"MEDICAL VALVE CONNECTOR"

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Field of the invention

The present invention relates in general to connectors, for example medical ones, which comprise a tubular body having an inlet fitting of the male luer or luer-lock type which can be connected by screwing to a complementary female luer or luer-lock fitting, an outlet fitting coaxial to the inlet fitting, and means defining a passage of flow between said inlet and outlet fittings.

More in particular, the invention relates to a medical connector of the type defined above with valve function, i.e., in which the passage of flow between the inlet and outlet fittings is kept closed substantially hermetic way in the absence of the complementary female luer or luer-lock fitting screwed on the male inlet luer or luer-lock fitting.

State of the prior art

From the documents Nos. US-6,299,132 and US-6,543,745 a valve connector of this sort is known, in which the male luer-lock inlet fitting comprises an outer tubular element and an inner tubular element axially displaceable but not rotationally displaceable with respect to the tubular outer body, following coupling with the complementary female luer-lock fitting, from a retracted position for closing to an advanced position for opening of the passage of flow. In said known solutions, sealing means are provided that can slide between the inner tubular element of the male luer-lock inlet fitting and the body of the connector, constituted by annular gaskets housed in corresponding external grooves of the inner tubular element. Elastic means are moreover provided, which

tend to keep the inner tubular element of the male luer-lock inlet fitting in the aforesaid retracted position, constituted in the first case by a spring or else by an elastic body, and in the second case also by a spring. The passage of flow in the advanced opening position of the inner tubular body is in both cases defined by a generally annular peripheral path, in which the flow is in contact with the wall of the tubular body of the connector.

In addition to a relatively complex construction, on account of the conformation both of the sliding-seal means through the inner tubular element of the male luer-lock fitting, and of the passage of flow, these known solutions entail the risk of contamination of the flow itself from the inlet fitting to the outlet fitting of the connector.

Summary of the invention

The purpose of the present invention is to overcome the aforesaid drawbacks and, in particular, to provide a medical valve connector of the type defined at the start of the present description, which is built in a simpler and more essential way and is moreover designed to eliminate the risks of contamination of the flow that traverses it.

According to the invention, the above purpose is achieved basically thanks to the fact that said means that define the passage of flow, said sliding-seal means, and said elastic means are integrated in a generally tubular body made of elastic material set axially in a sealed way between said inlet and outlet fittings of the valve connector.

According to a first embodiment of the invention, the inner tubular element of the male luer or luer-lock inlet fitting is open at its internal end, and the tubular body made of elastic material is formed with a

transverse diaphragm having a pre-cut, which can be opened elastically by said internal end of said inner tubular element when the latter sets itself in the advanced opening position.

According to a variant of the invention, the inner tubular element of the male luer or luer-lock inlet fitting is closed at its internal end and has in the proximity thereof at least one radial passage, and the tubular body of elastic material defines a chamber which is open towards the outlet fitting and within which said at least one radial passage sets itself in the advanced position for opening the aforesaid inner tubular element.

The outlet fitting of the valve connector according to the invention can consist of a simple tubular element for direct connection to a pipe, or else of a fitting of the female luer or luer-lock type that can be engaged by screwing to a complementary male luer or luer-lock fitting. In either case, the outlet fitting can be advantageously connected to the body of the connector in a rotary way. In the case of an outlet fitting of the female luer or luer-lock type, this can be conveniently axially translatable from a retracted position to an advanced position against the action of the aforesaid tubular body of elastic material, and provided between said outlet fitting and the body of the connector are first and second one-directional detent means, of which the first prevent rotation between the outlet fitting and the body of the connector in a first direction of rotation corresponding to the direction of screwing of the complementary male luer or luer-lock fitting to said outlet fitting when the latter is set in the aforesaid retracted position, and the second prevent rotation between said outlet fitting and the body of the

connector in a second direction of rotation corresponding to the direction of unscrewing of the complementary male luer-lock fitting when the outlet fitting is translated into the advanced position. In this way, screwing between the female luer or luer-lock fitting of the connector and the complementary male luer or luer-lock fitting is obtained normally as in the case of traditional medical connectors of the same type, whilst unscrewing thereof can be performed only following upon a translation of the female luer or luer-lock fitting towards the inside of the body, performed positively against the action of the tubular body made of the elastic material. In the absence of said positive and voluntary translation, a rotation of unscrewing of the complementary male luer or luer-lock fitting simply causes a corresponding rotation of the female luer or luer-lock fitting of the connector with respect to the body. This advantageously prevents any accidental or undesirable separation between the connector according to the invention and the medical line connected in use to the complementary male luer or luer-lock fitting.

