

PATENT COOPERATION TREATY**TITLE:** CATHETER TUBING SYSTEM**INVENTOR(S):** MATTHEW G. MCINTYRE, DENEEN T. PLESSALA, PETER T. FALKNER**[0001] RELATED APPLICATIONS**

[0002] This application claims priority to U.S. Provisional Application No. 62/633,951 filed 22 February 2018. The entire contents of the above application are hereby incorporated by reference as though fully set forth herein.

[0003] FIELD

[0004] The present invention relates in general to catheter tubing. More specifically, the present invention relates to a multi-tube catheter tubing assembly device for a urinary catheter.

[0005] BACKGROUND

[0006] It is well known in the art that indwelling urinary catheter systems, such as a Foley catheter consists of two lumens: (i) one for drainage of urine from the bladder and (ii) a second lumen used to inflate the retention balloon that lies within the bladder to hold the catheter in place. A triple lumen catheter currently in the art has an additional lumen for instillation of fluid into the bladder. In place of the third lumen used to instill fluid, this optional lumen may be used in order to continuously efflux fluid and irrigate the periurethral space and the catheter body to prevent formation of biofilm and further ensuing bacterial infection. The fluid instilled generally includes certain therapeutic agents used in intravesical therapy such as immunotherapy agents or chemotherapeutic

agents, antispasmodic agents and numbing agents, such as lidocaine. The fluid effluxed generally includes antiseptics, antibiotics or antimicrobials and/or combinations thereof to prevent biofilm formation on the exterior surface of the catheter body. Such a catheter system is more fully described in patent application number PCT/US17/26450, the contents of which are incorporated by reference herein.

[0007] While the use of a multi-lumen tubing system is preferred, present systems known in the art utilize long separate catheter tubes that connect each catheter lumen to its opposing end source, whether it be the drainage container for the drainage lumen or the fluid container used to instill fluid or irrigate the periurethral space and catheter body. Often, these separate tubes have a tendency to tangle with themselves and the patient's body and become cumbersome for the patients and the medical staff while treating the patient. It is therefore an object of the present invention to provide a catheter tubing device assembly to reduce tangling with other tubing or the patient's body.

[0008] **BRIEF SUMMARY OF THE INVENTION**

[0009] The preferred embodiment of the present invention comprises a drainage tube and a fluid delivery tube, each having an exterior surface and connectors on both its ends wherein the tubes are bundled together by having a portion of the exterior surface of the drainage tube is fixedly attached to a portion of the exterior surface of said fluid delivery tube. In the case of multiple fluid delivery lumens, the present invention anticipates having a plurality of fluid delivery tubes wherein a portion of the exterior surface each tube is fixedly attached to the exterior surface of another tube in the assembly. The connector on the first end of the drainage tube is operable to attach to a drainage lumen of a urinary catheter, and the connector on the second end is operable to attach to a container for holding

the drained fluid. The connectors on the first end of the fluid delivery tube(s) are operable to attach to a fluid delivery lumen of a urinary catheter, and the connector on the second end is operable to attach to a container assembly for holding the fluid to be delivered. As an additional option, the inside diameter of the drainage tube may be greater than the diameter of any fluid delivery tube. Similarly, the upper portion of the tubes between the catheter and attachment portion is necessarily longer to prevent kinks in the tubing.

[00010] BRIEF DESCRIPTION OF THE DRAWINGS

[00011] Figure 1. Figure 1 is a side view of the catheter tubing device assembly of the present invention showing a drainage tube and a plurality of fluid delivery tubes.

[00012] Figure 2. Figure 2 is a side view of the catheter tubing device assembly of the present invention attached to a multi-lumen urinary catheter.

[00013] DETAILED DESCRIPTION

[00014] Turning to Fig. 1, the catheter tubing assembly device of the present invention is shown in detail and comprises a drainage tube **10** having an exterior surface with a first end **20** and a second end **30**, and a plurality of fluid delivery tubes **40** each having an exterior surface, a first end **50**, and second end **60**. In order to prevent entanglement of these tubes, an attachment portion **70** of the exterior surface of the drainage tube is fixedly attached to a portion of the exterior surface of the fluid delivery tube **40** such that the tubes form a bundle. The attachment portion **70** may be prefabricated such that the assembly constitutes a contiguous body or the individual tubes can be separately bonded together using bonding means known in the art, e.g. adhesives, glues, or epoxies. Although not shown in the figures, for this patent, the present invention only requires at least one drainage tube **10** and at least one fluid delivery tube **40**, to be compatible with a typical triple lumen urinary catheter.

Moreover, as shown in Fig. 1, the drainage tube diameter, i.e. the inner diameter of the tube, is necessarily larger than the inner diameter of the fluid delivery tubes.

[00015] The drainage tube **10** has a first drainage tube connector **80** at its first end **20** and a second drainage tube connector **90** at its second end **30**. The fluid delivery tube **40** has a first delivery tube connector **100** at its first end **50**, and a second fluid delivery tube connector **110** at its second end **60** operable to attach to a container assembly known in the art for holding fluid that is to be delivered.

[00016] Based on the multi-lumen design of the catheter, in order to avoid kinks or looping in the entire catheter tubing system. the upper portions **120** of each tube in the assembly, i.e. the length of tubing between the first ends **20, 50** and the attachment portion **70**, is necessarily longer than lower portions **130** of each tube, i.e. the length of tubing between the second ends **30, 60** and the attachment portion **70**.

