015] In one embodiment, the second tubular strain relief fits over the distal connection section and a distal fit is formed therebetween.

[0016] In one embodiment, the middle portion comprises a suture receiving portion. The suture receiving portion has a suitable structure that can be anchored to the tissue or fascia of a patient. For example, but not by way of limitation, the suture receiving structure can have a suture receiving groove or hole. Preferably, the suture receiving portion has at least two locations to receive sutures so as to reduce rotation of the connector.

[0017] In one embodiment, the present invention includes an implantable medical device comprising a proximal catheter having a proximal connection section, the proximal connection section having a proximal connector-receiving portion, and a distal catheter having a distal connection section, the distal connection section having a distal connector-receiving portion. The implantable medical device also has a connector between the proximal catheter and the distal catheter, the connector defining a fluid passageway, the connector having a first end, a first intermediate portion, a middle portion, a second intermediate portion, and a second end. The middle portion is located between the first intermediate portion and the second intermediate portion. The first end is adapted to fit inside the proximal connector-receiving portion, the second end is adapted to fit inside the distal connector-receiving portion. There is also at least a first protrusion and a second protrusion projecting from the connector, wherein the at least first protrusion is located between the first end and the first intermediate portion, and the second protrusion is located between the second intermediate portion and the second end. The invention further has a first tubular strain relief having an extending first portion that extends past the first end of the connector and fits over the proximal connection section, and a second tubular strain relief having an extending second portion that extends past the second end of the connector and fits over the distal connection section. Thus, when the first end of the connector is inserted into the proximal connector-receiving portion a first interlock fit is formed therebetween, and when the second end of the connector is inserted into the distal connector-receiving portion a second interlock fit is formed therebetween. The result is a fluid tight connection between the proximal catheter and the distal catheter, and wherein at least the middle portion of the connector is exposed. Since the middle portion of the connector is exposed, it can be anchored by suturing to surrounding tissue or fascia of a patient. The connector of this embodiment can have any or all combination of additional features recited in the preceding paragraphs.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] **FIG. 1** is a side view of a implantable medical device in accordance with the present invention.

[0019] **FIG. 2** is a side view of an alternative embodiment of the implantable medical device of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0020] **FIG. 1** is a side view of a implantable medical device used to connect sections of medical tubing in accordance with a preferred embodiment of the present invention. More specifically, as shown in **FIG. 1**, an implantable medical device **10** comprises a proximal catheter **12** having a proximal connection section **14**, the proximal connection section **14** having a proximal connector-receiving portion **34**. Implantable medical device **10** also has a distal catheter **16** having a distal connection section **18**, the distal connection section **18** having a distal connector-receiving portion **36**. Implantable medical device **10** also has a connector **20** between the proximal catheter **12** and the distal catheter **16**, the connector **20** defining a fluid passageway **22**, the connector **20** having a first end **24**, a first intermediate portion **26**, a middle portion **28**, a second intermediate portion **30**, and a second end **32**. The middle portion **28** is located between the first intermediate portion **26** and the second intermediate portion **30**. The first end **24** is adapted to fit inside the proximal connector-receiving portion **34**, and the second end **32** is adapted to fit inside the distal connector-receiving portion **36**.

[0021] Implantable medical device **10** has at least a first protrusion **38** and a second protrusion **40** projecting from the connector **20**, wherein the first protrusion **38** is located between the first end **24** and the first intermediate portion **26**, and the second protrusion **40** is located between the second intermediate portion **30** and the second end **32**. Also provided is a first tubular strain relief **42** having an extending first portion **44** that extends past the first end **24** of the connector **20** and fits over the proximal connection section **14**, and a second tubular strain relief **52** having an extending second portion **54** that extends past the second end **32** of the connector **20** and fits over the distal connection section **18**. Thus, when the first end **24** of the connector **20** is inserted into the proximal connector-receiving portion **34** a first interlock fit **62** is formed therebetween. Also, when the second end **32** of the connector **20** is inserted into the distal connector-receiving portion **36** a second interlock fit **64** is formed therebetween, resulting in a fluid tight connection between the proximal catheter **12** and the distal catheter **16**. As shown in **FIG. 1**, this construction results in at least the middle portion **28** of connector **20** being exposed. Because the middle portion **28** is exposed, the middle section **28** provides a convenient place at which the connector can be anchored by suturing it to surrounding tissue or fascia of a patient. As further shown in **FIG. 1**, the first intermediate portion **26** can include a first lip **48**, and the second intermediate portion **30** can include a second lip **58**. Thus, when the first tubular strain relief **42** fits over the first lip **48** of the first intermediate portion **26**, a third interlock fit **50** is formed therebetween. Further, when the second tubular strain relief **52** fits over the second lip **58** of the second intermediate portion **30**, a fourth interlock fit **60** is formed therebetween.