When the male luer or luer-lock inlet fitting of the connector is in turn engaged with a complementary female luer or luer-lock fitting, and consequently its inner tubular element is set in the advanced opening position, the translation of the female luer or luer-lock outlet fitting of the connector towards the advanced position is blocked and prevented by the contrast against said inner tubular element. In this condition therefore, unscrewing of the complementary male luer or luer-lock fitting is prevented on account of the free rotation of the female luer or luer-lock outlet fitting with respect to the body of the connector, in the direction of rotation which

corresponds to unscrewing of the complementary male luer or luer-lock fitting.

According to a further characteristic of the invention, the inner tubular element of the male luer or luer-lock inlet fitting of the connector can moreover be conveniently provided with manoeuvring means projecting on the outside of the body of the connector for controlling manually axial displacement of the inner tubular element from the retracted position to the advanced one, even in the absence of coupling with the complementary female luer or luer-lock fitting, so as to be able to provide, if need be, manual engagement of the connector precisely through a controlled opening of the passage of flow between the inlet fitting and the outlet fitting.

Brief description of the drawings

Further characteristics of the invention will emerge clearly evident in the course of the ensuing detailed description, with reference to the annexed plate of drawings, which are provided purely by way of non-limiting example and in which:

- Figure 1 is a schematic perspective view of a first example of embodiment of the medical valve connector according to the invention;
- Figure 2 is an axial cross-sectional view of the connector in a first operating condition;
- Figure 3 is a view similar to that of Figure 2 in a second operating condition of the connector;
- Figure 4 is a view similar to that of Figure 2 of a first variant of the connector;
- Figure 5 is a view similar to that of Figure 2 of a second variant of the connector;
- Figure 6 is a perspective view similar to that of Figure 1 of a third variant of the connector according to the invention;

- Figure 7 is an axial cross-sectional view of the connector of Figure 6 in a first operating condition;

- Figure 8 is a view similar to that of Figure 7, with the connector in a second operating condition;

- Figure 9 is a view similar to that of Figure 7 in a third operating condition;

- Figure 10 is an exploded perspective view at a larger scale of the body of the connector represented in Figures 6 to 9;

- Figure 11 is a perspective view, at a larger scale, of the outlet fitting of the connector represented in Figures 6 to 9;

- Figure 12 is a perspective view, at a larger scale, of the elastic tubular body of the connector according to Figures 6 to 9;

- Figure 13 is a view similar to that of Figure 1 showing a fourth variant of the connector according to the invention;

- Figure 14 is an axial sectional view of the connector of Figure 13 in a first operating condition;

- Figure 15 is a view similar to that of Figure 14 in a second operating condition;

- Figure 16 is a view similar to those of Figures 14 and 15 in a third operating condition of the connector;

- Figure 17 is a perspective view at a larger scale of a detail of the connector represented in Figures 13 to 16;

- Figure 18 is an axial sectional view of a fifth variant of the connector according to the invention, represented in a first operating condition; and

- Figure 19 is a view similar to that of Figure 18 in a second operating condition of the connector.

Detailed description of the invention

With initial reference to Figures 1 to 3, number 1

designates as a whole a valve connector according to the invention, basically comprising a tubular body 2 provided, coaxially with respect to its opposite ends, with an inlet fitting 3 and with an outlet fitting 4, both of which can be connected, in the way clarified in what follows, to respective parts of a medical line, for example an infusion line. The components of the medical connector 1 described above are all made of moulded plastic material.