[00017] Turning to Fig. 2, the embodiment of the invention displayed in Fig. 1 is shown being used with a 3-way catheter as described in patent application number PCT/US17/26450. This catheter is merely illustrative of the general components of a 3-way catheter known in the art and how the terminal ends of such a catheter are used in combination with the subject catheter tubing assembly device. An elongated tubular catheter body **601** having a distal end **602** and a proximal end **603** is shown. A drainage lumen **604** extends through tube **617** in the catheter body **601** from the distal end **602** to the proximal end **603**, and the drainage lumen **604** communicates with an opening or eyelet **605** in the catheter body **601** at the distal end **602** of the catheter body **601** through which the fluid may flow into the drainage lumen **604** when the catheter is used to drain a fluid from a cavity, duct, or vessel (e.g., draining urine from a person's bladder). A first sleeve portion **606** constructed from a semipermeable membrane is formed over the catheter body

601. A fluid delivery lumen **607** extends from the catheter body **601** at the distal end **602**. The fluid delivery lumen **607** connects with the first sleeve portion **606** using tube **616** that runs through the length of the catheter body **601**. The fluid delivered into the catheter body **601** through the tube may be continuously effluxed from the sleeve portion **606** through the semipermeable membrane in a circumferential controlled delivery to continuously irrigate the periurethral space and the catheter body **601** to prevent formation of biofilm and further ensuing bacterial infection. However, the sleeve portion **606** is not required as the fluid may be used to continuously or intermittently irrigate the bladder using a traditional 3-way Foley catheter.

[00018] A second sleeve portion **609** constructed from a semipermeable membrane is formed over the catheter body **601** above the tube section **610**. A second fluid delivery lumen **611** extends from the catheter body **601** at the distal end **602**. The fluid delivery lumen **611** connects with the sleeve portion **609** using tube **618** that runs through the length of the catheter body **601**. The fluid delivered into the catheter body **601** through the tube **618** is continuously effluxed from the sleeve portion **609** through the semipermeable membrane and into the bladder itself.

[00019] The first drainage tube connector **80** is operable to attach to the cylindrical drainage lumen **604** by using attachment means known in the art, including using an open-ended cylindrical cap, as shown in the figure, that is force fitted over the drainage lumen **604**. The second drainage tube connector **90** is operable to attach to a container assembly known in the art for holding fluid that is drained by using attachment means known in the art, including using an open-ended conically shaped cap, and shown in the figure, that is force fitted within the inlet lumen for the drainage container (not shown).

[00020] The first fluid delivery tube connector **100** is operable to attach to the terminal ends of the fluid delivery lumens **607**, **611** and the second fluid delivery tube

connector **110** is operable to attach to a container assembly known in the art for holding fluid that is to be delivered (not shown). The first and second delivery tube connectors **100, 110** are selected from a group of pressurized connectors known in the art, including but not limited to male/female locking mechanisms, such as Leur locks. The terminal ends of the fluid delivery lumens **607, 611** for a urinary catheter may be male or female. In Fig. 2, the first delivery tube connector **100** comprises a female connector that attaches to the male terminal end of the fluid delivery lumen **607, 611** and the second fluid delivery tube connector **110** comprises a male connector that attaches to the inlet lumen for fluid container (not shown).

[00021] Obviously, the bundling of multiple fluid delivery tubes **40** makes it difficult on the user to make sure that the connectors **100, 110** of each tube are attached to the proper catheter lumen and fluid delivery container. In order to prevent such a problem, the present invention optionally may include a marking system on its connectors **100, 110** so that the user can easily distinguish the connectors **100, 110** of one fluid delivery tube **40** from another when making necessary connections. Such markings on the connectors may be made by using different colors, alternative fitting configurations, or different inscriptions on the fitting connector itself, or any other comparable marking mechanism known in the art.

[00022] Although not shown in the figures, the invention anticipates having sufficient length and space on each individual fluid delivery tube **40** to accommodate a roller clamp. These clamps are well known in the art and are used to adjust the volumetric flow of fluid through the catheter by adjustably clamping the flexible catheter tubing. For the present invention, the roller clamp would be positioned around an exterior portion of the tube either before or after the attachment portion **70** of the tube **40** that is fixedly attached to another fluid delivery tube **40** or drainage tube **10**.

[00023] For the purposes of promoting an understanding of the principles of the invention, reference has been made to the preferred embodiments illustrated in the drawings, and specific language has been used to describe these embodiments. However, this specific language intends no limitation of the scope of the invention, and the invention should be construed to encompass all embodiments that would normally occur to one of ordinary skill in the art. The particular implementations shown and described herein are illustrative examples of the invention and are not intended to otherwise limit the scope of the invention in any way. For the sake of brevity, conventional aspects of the system (and components of the individual operating components of the system) may not be described in detail. Furthermore, the connecting lines, or connectors shown in the various figures presented are intended to represent exemplary functional relationships and/or physical or logical couplings between the various elements. It should be noted that many alternative or additional functional relationships, physical connections or logical connections may be present in a practical device. Moreover, no item or component is essential to the practice of the invention unless the element is specifically described as “essential” or “critical”. Numerous modifications and adaptations will be readily apparent to those skilled in this art without departing from the spirit and scope of the present invention.