placed intravenously in the patient, which can then be easily connected with a tubing section connected with the new fluid bag.

[0005] Existing tubing connectors are prone to leakage and unwanted disconnection when the patient is still receiving treatment via the connected tubes due to side-loads caused by the weight of the connected tubes and components, as well as accidental pulling of the tubes by the patient or medical personnel.

[0006] Furthermore, certain medical devices require the use of multiple tubes for supplying air or fluid between the patient and the device. For example, certain models of blood pressure monitors, such as the Dinamap Procare series, manufactured by General Electric, employ dual tubes for connecting the blood pressure cuff to the monitor. As such, a connector including multiple air passages for directing airflow between the tube segments is desirable, so as to avoid having to individually connect and disconnect multiple connectors when hooking or unhooking a patient to the monitor.

[0007] The information included in this Background section of the specification, including any references cited herein and any description or discussion thereof, is included for technical reference purposes only and is not to be regarded subject matter by which the scope of the invention is to be bound.

US2005/057042 discloses a bayonet tube connector for connecting two fluid passageways using a male member and a female member.

SUMMARY

[0008] A male bayonet connector may include a shaft defining a lumen therethrough and a grip that facilitates gripping of the shaft by the user. The outer surface of the shaft may define a tubing coupling for connecting with a section of tubing, an annular recess or channel that interfaces with a latch in a female connector for connecting the male bayonet connector with the female connector, and a sealing portion that engages a seal member or surface on an inner diameter of a receiving lumen within the female latch connector for creating a fluid seal between the male and female connectors.

[0009] In one implementation, a male bayonet connector includes a shaft defining a lumen and having a distal end portion and a proximal end portion. The proximal end portion of the shaft is configured to engage a section of tubing and the distal end portion of the shaft includes a sealing surface configured to engage a seal member on an inner diameter of a receiving lumen in the female latch connector to create a fluid-tight seal. The male bayonet connector further includes a grip that extends around at least a portion of the shaft. The shaft defines an annular recess proximal to and adjacent the distal end portion. The annular recess has a smaller diameter than the outer diameter of the sealing surface of the distal end portion. The annular recess has a proximal chamfered sidewall and a distal sidewall perpendicular to the axis of the lumen of the shaft. A ratio of a length of the sealing surface to a distance the grip and the distal sidewall is such that a side-load force of up to 10 lbs (4.5 Newtons), as imparted on the male bayonet connector, will not break the fluid-tight seal between the

portion 121(1)-121(2). In one embodiment, the proximal shaft portions 166(1)-166(2) may have a uniform outer diameter. In other embodiments, the proximal shaft portions may have an outer diameter that is either larger or smaller than the outer diameter of the sealing portion 121(1)-121(2).

[0039] The shafts 122(1)-122(2) may also each include an annular channel 124(1)-124(2) between the proximal portions 165(1)-165(2) and the sealing portions 121(1)-121(2) that provides for locking of male dual bayonet connector 102 with the female latch connector 206. As shown in FIG. 3, the annular channels 124(1)-124(2) include a bottom region 135(1)-135(2) that has a smaller outer diameter than the outer diameter of the sealing portion 121(1)-121(2). The distal end of each annular channel 124(1)-124(2) is bounded by a distal sidewall 103(1)-103(2) perpendicular to the axes of the cylindrical lumens 107(1)-107(2). The depth of the annular channels 124(1)-124(2) is defined by the difference between the radius of the sealing portion 121(1)-121(2) and the radius of the bottom region 135(1)-135(2).

[0040] As best shown in the top and side views of the male dual bayonet connector 102 in FIGS. 4 and 6, the proximal end of each annular recess 124(1)-124(2) may be defined by a chamfered or beveled edge 101(1)-101(2). The beveled edge 101(1)-101(2) may define an angle with respect to the axes of the cylindrical lumens 107(1)-107(2). For example, the surface defined by each beveled edge 101(1)-101(2) may form a 45-degree angle with respect to the axes of the cylindrical lumens 107(1)-107(2). The beveled edge 101(1)-101(2) interfaces with the proximal side of the latch plate 200, which forces the male dual bayonet connector 102 proximally and holds the perpendicular sidewall against the latch plate 200 of the female latch connector 206 in the annular channels 124(1)-124(2). This interface reduces movement of the male dual bayonet connector 102 with respect to the female latch connector 206 and thereby reduces wear of the sealing member 207 in the female latch connector 206. In other embodiments, beveled edges 101(1)-101(2) may be perpendicular to the axes of the cylindrical lumens 107(1)-107(2), may be curved, or alternatively, may define any other angle between 0 and 90 degrees.