With reference now in greater detail to Figure 2, the inlet fitting 3 is of the male luer or luer-lock type, with an external hollow element 5 internally threaded and formed integrally with the body 2, and an inner tubular element 6, which can slide axially with respect to the external element 5. Said male luer-lock fitting 3 (referred to in what follows for reasons of brevity as “inlet fitting”) can be connected by screwing, in a way in itself known, to a complementary female luer or luer-lock fitting, for example generally similar to the outlet fitting 4. Said female luer-lock fitting 4 (in what follows simply referred to as “outlet fitting”) has a cavity having a conical surface 7 and an external thread 8. When a female luer-lock connector of this sort is engaged with the inlet connector 3, by screwing the thread 8 within the internal thread of the external element 5, the cavity having a conical surface 7 engages the external surface of the inner tubular element 6, designated by 9, which is also conical, with a conicity complementary to that of the cavity 7.

In the case of the example described herein, the outlet fitting 4 has an annular flange 10 rigidly fixed within a widened end part 11 of the body 2, which has an ergonomic conformation with recesses 12 designed to facilitate manual gripping thereof.

As mentioned previously, the inner tubular element 6 of the inlet fitting 3 is axially mobile with respect to the body 2 between the retracted position, represented in Figure 2, and an advanced position in the direction of the outlet fitting 4, represented in Figure 3. Said inner tubular element 6 is formed, approximately in a median area thereof, with an annular flange 13 of polygonal shape or star shape, coupled in a slidable but not rotary way with corresponding internal longitudinal grooves 13a of the body 2. The flange 13, in the retracted position of Figure 2, rests against an internal annular arrest collar 14, formed integrally with the body 2. This position is maintained thanks to the action of a tubular body of elastic material 15, which, according to the invention, is set substantially in a sealed way between the inlet fitting 3 and the outlet fitting 4.

This body of elastic material 15 integrates, according to the invention, three substantial functions: a first function, as mentioned, of thrust of the inner tubular element 9 towards the retracted position; a second function of sliding seal between the inner tubular element 6 and the body 2; and a third function consisting in the definition of a passage of flow between the inlet fitting 3 and the outlet fitting 4.

In the embodiment described here, the tubular body of elastic material 15 has, at one end, an annular part 16 in front-sealing contact against the flange 10 of the outlet fitting 4 and in lateral-sealing contact with the internal wall of the body 2, an opposite end 17 resting against the annular flange 13 of the inner tubular element 6, and an intermediate part 18, formed internally with one or more integral seal rings 19 in sliding contact against the wall of the inner tubular

element 6 and formed externally with a wall 20 that is elastically more compliant in an axial direction. Said wall 20 conveniently has a conformation with alternating helical ribbings and grooves 20, 21, in the way represented in Figure 12, albeit with reference to an elastic tubular body 15 of a shape different from that of Figures 2 and 3, which will now be further described in greater detail in what follows.

In addition, the elastic tubular body 15 of the embodiment described here has, between the end 16 and the intermediate part 18, a transverse diaphragm 22 formed with a central pre-cut 23, which is normally closed hermetically as a result of an appropriate radial pre-loading between the elastic tubular body 15 and the body 2 of the connector 1.

The inner tubular element 6 has an internal end 6a facing the side of the diaphragm 22, open axially.

Operation of the connector set forth above is described in what follows.

In the absence of coupling between a female luer-lock fitting (as mentioned, generally corresponding to the outlet fitting 4) and the inlet fitting 3, the inner tubular element 6 of said inlet fitting 3 is kept by the elastic tubular body 15 in the retracted position represented in Figure 2. In said condition, the passage of flow between the inlet fitting 3 and the outlet fitting 4 is obstructed, and hence closed hermetically, by the transverse diaphragm 22 of the elastic tubular body 15.

When a complementary female luer-lock fitting is engaged and screwed to the inlet fitting 3, the interaction between the corresponding conical surfaces causes axial translation of the inner tubular element 6 from the retracted position of Figure 2 to the advanced position of Figure 3. As a result of said advance, the

inner tubular element 6 is pressed against the diaphragm 22 of the elastic tubular body 15 and opens the pre-cut 23, without, however, traversing the diaphragm 22 with its open end 6a, deforming accordingly the elastic tubular body 15 and thus opening the passage of flow between the inlet fitting 3 and the outlet fitting 4. During this movement, the inner tubular element 6 slides in a sealed way against the integral ring or rings 19 of the elastic body 15, and at the end of its travel (corresponding to the screwing home of the female luer-lock fitting engaged with the inlet fitting 3) the inner tubular element 6 is stopped in the advanced position, as a result of the contrast between external projections 24, formed at the end of the conical surface 9 and corresponding complementary projections 25 of the internal annular flange 14. Obviously, the conformation and arrangement of this system of arrest could differ from the one illustrated.

