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EP-A1- 1 747 796
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WO-A1-2009/095760
US-A- 5 269 771

DESCRIPTION

Field of the invention

[0001] The present invention regards connectors for medical lines, particularly for hemodialysis lines, of the type comprising a male luer lock valved fitting and a female luer fitting that can be engaged with the male luer lock fitting.

State of the prior art

[0002] Document WO 2009/095760 (EP-2237830B1) on behalf of the Applicant reveals a connector thus made in which the male luer lock valved fitting comprises an outer body, an inner tubular element axially displaceable with respect to the outer body between a receded position and an advanced position, and a hollow element made of elastic material interposed between the outer body and the inner tubular element and having a transversal end wall formed with a pre-cut: in the receded position of the inner tubular element, the pre-cut is closed, so as to cut off the flow between the female luer lock fitting and the male luer lock fitting. The connector further comprises a rotatable ring nut on the outer body of the male luer lock fitting and having an inner threading that can be screwed with an outer thread of the female luer lock fitting, after the latter is axially engaged on the inner tubular element.

[0003] When the ring nut is screwed, the inner tubular element is displaced from the receded position towards the advanced position compressing the hollow element made of elastic material and deforming the transversal end wall of the latter so as to open the pre-cut.

[0004] Furthermore, in this known valved connector, the inner luer cone of the female luer lock fitting is suitable to be engaged by friction with the outer luer cone of the inner tubular element before the screwing of the rotatable ring nut, and to maintain the friction engagement after unscrewing the rotatable ring nut.

[0005] When the slidable inner tubular element is in the receded closing condition, there occurs a given axial distance between the end thereof and the transversal wall of the elastic hollow element. According to this arrangement, the opening of the pre-cut and thus the flow path between the female luer lock fitting and the male luer lock valved fitting, occurs gradually, thus - in some applications and in hemodialysis lines in particular - it can give rise to serious inconveniences for the patient. The closure of the pre-cut also occurs gradually following the unscrewing of the rotatable ring nut.

Summary of the invention

[0006] The object of the present invention is to provide a valved connector of the type described above in which the opening of the flow between the female luer lock fitting and the male luer lock valved fitting, as well as the relative reclosing, are made in an ON/OFF switch-like manner.

[0007] According to the invention, this object is obtained due to the fact that, in a valved connector as defined in the pre-characterised part of claim 1, in the aforementioned receded position said inner tubular element of the male luer lock fitting is in substantial contact with said transversal end wall of the hollow element made of elastic material thus, when the inner luer cone of the female luer lock fitting is engaged by friction with said inner tubular element axially pushing it even before the unscrewing of said rotatable ring nut with the female luer lock fitting, said pre-cut is instantly fully opened, and when said ring nut ceases the unscrewing from the female luer lock fitting, said pre-cut fully re-closes instantly.

Brief description of the drawings

[0008] The invention will now be described in detail with reference to the attached drawings, provided purely by way of non-limiting example, wherein:

- figure 1 is a longitudinal sectional view of a valved connector according to the invention, represented in the disabled condition i.e. the closure of the flow,
- figure 2 is a view analogous to figure 1 showing the valved connector in the previously enabled condition i.e. the opening of the flow, with the threaded coupling not engaged, and
- figure 3 is a view analogous to figures 1 and 2 showing the valved connector in a condition, still enabled, subsequent to the one of figure 2 and with the threaded coupling engaged.

Detailed description of the invention

[0009] Initially with reference to figure 1, the connector for medical lines according to the invention comprises a male luer lock valved fitting 1 and a female luer lock fitting 2 that can be axially engaged with the male luer lock fitting 1.

[0010] The male luer lock fitting 1 comprises an outer tubular body 3 having a proximal end on which a ring nut 4 is coaxially rotatable and a distal end which forms a connector 5 intended to be connected to a section of the medical line, for example a duct connected to a hemodialysis equipment.

[0011] The male luer lock fitting 1 further comprises an inner tubular element 6 axially mounted

slidable, with respect to the outer tubular body 3, between a receded position represented in figure 1 and a fully advanced position in the direction of the connector 5 represented in figure 3, passing through the partly advanced position illustrated in figure 2.