[0022] Preferably, the extending first portion **44** of the first tubular strain relief **42** is more flexible than a remainder of the first tubular strain relief **42**, and the extending second portion **54** of the second tubular strain relief **52** is more flexible than a remainder of the second tubular strain relief **52**. The difference in flexibility can be obtained in any suitable manner, including but not limited to a tapering of the first and second tubular stain reliefs as they extend away from the connector **20**. Alternatively, different materials, or slits and/or holes defined in the first and second tubular strain reliefs can provide the desired difference in flexibility as will be recognized by those of skill in the art.

[0023] Preferably, the extending first portion **44** of the first tubular strain relief **42** tapers to a smaller outside diameter as it extends away from the first end **24** of the connector **20**, and the extending second portion **54** of the second tubular strain relief **52** tapers to a smaller outside diameter as it extends away from the second end **32** of the connector **20**.

[0024] In one embodiment, the first intermediate portion **26** and/or the second intermediate portion **30** have at least one portion that is exposed along with the middle portion **28**. Thus, portions **26**, **28** and/or **30** can define at least two grooves **68** at which the connector **20** can be anchored by suturing it to the tissue or fascia of a patient. By providing at least two places for suturing, connector **20** provides a structure that can be sutured to the tissue or fascia of a patient that will not be a susceptible to rotation as a connector that has only one place to suture it to the tissue or fascia of a patient.

[0025] In a preferred embodiment, the connector **20** comprises a metal or metal alloy. Those of skill in the art will recognize that a metal or metal alloy can be sutured to the tissue or fascia of a patient more securely than a softer material, such as the material used for strain reliefs or for catheter tubing.

[0026] As shown in **FIG. 1**, when the first tubular strain relief **42** fits over the proximal connection section **14**, a proximal fit **46** is formed therebetween. As also shown in **FIG. 1**, when the second tubular strain relief **52** fits over the distal connection section **18**, a distal fit **56** is formed therebetween.

[0027] As shown in **FIG. 1**, the middle portion **28** further comprises a suture receiving portion **66**. The suture receiving portion **66** has a suitable structure that can be anchored to the tissue or fascia of a patient. For example, but not by way of limitation, the suture receiving portion **66** can define a suture receiving groove **68** or hole **70**. Preferably, the suture receiving portion **66** has at least two locations, e.g., at least two suture receiving grooves **68** or holes **70** to receive sutures so as to reduce rotation of the connector. As shown in **FIG. 1**, the suture receiving portion **66** defines two suture receiving grooves **68**.

[0028] An alternative embodiment is shown in **FIG. 2**. In **FIG. 2**, device **100** is the same as the device **10** shown in **FIG. 1**, except that suture receiving portion **66** defines two holes **70** instead of two suture receiving grooves.

[0029] The present invention also provides a method for connecting implantable medical tubing. More specifically, the present invention comprises the step of providing a implantable medical device **10** comprising a proximal connection section **14**, the proximal connection section **14** having a proximal connector-receiving portion **34**; a distal connection section **18**, the distal connection section **18** having a distal connector-receiving portion **36**; a connector **20** between the proximal catheter **12** and the distal catheter **16**, the connector **20** defining a fluid passageway **22**, the connector **20** having a first end **24**, a first intermediate portion **26**, a middle portion **28**, a second intermediate portion **30**, and a second end **32**, the middle portion **28** located between the first intermediate portion **26** and the second intermediate portion **30**, the first end **24** adapted to fit inside the proximal connector-receiving portion **34**, the second end **32** adapted to fit inside the distal connector-receiving portion **36**, and at least a first protrusion **38** and a second protrusion **40** projecting from the connector **20**, wherein a first protrusion **38** is located between the first end **24** and the first intermediate portion **26**, and the second protrusion **40** is located between the second intermediate portion **30** and the second end **32**; a first tubular strain relief **42** having an extending first portion **44** that extends past the first end **24** of the connector **20** and fits over the proximal connection section **14**; and a second tubular strain relief **52** having an extending second portion **54** that extends past the second end **32** of the connector **20** and fits over the distal connection section **18**.

[0030] A preferred method of the present invention further comprises the steps of placing the proximal connection section **14** over the first end **24** of the connector; inserting the first end **24** of the connector **20** into the proximal connector-receiving portion **34** to form a first interlock fit **62** therebetween; placing the distal connection section **18** over the second end **32** of the connector **20**; inserting the second end **32** of the connector **20** into the distal connector-receiving portion **36** to form a second interlock fit **64** therebetween; thereby forming a fluid tight connection between the proximal connection section **14** and the distal connection section **18**, and wherein at least the middle portion **28** of the connector **20** is exposed.