When the female luer-lock fitting thus screwed is unscrewed and decoupled from the inner tubular element 6, this is brought back by the elastic return of the tubular body 15 into the retracted position of Figure 2, thus enabling reclosing of the pre-cut 23 and hence of the passage of flow between the inlet fitting 3 and the outlet fitting 4.

The variants of the connector that will be described hereinafter are generally similar to the embodiment illustrated previously, and only the differences will be described in detail, using the same reference numbers for the parts that are identical or similar.

In the case of Figure 4, the connector differs from that of Figures 1 to 3 only as regards the fact that the outlet fitting 4 is constituted, instead of by a

female luer-lock fitting, by a simple cylindrical tubular element 26 for direct connection to a pipe. In this case, the fitting 26 can be fixed rigidly to the widened part 11 of the body 2 of the connector 1, or else it can rotate freely in two directions.

In the embodiment represented in Figure 5, the fitting 26, which is generally similar to that of Figure 4, is connected to the body 2 in a rotary way, via a collar 27 fixed to the widened part 11 to withhold axially, but as mentioned in a rotary way, an annular flange 28 of the fitting 26 with respect to the body 2. Said flange 28 has an axial shank 29, engaged rotationally in a sealed way within a corresponding annular recess 30, formed at the end 16 of the tubular body of elastic material 15.

The variant represented in Figures 6 to 12 differs from the embodiment described with reference to Figures 1 to 3, in the first place, for the fact that the end 6a of the inner tubular element 6 of the inlet fitting 3 is closed, and in the proximity of said closed end 6a the inner tubular element 6 has one or more through radial holes 31. Furthermore, in this case the tubular body of elastic material 15 is without the diaphragm 22 with the pre-cut 23 of the previous embodiments.

The operation of opening/closing of the connector 1 according to this variant embodiment is similar to what has also been described previously. In the retracted position of the outer tubular element 6 of the inlet fitting 3, represented in Figure 7 and corresponding to the absence of a complementary female luer-lock fitting engaged with the inlet fitting 3, the passage of flow through the fittings 3 and 4 is closed on account of the fact that the radial opening or openings 31 are obstructed by the portion 18 of the elastic tubular body 15, on opposite sides with respect to a pair of

integral seal rings 19 thereof.

Following upon advance of the inner tubular element 6, as a result of engagement of a complementary female luer-lock fitting within the inlet fitting 3, the side hole or holes 31 are freed from the elastic tubular body 15, in the way represented in Figure 8, thus opening the passage of flow between the inlet and outlet fittings 3, 4 through a chamber 32 defined within the end 16 of the elastic tubular body 15.

When the complementary female luer-lock fitting is unscrewed and separated from the inlet fitting 3, the elastic tubular body 15 brings the inner tubular element 6 back into the retracted position of Figure 7, interrupting again the passage of flow through the connector 1.

The second important difference between the variant of Figures 6 to 12 and the previous embodiments lies in the fact that the outlet fitting 4, also in this case constituted by a female luer-lock fitting, is connected to the body 2 of the connector 1 in both a rotationally and axially translatable way. For this purpose, the radial flange 10 is set between the widened part 11 of the body 2 and a collar 33 rigidly connected to said widened part 11, for example by means of welding or other systems. The flange 10 is in this case formed integrally with a ring of pawl-like sprung teeth 34, more clearly visible in Figure 11, designed to co-operate in the way clarified in what follows with a ring of saw teeth 35, formed integrally within the collar 33 in the way represented in detail in Figure 10. As will be seen in what follows, the pawls 34 and the teeth 35 define a first one-directional detent assembly via which the luer-lock fitting 4 cannot rotate with respect to the body 2 of the connector 1 in a first direction of rotation corresponding to screwing

on said female luer-lock fitting 4 of a complementary male luer-lock fitting. This complementary male luer-lock fitting is not illustrated, in so far as it is conventional and generally corresponds to the inlet fitting 3, except for the fact that the corresponding external and internal tubular elements are normally made of a single piece.