[0012] The inner tubular element 6 has a portion 7 projecting outside the rotatable ring nut 4 and shaped like an outer luer cone, and - on the opposite side - a portion 8 having outer radial projections 9 slidably but not rotatably coupled with the outer body 3. The projections 9, in the receded position of the inner tubular element 6, abut against an inner annular stop flange 10 of the outer body 3, and such receded position of the inner tubular element 6 is maintained due to the action of a hollow element made of elastic material 11 which is interposed coaxially and substantially sealingly between the outer body 3 and the portion 8 of the inner tubular element 6. This element made of elastic material 11 substantially integrates three functions: a first function, as mentioned, for elastically pushing the inner tubular element 6 towards the receded position; a second function for the slidable sealing of the portion 8 of the tubular element 6; and a third function consisting in defining a valved flow path through the male luer lock fitting 1. For this purpose, the hollow element made of elastic material 11 has a transversal end wall 12 facing the connector 5 of the outer body 3 and formed with a central pre-cut 13. On the opposite end, the hollow element made of elastic material 11 rests against the radial appendages 9 of the inner tubular element 6, and - in the intermediate part thereof - it has a more elastically yieldable wall, formed with alternated helical ribs and grooves 14, for example according to the description provided for in document EP-1747796A1.

[0013] The pre-cut 13 is normally maintained hermetically closed due to a suitable radial preload of the transversal wall 12.

[0014] According to the distinctive characteristic of the invention, when the inner tubular element 6 is arranged with the radial appendages 9 resting against the inner annular stop flange 10, the free end of the portion 8 thereof is in immediate axial proximity and conveniently in substantial front contact with the transversal wall 12 of the hollow element made of elastic material 11.

[0015] The female luer lock fitting 2 conventionally has - on the one side - an inner luer cone 15 complementary to the outer luer cone of the portion 7 of the inner tubular element 6, and - on the other side - a connector 18 that can be connected to the medical line, for example to a duct connected to a patient subjected to dialysis. The portion 15 is formed externally with an end thread 16 that can be engaged with an inner threading 17 of the rotatable ring nut 4.

[0016] Figure 1 represents the condition in which the inner luer cone 15 of the female luer lock fitting 2 is engaged on the outer luer cone of the portion 7 of the inner tubular element 6, before the thread 16 is engaged with the threading 17 of the rotatable ring nut 4. In this condition, the conical surfaces 15 and 7 are friction-coupled to each other, and the outer tubular element 6 is in the receded position with the pre-cut 13 maintained closed. As previously mentioned, according to the distinctive characteristic of the invention, in this condition the inner tubular element 6 is arranged, at the free end of the portion 8 thereof, in

substantial contact with the transversal wall 12 of the hollow element made of elastic material 11.

[0017] Should - even before the threading 17 of the ring nut 4 can engage the thread 16 of the female luer lock fitting 2 - the latter be axially pushed to the position represented in figure 2, the inner tubular element 6 is in turn axially pushed by the female luer lock fitting 2 towards the advanced position and fully opens the pre-cut 13, as represented in figure 2: thus, the flow path through the valved connector promptly opens even before the rotatable ring nut 14 is screwed on the female luer lock fitting 2.

[0018] When the thread 16 engages the threading 17 and the ring nut 4 is rotated being screwed on such thread 16, as represented in figure 3, the valved connector is already fully open: the inner tubular element 6 is arranged in a fully advanced position, with the portion 8 thereof abundantly projecting beyond the pre-cut 13 and the hollow element made of elastic material 11 fully axially compressed.

[0019] When the rotatable ring nut 4 is unscrewed, the inner tubular element 6 is firstly displaced to the intermediate position of figure 2, due to the return of the hollow element made of elastic material 11 towards the undeformed condition as well as the drawing - by friction - by the female luer lock fitting 2, until it returns to the fully receded position of figure 1 in which the outer radial projections 9 abut against the inner annular flange 10. Upon reaching such position, in which the ring nut 4 is fully unscrewed, the pre-cut 13 fully recloses instantly, while the inner luer cone 15 of the female luer lock fitting 2 and the outer luer cone 7 of the inner tubular element 6 remain mutually engaged by friction and thus can be axially mutually separated intentionally.

[0020] Thus, basically the valved connector according to the invention is advantageously provided with an operation of the ON-OFF type, i.e. with the full opening of the flow already before the screwing of the rotatable ring nut 4, and an equally full and immediate reclosing the flow as soon as the rotatable ring nut 4 ceases unscrewing from the female luer lock fitting 2.

[0021] Obviously, the construction details and the embodiments may widely vary with respect to what has been described and illustrated, without departing from the scope of protection of the present invention as described in the claims that follow.