[0041] The length D1 of the sealing surfaces 123(1)-123(2) of the shafts 122(1)-122(2) as shown in Fig. 3 may bear a relationship to the distance D2 from the perpendicular sidewall 103(1)-103(2) of the annular channels 124(1)-124(2) to the grip 178. In one embodiment, the ratio of the length D1 of the sealing surfaces 123(1)-123(2) to the distance D2 from the perpendicular sidewall 103(1)-103(2) to the grip 178 may be such that a side-load force of up to 10 lbs (4.5 Newtons), as imparted on the male bayonet connector 102, will not break the seal between the sealing surfaces 123(1)-123(2) and the sealing member 270 in the female connector 206. For example, in some implementations, the ratio of the length D1 to the distance D2 may be between 0.889 to 1.105.

[0063] It will be apparent to those of ordinary skill in the art that variations and alternative embodiments may be made given the foregoing description. Such variations and alternative embodiments are accordingly considered within the scope of the present invention.

[0064] As used herein, lumen refers not only to its definition, but also refers to an opening, aperture, or other passageway. The fluid referred to herein can be gaseous, liquid, or other state of material that is flowable through a tube (i.e., granular). In addition, while generally described above as sealed when connected together, the connector structures may be sealed or unsealed. The connection between the male dual bayonet connector and female latch connectors and their respective tube sections can be by means other than a barbed fitting, for example, but not limited to, threaded, press-fit without a barb, John Guest fitting, ferrule, and panel mount.

[0065] All directional references (e.g., upper, lower, upward, downward, left, right, leftward, rightward, top, bottom, above, below, inner, outer, vertical, horizontal, clockwise, and counterclockwise) are only used for identification purposes to aid the reader's understanding of the example of the invention, and do not create limitations, particularly as to the position, orientation, or use of the invention unless specifically set forth in the claims. Joinder references (e.g., attached, coupled, connected, joined, and the like) are to be construed broadly and may include intermediate members between a connection of elements and relative movement between elements. As such, joinder references do not necessarily infer that two elements are directly connected and in fixed relation to each other.

[0066] In some instances, components are described with reference to "ends" having a particular characteristic and/or being connected with another part. However, those skilled in the art will recognize that the present invention is not limited to components which terminate immediately beyond their points of connection with other parts. Thus, the term "end" should be interpreted broadly, in a manner that includes areas adjacent, rearward, forward of, or otherwise near the terminus of a particular element, link, component, part, member or the like. In methodologies directly or indirectly set forth herein, various steps and operations are described in one possible order of operation, but those skilled in the art will recognize that steps and operations may be rearranged, replaced, or eliminated without necessarily departing from the ~~spirit and~~ scope of the present invention.

[0067] The above specification, examples and data provide a complete description of the structure and use of exemplary embodiments of the invention. Although various embodiments of the invention have been described above with a certain degree of particularity, or with reference to one or more individual embodiments, those skilled in the art could make numerous alterations to the disclosed embodiments without departing from the spirit or scope of this invention. Other embodiments are therefore contemplated. It is intended that all matter contained in the above description and shown in the accompanying drawings shall be interpreted as illustrative only of particular embodiments and not limiting.

CLAIMS

What is claimed is

1. A male bayonet connector for connecting sections of tubing, comprising

a first shaft having ~~including~~ a first distal end portion and a first proximal end portion and defining a first lumen and a first annular channel proximal to and adjacent the first distal end portion; and

a grip extending around at least a portion of the first shaft; wherein

the first proximal end portion of the first shaft is configured to engage a first section of tubing and the first distal end portion of the first shaft has a first sealing surface configured to engage a first inner surface of a female receiving structure to create a fluid-tight seal;

the first annular channel is defined by a distal sidewall; and

a ratio of a length of the first sealing surface to a distance between the distal sidewall and the grip is such that a side-load force of up to 10 lbs (4.5 Newtons), as imparted on the male bayonet connector, will not break the fluid-tight seal between the first sealing surface and the first inner surface of the female receiving structure.

2. The male bayonet connector of claim 1, wherein the first distal sidewall defines a surface that is oriented substantially perpendicular to an axis of the first lumen.

3. The male bayonet connector of claim 1, wherein the first distal sidewall defines a surface for interfacing with a first latch structure within the female receiving structure so as to prevent removal of the male bayonet connector from the female receiving structure when the first latch structure engages the first annular channel.