With reference once again to Figure 10, the widened part 11 of the body 2 is in turn formed internally with a ring of detent teeth 36, set opposed and staggered axially with respect to the saw teeth 35 of the collar 33, with which there is designed to co-operate in the way clarified in what follows a ring of saw teeth 37, which are also formed integrally with the outlet fitting 4 underneath the sprung pawls 34, in the way more clearly visible in Figure 11. The teeth 36 and 37 define a second one-directional detent assembly designed to enable rotation of the fitting 4 with respect to the body 2 only in a second direction of rotation, opposite to the first, to enable, as will be seen, unscrewing of the complementary male luer-lock fitting screwed on the outlet fitting 4.

The flange 10 of the fitting 4, with the sprung pawls 34 and the saw teeth 37, is housed with axial play between the collar 33 and the enlarged part 11 of the body 2. This enables the outlet fitting 4 to translate axially with respect to the body 2 between the retracted position represented in Figures 7 and 8 and the advanced position represented in Figure 9. The tubular body of elastic material 15 tends normally to keep said fitting 4 in the retracted position illustrated in Figures 7 and 8: an elastic axial compression of the body 15 enables the outlet fitting 4 to translate from the retracted position to the advanced position of Figure 9. On account of said

elastic compression, the tubular body 15 conveniently (but not necessarily) has the conformation more clearly visible in Figure 12. It presents a generally cylindrical end portion 38 in sliding-seal contact, via one or more integral rings 39, with an axial shank 40 of the outlet fitting 4, and an annular flange 41, on which said shank 40 rests at the front. The remaining part of the elastic tubular body 15, up to its end 17 resting against the collar 13 of the inner tubular element 6 of the inlet fitting 3, is formed with the helical grooves 20 and helical projections 21 already described previously.

Operation of the connector according to this embodiment is described in what follows.

When the outlet fitting 4 is in its normal retracted position shown in Figures 7 and 8, the complementary male luer-lock fitting can be easily screwed thereon thanks to the blocking in rotation, in the direction corresponding to that of screwing of said complementary male luer-lock fitting, performed by the first detent assembly 34-35. Once screwing is completed, unscrewing of the complementary male luer-lock fitting is not allowed as a result of the free rotation in said direction of the fitting 4 with respect to the body 2.

In order to be able then to unscrew the complementary male luer-lock fitting from the outlet fitting 4, the fitting 4 must be translated positively in an axial direction from the retracted position of Figures 7 and 8 to the advanced position of Figure 9. As a result of said translation, engagement of the second detent assembly 36-37 is obtained. In this way, the fitting 4 is blocked in rotation in the direction opposite to the previous one, i.e., in the direction corresponding to that of unscrewing of the

complementary male luer-lock fitting, which can in this way be disengaged from the connector 1. It is therefore evident that the detachment between the connector 1 and a medical line connected to the complementary male luer-lock fitting requires a preliminary voluntary action of axial displacement of the fitting 4 from the retracted position to the advanced one. As soon as the action is removed, the elastic tubular body 15 brings the outlet fitting 4 back into the retracted position shown in Figures 7 and 8.

With the arrangement described above, it is moreover possible to provide a further safety function, as a result of which the displacement of the outlet fitting 4 from the retracted position to the advanced one, and hence the consequent possibility of removal of the complementary male luer-lock fitting screwed on said outlet fitting 4, is prevented as long as the inlet fitting 3 is in turn engaged with a corresponding complementary female luer-lock fitting. Said supplementary function is readily understandable from Figure 8, which, as mentioned previously, corresponds to the advanced position of the inner tubular element 6 of the inlet fitting 3. In this position, the end 6a of the inner tubular element 6 is at the front adjacent to the internal part of the outlet fitting 4, the axial displacement of which from the retracted position to the advanced position is therefore prevented. As a result, unscrewing of a complementary male luer-lock fitting from the outlet fitting 4 is inhibited, on the basis of what has been described previously.

Only unscrewing of the complementary female luer-lock fitting from the inlet fitting 3 enables, as a result of the return of the inner tubular element 6 from the advanced position to the retracted position, axial translation of the outlet fitting 4 from the

retracted position to the advanced one, thus enabling unscrewing of the complementary male luer-lock fitting from the outlet fitting 4.

It should be noted that the conformation of the teeth of the two detent assemblies 34-36 and 35-37 is purely indicative, given that the same functional effects could be obtained with equivalent systems such as front toothings, conical surfaces or other functionally equivalent solutions.