[0031] A preferred method further comprises the steps of providing the first intermediate portion **26** with a first lip **48**, and the second intermediate portion **30** with a second lip **58**. Thus, when the first tubular strain relief **42** is placed over the first lip **48** of the first intermediate portion **26**, a third interlock fit **50** is formed therebetween. Further, when the second tubular strain relief **52** is placed over the second lip **58** of the second intermediate portion **30**, a fourth interlock fit **60** is formed therebetween.

[0032] A preferred method further comprises the steps of providing at least one suture receiving portion **66** on the middle portion **28** and anchoring the connector **20** by suturing the suture receiving portion **66** to tissue of a patient. In one embodiment, the method further comprises the steps of providing at least two suture receiving grooves **68** on the suture receiving portion **66** and anchoring the connector **20** by suturing the suture receiving grooves **68** to tissue of a patient. In one embodiment, the method further comprises the steps of providing at least two suture receiving holes **70** on the suture receiving portion **66** and anchoring the connector **20** by suturing the suture receiving holes **70** to tissue of a patient.

[0033] From the foregoing detailed description of specific embodiments of the invention, it should be apparent that a medical connector and method for its use has been disclosed. Although particular embodiments of the invention have been disclosed herein in detail, this has been done for the purpose of illustration only, and is not intended to be limiting with respect to the scope of the appended claims, which follow. In particular, it is contemplated by the inventors that various substitutions, alterations and modifications may be made to the embodiments of the invention without departing from the spirit and scope of the invention as defined by the claims. Further, although the embodiments disclosed relate primarily to use of the connector for connecting catheter sections, the connector could be used for other applications where it is desirable to connect separate sections of medical tubing

together, especially those situations where the tubing is to be implanted in the human body. Such applications include connecting sections of stents, penile implants and sphincter implants.

1. An implantable medical connection system for medical tubing, the connection system comprising:

an implantable medical connector defining a passageway having first and second ends, the connector including

a central portion defining at least one suture-receiving groove extending annularly around an annular surface of the central portion;

first connection means for connecting an end of a first medical tube in fluid communication with the first end of the passageway; and

second connection means for connecting an end of a second medical tube in fluid communication with the second end of the passageway;

wherein the first and second connection means so connect the first and second medical tube to the implantable medical connector that the suture-receiving groove remains exposed; and

at least one suture placed in and extending along at least a portion of the suture-receiving groove whereby the implantable medical connection system may be anchored to biological tissue.

2. The implantable medical connection system of claim 1 wherein:

the central portion has a first end and a second end opposite the first end; and

the first and second connection means each comprise a tubular structure adapted to receive an end of medical tubing thereon, the tubular structure having at least one protrusion adapted for retention of medical tubing thereon, wherein the first connection means extends from the first end of the central portion, and the second connection means extends from the second end of the central portion.

3. The implantable medical connection system of claim 2 further comprising:

a first tubular strain relief extending from the first end of the central portion and having a lumen in which the first connection means is housed, the lumen of the first strain relief being adapted to receive the end of the first medical tube therein when the end of the first medical tube is connected to the first connection means; and

a second tubular strain relief extending from the second end of the central portion and having a lumen in which the second connection means is housed, the lumen of the second strain relief being adapted to receive the end of the second medical tube therein when the end of the second medical tube is connected to the second connection means.

4. The combination of the implantable medical connection system of claim 3 with a first medical tube having a first end connected to the first connection means and received in the first tubular strain relief and a second medical tube having a first end connected to the second connection means and received in the second tubular strain relief.

5. The combination of an implantable infusion pump with the combination of claim 4 wherein the first medical tube has a second end connected in fluid connected to the implantable infusion pump.

6. The implantable medical connection system of claim 3, wherein

the first tubular strain relief has a lip at one end that is adapted to fit over the first end of the central portion to form an interlock fit therebetween, and

the second tubular strain relief has a lip at one end that is adapted to fit over the second end of the central portion to form an interlock fit therebetween.

7. The implantable medical connector of claim 6, wherein the first tubular strain relief has an extending first portion at an end opposite to the end having the lip of the first tubular strain relief, the extending first portion being more flexible than a remainder of the first tubular strain relief.

8. The implantable medical connector of claim 6, wherein the second tubular strain relief has an extending second portion at an end opposite to the end having the lip of the second tubular strain relief, the extending second portion being more flexible than the remainder of the second tubular strain relief.

9. The implantable medical connector of claim 6, wherein the first tubular strain relief has an extending first portion at an end opposite to the end of having the lip of the first tubular strain relief, the extending first portion being more flexible than a remainder of the first tubular strain relief, and wherein the second tubular strain relief has an extending second portion at an end opposite the end having the lip of the second tubular strain relief, the extending second portion being more flexible than the remainder of the second tubular strain relief.