4. The male bayonet connector of claim 1, wherein the grip extends axially away from the first shaft so as to define a flange around the first shaft.

5. The male bayonet connector of claim 4, wherein the flange defines an outer edge and the grip includes a plurality of indentations along the outer edge of the flange for facilitating gripping of the grip.

6. The male bayonet connector of claim 1, wherein the ratio of the length of the first sealing surface to the distance between the first distal sidewall and the grip is between 0.889 and 1.105.

7. The male bayonet connector of claim 1, wherein the first annular channel further defines a first beveled edge opposite the first distal sidewall.

8. The male bayonet connector of claim 7, wherein a surface of the first beveled edge defines an angle that is substantially 45 degrees with respect to an axis of the first lumen.

9. The male bayonet of claim 1, wherein the grip is positioned to prevent further insertion of the first shaft into the female receiving structure.

10. The male bayonet connector of claim 1, further comprising

a second shaft having a second distal end portion and a second proximal end portion and further defining a second lumen and a second annular channel proximal to and adjacent the second distal end portion, wherein

the second proximal end portion of the second shaft is configured to engage a second section of tubing and the second distal end portion of the second shaft has a second sealing surface configured to engage a second inner surface of a corresponding female receiving structure to create a fluid-tight seal;

the second annular channel is defined by a second distal sidewall; and

a ratio of a length of the second sealing surface to a distance between the second distal sidewall and the grip is such that a side-load force of up to 10 lbs (4.5 Newtons), as imparted on the male bayonet connector, will not break the fluid-tight seal between the second sealing surface and the second inner surface of the female receiving structure.

11. The male bayonet connector of claim 10, wherein the grip connects the first and second shafts.

12. The male bayonet connector of claim 11, wherein the grip extends axially away from the first shaft so as to define a first flange around the first shaft and axially away from the second shaft so as to define a second flange around the second shaft, and the first and second flanges are connected by a webbed portion therebetween.

13. The male bayonet connector of claim 12, wherein the webbed portion defines a recessed area between the first and second flanges.

14. The male bayonet of claim 10, wherein the wherein a distance between a first central axis of the first lumen and a second central axis of the second lumen is between 1.695 to 2.035 times the distance between the first distal sidewall and the grip.

15. A male bayonet connector for connecting sections of tubing, comprising

a first shaft having a first distal end portion and a first proximal end portion and further defining a first lumen and a first annular channel proximal to and adjacent the first distal end portion, wherein the first proximal end portion of the first shaft is configured to

engage a first section of tubing and the first distal end portion of the first shaft has a first sealing surface configured to engage a first inner surface of a female receiving structure to create a fluid-tight seal;

a second shaft having a second distal end portion and a second proximal end portion and further defining a second lumen, wherein the second proximal end portion of the second shaft is configured to engage a second section of tubing and the second distal end portion of the second shaft has a second sealing surface configured to engage a second inner surface of a female receiving structure to create a fluid-tight seal; and

a grip connecting the first and second shafts; wherein

the first annular channel is defined by a first distal sidewall that is perpendicular with respect to an axis of the first lumen and a first proximal sidewall having a beveled edge, and

a ratio of a length of the first sealing surface to a distance between the first distal sidewall to the grip is such that a side-load force of up to 10 lbs (4.5 Newtons), as imparted on the male bayonet connector, will not break the fluid-tight seal between the first sealing surface and the first inner surface of the female receiving structure.

16. The male bayonet connector of claim 15, wherein

the second shaft defines a second annular channel proximal to and adjacent the second distal end portion,

and further defines a second annular shelf defining a distal wall of the second annular channel and a second beveled edge defining a proximal wall of the second annular channel,

the second annular shelf defines a surface that is perpendicular with respect to an axis of the second lumen, and

a ratio of a length of the second sealing surface to a distance from the second annular shelf to the grip is such that a side-load force of up to 10 lbs (4.5 Newtons), as imparted on the male bayonet connector, will not break the fluid-tight seal between the second sealing surface and the second inner surface of the female receiving structure.

17. The male bayonet connector of claim 15, wherein the grip extends axially away from the first and second shafts so as to define a first flange around the first shaft and a second flange around the second shaft.

18. The male bayonet connector of claim 16, wherein the first and second shafts are connected by a webbed portion that extends between the first and second flanges.

19. The male bayonet connector of claim 16, wherein the grip defines an outer edge and includes a plurality of indentations along the outer edge of the grip for facilitating gripping of the grip.