The variant represented in Figures 13 to 17 differs from the embodiment of Figures 6 to 12 basically as regards the presence of a system of manual engagement, via which the inner tubular element 6 of the inlet fitting 3 can be displaced axially from the retracted position to the advanced position even in the absence of a complementary female luer-lock connector coupled to said inlet fitting 3. This system of engagement envisages the presence of a pair of shaped manoeuvring tabs 42 carried, in the way more clearly visible in Figure 17, by a pair of radial arms 43 formed integrally with a collar 44, which is in turn integral with the inner tubular element 6 of the inlet fitting 3. The arms 43 extend through respective axial slits 45 of the body 2, preventing rotation of the inner tubular element 6 with respect to the body 2, in such a way that the tabs 42 can be actuated from outside the connector 1 for axial translation of the inner tubular element 6 from the retracted position represented in Figure 14, corresponding to closing of the passage of flow between the fittings 3 and 4, to the advanced position represented in Figure 15, corresponding to opening of the passage of flow.

In the position of Figure 15, axial displacement of the outlet fitting 4 from the retracted position to the advanced one is likewise prevented. Figure 16

illustrates, instead, the axially advanced position of the outlet fitting 4, in the retracted position of the outer tubular element 6, to enable unscrewing of the complementary male luer-lock fitting engaged with said outlet fitting 4 with the same modalities already described previously with reference to Figure 9.

The further variant of the connector represented in Figures 18 and 19 is particularly simple and compact from the constructional standpoint. In said variant, in which the outlet fitting 4 has, by way of example, a conformation similar to that of the fitting 26 of Figure 5, the body of elastic material 15 that, according to the invention, performs the functions of sliding seal between the outer tubular element 6 and the body 2, of elastic thrust member to keep said inner tubular element 6 in the retracted position, and of delimitation of the passage of flow between the fittings 3 and 4 consists of a simple element of a generally cylindrical shape having an axial cut or through central slit 46, pressed in (as will be seen, partial) hermetic seal under the action of an appropriate radial pre-loading of assembly of the elastic body 15 within the body 2. In this case, the open end 6a of the inner tubular element 6 of the inlet fitting 3 is partially wedged and engaged within the elastic body 15 also in the retracted position of said inner tubular element 6, represented in Figure 18, thus keeping the cut 46 partially open. Following upon engagement of a complementary female luer-lock fitting with the inlet fitting 3, the inner tubular element 6 translates axially towards the outlet fitting 4, as in the previous embodiments, thus completely opening the cut 46 so as to open the passage of flow between the fittings 3 and 4, in the way represented in Figure 19. As may be seen in Figure 19, the end 6a does not

traverse the elastic body 15, but in any case keeps the cut 46 open thanks to its further wedging within said elastic body 15. In this condition, the body 15 sets itself consequently in a tubular condition, as in the embodiments described previously, keeping the passage of flow between the fittings 3 and 4 open.

When the complementary female luer-lock fitting is unscrewed from the inlet fitting 3, the elastic return of the body 15 towards the undeformed condition pushes the outer tubular element 6 back into the retracted position of Figure 18, so as to provide the partial reclosing of the cut 46 in order to close the passage of flow between the fittings 3 and 4 hermetically.

It should be noted that, even though in the foregoing description and in the ensuing claims the fitting 3 is constantly referred to as inlet fitting and the fitting 4 is constantly referred to as outlet fitting, the flow through the connector 1 could be reversed, i.e., the fitting 4 can define the inlet fitting and the fitting 3 can define, in this case, the outlet fitting.

Of course, the details of construction and the embodiments may vary widely with respect to what is described and illustrated herein purely by way of example, without thereby departing from the scope of the present invention, as defined in the ensuing claims.