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO2009095760A [0002]
- EP2237830B1 [0002]
- EP1747796A1 [0012]

Patentkrav

1. Ventilkonnektor til medicinske ledninger, især hæmodialyseledninger, omfattende en han-luer-lås-ventilfitting (1) og en hun-luer-lås-fitting (2), der kan gå i indgreb med han-luer-lås-fittingen (1), hvor han-luer-lås-fittingen (1) omfatter et udvendigt legeme (3), et indvendigt rørformet element (6), der kan forskydes aksialt og i forhold til det udvendige legeme (3) mellem en tilbagetrukket position og en fremført position, og et hult element, der er fremstillet af et elastisk materiale (11), anbragt imellem det udvendige legeme (3) og det indvendige rørformede element (6) og med en tværgående endevæg (12), der er udformet med en forhåndsudskæring (13), der - i det indvendige rørformede elements (6) tilbagetrukne position - er lukket for at afskære flowet mellem hun-luer-lås-fittingen (2) og han-luer-lås-fittingen (1); hvor det udvendige legeme (3) af han-luer-lås-fittingen (1) er forsynet med en roterbar ringnot (4) med et indvendigt gevind (17), der kan skrues sammen med et udvendigt gevind (16) af hun-luer-lås-fittingen (2),
og hvor det indvendige rørformede element (6) kan forskydes fra den tilbagetrukne position mod den fremførte position, hvorved det hule element, der er fremstillet af elastisk materiale (11), presses sammen og deformerer den tværgående endevæg (12), således at forhåndsudskæringen (13) åbnes, og hun-luer-lås-fittingen (2) har en indvendig luer-kegle (15), der er egnet til aksialt at gå i friktionsindgreb med det indvendige rørformede element (6) allerede før skruningen og endda efter afskruningen af den roterbare ringnot (4) i forhold til det udvendige gevind (16) af hun-luer-lås-fittingen (2), **kendetegnet ved, at**
i den ovennævnte tilbagetrukne position er det indvendige rørformede element (6) af han-luer-lås-ventilfittingen (1) i direkte aksial nærhed af og i frontkontakt med den tværgående endevæg (12) af det hule element, der er fremstillet af elastisk materiale (11), hvorved forhåndsudskæringen (13) åbnes fuldstændigt, når den indvendige luer-kegle (15) er i friktionsindgreb med det indvendige rørformede element (6) for aksialt at skubbe det mod den fremførte position endda før det indvendige gevind (17) af den roterbare ringnot (4) kan gå i indgreb med det udvendige gevind (16) af hun-luer-lås-fittingen (2), og forhåndsudskæringen (13) lukker igen fuldstændigt med det samme, når ringnoten (4) er afskruet helt fra hun-luer-lås-fittingen (2).