10. The implantable medical connector of claim 6, wherein the first tubular strain relief has an extending first portion at an end opposite to the end having the lip of the first tubular strain relief, wherein the extending first portion tapers to a smaller outside diameter as it extends in a direction away from the lip.

11. The implantable medical connector of claim 6, wherein the second tubular strain relief has an extending second portion at an end opposite to the end having the lip of the second tubular strain relief, wherein the extending second portion tapers to a smaller outside diameter as it extends in a direction away from the lip.

12. The implantable medical connector of claim 6, wherein the first tubular strain relief has an extending first portion at an end opposite to the end of having the lip of the first tubular strain relief, wherein the extending first portion tapers to a smaller outside diameter as it extends in a direction away from the lip of the first tubular strain relief, wherein the second tubular strain relief has an extending second portion at an end opposite to the end having the lip of the second tubular strain relief, wherein the extending second portion tapers to a smaller outside diameter as it extends in a direction away from the lip of the second tubular strain relief.

13. An implantable medical connection system for medical tubing, the connection system comprising:

an implantable medical connector defining a passageway having first and second ends, the connector including

a central portion having an outside surface that defines at least one suture-receiving hole;

first connection means for connecting an end of a first medical tube in fluid communication with the first end of the passageway; and

second connection means for connecting an end of a second medical tube in fluid communication with the second end of the passageway;

wherein the first and second connection means so connect the first and second medical tube to the implantable medical connector that the suture-receiving groove remains exposed; and

at least one suture placed in and extending through the suture-receiving hole whereby the implantable medical connection system may be anchored to biological tissue.

14. The implantable medical connection system of claim 13 wherein:

the central portion has a first end and a second end opposite the first end; and

the first and second connection means each comprise a tubular structure adapted to receive an end of medical tubing thereon, the tubular structure having at least one protrusion adapted for retention of medical tubing thereon, wherein the first connection means extends from the first end of the central portion, and the second connection means extends from the second end of the central portion.

15. The implantable medical connection system of claim 14 further comprising:

a first tubular strain relief extending from the first end of the central portion and having a lumen in which the first connection means is housed, the lumen of the first strain relief being adapted to receive the end of the first medical tube therein when the end of the first medical tube is connected to the first connection means; and

a second tubular strain relief extending from the second end of the central portion and having a lumen in which the second connection means is housed, the lumen of the second strain relief being adapted to receive the end of the second medical tube therein when the end of the second medical tube is connected to the second connection means.

16. The combination of the implantable medical connection system of claim 15 with a first medical tube having a first end connected to the first connection means and received in the first tubular strain relief and a second medical tube having a first end connected to the second connection means and received in the second tubular strain relief.

17. The combination of an implantable infusion pump with the combination of claim 16 wherein the first medical tube has a second end connected in fluid connected to the implantable infusion pump.

18. The implantable medical connection system of claim 15, wherein

the first tubular strain relief has a lip at one end that is adapted to fit over the first end of the central portion to form an interlock fit therebetween, and

the second tubular strain relief has a lip at one end that is adapted to fit over the second end of the central portion to form an interlock fit therebetween.

19. The implantable medical connector of claim 18, wherein the first tubular strain relief has an extending first portion at an end opposite to the end having the lip of the first tubular strain relief, the extending first portion being more flexible than a remainder of the first tubular strain relief.

20. The implantable medical connector of claim 18, wherein the second tubular strain relief has an extending second portion at an end opposite to the end having the lip of the second tubular strain relief, the extending second portion being more flexible than the remainder of the second tubular strain relief.

21. The implantable medical connector of claim 18, wherein the first tubular strain relief has an extending first portion at an end opposite to the end of having the lip of the first tubular strain relief, the extending first portion being more flexible than a remainder of the first tubular strain relief, and wherein the second tubular strain relief has an extending second portion at an end opposite the end having the lip of the second tubular strain relief, the extending second portion being more flexible than the remainder of the second tubular strain relief.

22. The implantable medical connector of claim 18, wherein the first tubular strain relief has an extending first portion at an end opposite to the end having the lip of the first tubular strain relief, wherein the extending first portion tapers to a smaller outside diameter as it extends in a direction away from the lip.

23. The implantable medical connector of claim 18, wherein the second tubular strain relief has an extending second portion at an end opposite to the end having the lip of the second tubular strain relief, wherein the extending second portion tapers to a smaller outside diameter as it extends in a direction away from the lip.

24. The implantable medical connector of claim 18, wherein the first tubular strain relief has an extending first portion at an end opposite to the end of having the lip of the first tubular strain relief, wherein the extending first portion tapers to a smaller outside diameter as it extends in a direction away from the lip of the first tubular strain relief, wherein the second tubular strain relief has an extending second portion at an end opposite to the end having the lip of the second tubular strain relief, wherein the extending second portion tapers to a smaller outside diameter as it extends in a direction away from the lip of the second tubular strain relief.

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