CLAIMS

1. A medical valve connector comprising a tubular body (2) having an inlet fitting of the male luer or luer-lock type (3), which can be coupled by screwing with a complementary female luer or luer-lock fitting, an outlet fitting (4) coaxial to the inlet fitting (3), and means defining a passage of flow between said inlet and outlet fittings (3, 4), in which said male inlet fitting (3) comprises an outer tubular element (5) and an inner tubular element (6), which is axially displaceable but not rotationally displaceable with respect to said outer body (5), following coupling with said complementary female fitting, from a retracted closing position to an advanced position for opening said passage of flow, and in which sliding-seal means (19) are provided between said inner tubular element (6) and said body (2), and elastic means (15) tending to keep said inner tubular element (6) in said retracted position, said connector being characterized in that said means defining the passage of flow, said sliding-seal means and said elastic means are integrated in a generally tubular body of elastic material (15) set axially in a sealed way between said inlet and outlet fittings (3, 4).

2. The connector according to Claim 1, characterized in that said inner tubular element (6) of the inlet fitting (3) is open at its internal end (6a) and said body of elastic material (15) is formed with a transverse diaphragm (22) having a pre-cut (23), which can be opened elastically by said internal end (6a) of said inner tubular element (6) when the latter sets itself in said advanced opening position.

3. The connector according to Claim 1, characterized in that said inner tubular element (6) of the male inlet fitting (3) is closed at its internal

end (6a) and has in the proximity thereof at least one radial passage (31), and said body of elastic material (15) defines a chamber (32) open towards said outlet fitting (4) and within which said at least one radial passage (31) sets itself in said advanced opening position.

4. The connector according to Claim 1, characterized in that said sealing means comprise at least one integral internal annular projection (19) of said body of elastic material (15).

5. The connector according to Claim 1, characterized in that it has means of axial arrest (13, 14) between said outer tubular element (6) of the inlet fitting (3) and said body (2) in said retracted closing position.

6. The connector according to Claim 1, characterized in that it has means of axial arrest (24, 25) between said inner tubular element (6) of the inlet fitting (3) and said body (2) in said advanced opening position.

7. The connector according to Claim 1, characterized in that said outlet fitting (4) consists of a female luer-lock fitting that can be engaged by screwing with a complementary male luer-lock fitting.

8. The connector according to Claim 1, characterized in that said outlet fitting (4) comprises a tubular element of direct connection (26) to a pipe.

9. The connector according to Claim 1, characterized in that said outlet fitting (4) is connected to the body (2) in a rotary way.

10. The connector according to Claim 7, characterized in that said female luer-lock outlet fitting (4) is connected to said body (2) in a rotary and axially translatable way from a retracted position to an advanced position against the action of said body

of elastic material (15) and in that first and second one-directional detent means (34-35; 36-37) are provided, of which the first (34, 35) prevent rotation between said outlet fitting (4) and said body (2) in a first direction of rotation corresponding to the direction of screwing of said complementary male luer-lock fitting with said outlet fitting (4) when this is set in said retracted position, and the second (36-37) prevent rotation between said outlet fitting (4) and said body (2) in a second direction of rotation corresponding to the direction of unscrewing of said complementary male luer-lock fitting from said outlet fitting (4) when said outlet fitting (4) is translated into said advanced position.

11. The connector according to Claim 10, characterized in that said first one-directional detent means include a ring of sprung pawls (34) carried by said outlet fitting (4) in a first axial position, and a corresponding ring of saw teeth (35) carried by said body (2) in a first corresponding axial position.

12. The connector according to Claim 11, characterized in that said second one-directional detent means include a ring of saw teeth (37) carried by said outlet fitting (4) in a second axial position staggered with respect to said first axial position, and a corresponding ring of detent teeth (36) carried by said body (2) in a second corresponding axial position.

13. The connector according to Claim 10, characterized in that said inner tubular element (6) of the inlet fitting (3) prevents, in said advanced position, axial translation of said outlet fitting (4) from said retracted position to said advanced position.

14. The connector according to Claim 1, characterized in that said inner tubular element (6) of

the inlet fitting (3) is provided with manoeuvring means (42) projecting on the outside of said body (2) for controlling manually axial displacement of said inner tubular element (6) from said retracted position to said advanced position.

15. The connector according to Claim 1, characterized in that said inner tubular element (6) of the inlet fitting (3) is open at its internal end (6a) and said body of elastic material (15) is formed with a central axial through slit (46); said internal end (6a) of said inner tubular element (6) of the inlet fitting (3) in said retracted position being wedged within said body of elastic material (15), keeping said central slit (46) partially open, and in said advanced position still remaining partially engaged within said body of elastic material (15), opening said central slit (46) completely.