DRAWINGS

FIG. 1

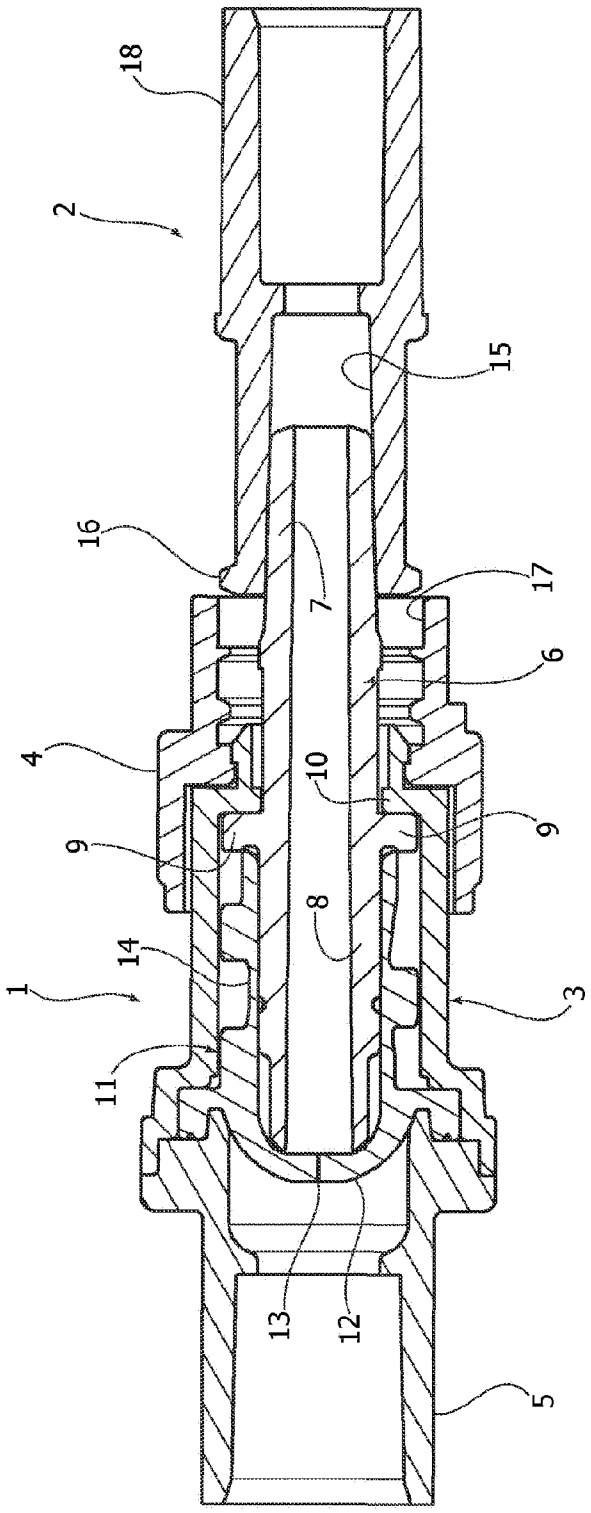

FIG. 2

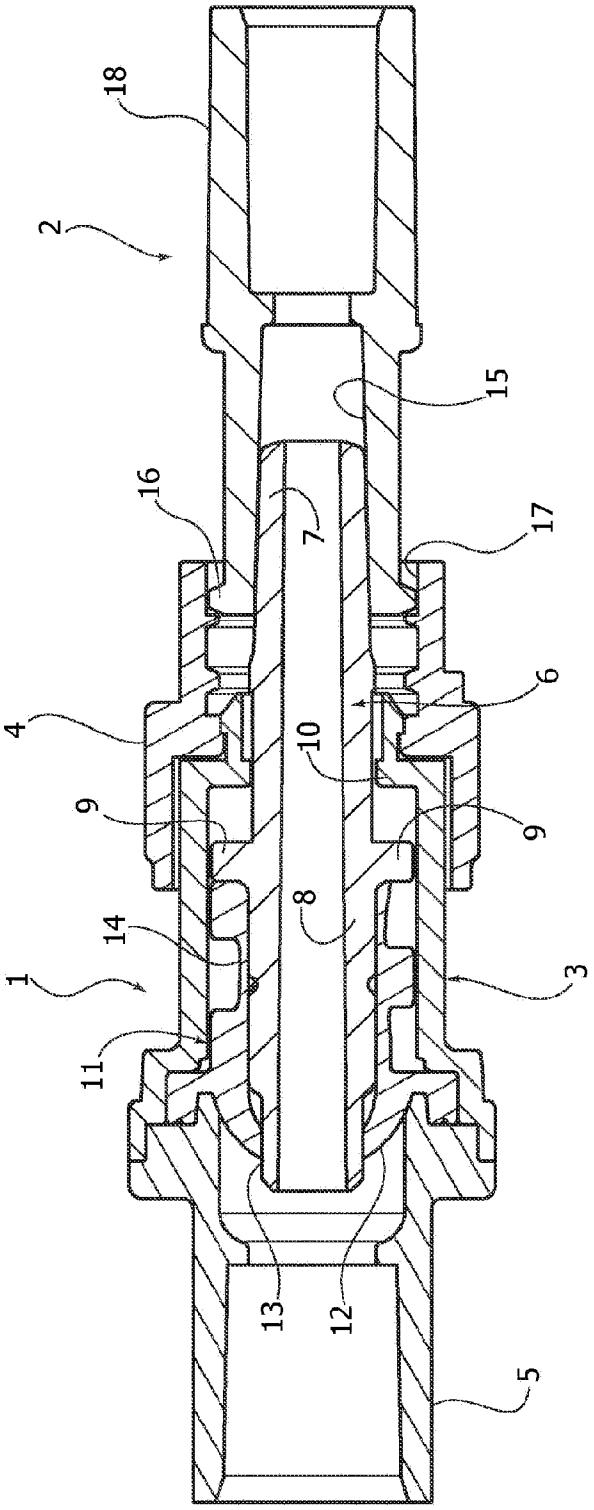

FIG. 3