(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
21 December 2017 (21.12.2017)

WIPO | PCT

(10) International Publication Number
WO 2017/216750 A1

(51) International Patent Classification:
F16L 33/22 (2006.01) *F16L 29/00* (2006.01)
F16L 11/12 (2006.01)

(21) International Application Number:
PCT/IB2017/053560

(22) International Filing Date:
15 June 2017 (15.06.2017)

(25) Filing Language: Italian

(26) Publication Language: English

(30) Priority Data:
102016000061556 15 June 2016 (15.06.2016) IT
102016000061565 15 June 2016 (15.06.2016) IT

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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM,

(54) Title: A CONNECTOR FOR THE RECIPROCAL CONNECTION OF AN END MEMBER OF A WATER SUPPLY OR A SPRAYER AND A FLEXIBLE HOSE

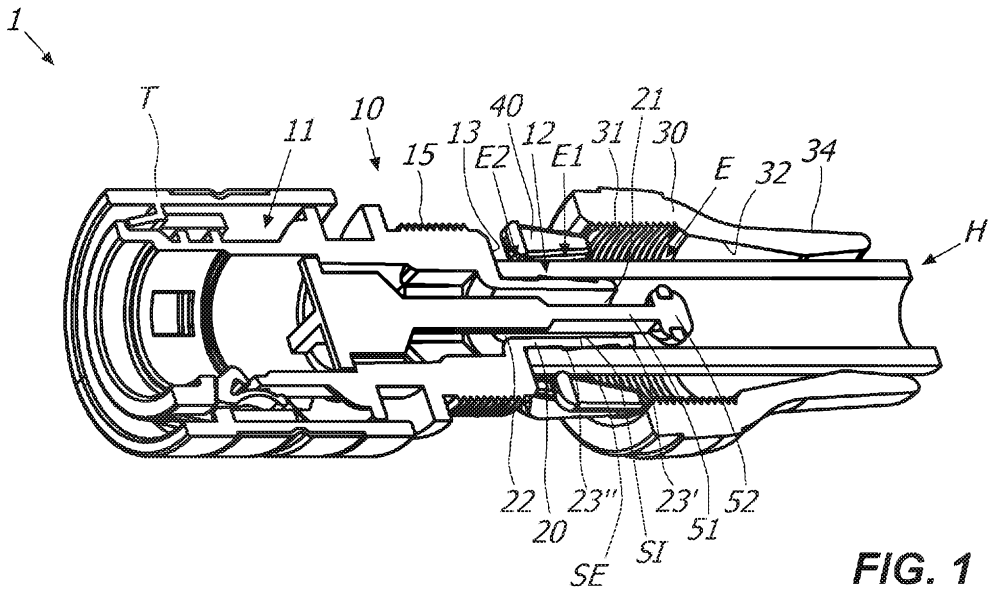

FIG. 1

(57) Abstract: A connector for the reciprocal connection of an end member (T) of a water supply or of a sprayer and a flexible hose (H), comprising a tubular main body (10) defining an axis (X) having a first end portion (11) for the coupling with the end member (T) and a second end portion (12) that includes an elongated spigot (20) whereon an end (E) of the flexible hose (H) may be fitted and an abutment wall (13) wherefrom the elongated spigot (20) extends. The connector (1) further comprises a substantially tubular shaped ring nut (30) placed peripherally to the spigot (20), the ring nut is reciprocally screwable with said main body (10). The connector further comprises an annular pressure element (40) interposed between the ring nut (30) and the spigot (20) coaxially thereto (20).

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TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

A CONNECTOR FOR THE RECIPROCAL CONNECTION OF AN END MEMBER OF A WATER SUPPLY OR A SPRAYER AND A FLEXIBLE HOSE

DESCRIPTION

Field of the invention

The present invention is generally applicable to the technical field of connectors for flexible hoses, and it particularly relates to a connector for the reciprocal connection of an end member of a water supply or of a sprayer and a flexible hose, in particolar a garden hose.

Background of the invention

Various types of connectors systems are known to connect flexible hoses to an end member, that may be threaded or not. In particular, connectors are known to connect garden hoses to the end member of a water supply, for instance a tap connected to the water network, or a sprayer.

Such connectors generally provide for a main body having a cylindrical spigot that is meant to be inserted inside the hose in correspondence to one end thereof, and a closing element, for example a ring nut that is screwed on the main body to radially compress a portion of the end of the hose against the spigot to obtain the hydraulic seal.

From the European Patent EP2047169 on behalf of the same Applicant a hose-connector assembly is known according with the aforementioned features.

Such connectors may be improved. In particolar with regards to the hydraulic seal thereof.

Moreover, such a type of connectors is particularly ineffective in case the garden hose is an extendible hose, such as the hose made according to the teachings of International Application PCT/IB2016 /059765.

Still, the known connectors are difficult to be mounted on the hose, especially in the case of an extendible hose.

Summary of the invention

Object of the present invention is to at least partially overcome the above mentioned drawbacks, by providing a connector for flexible hoses of high efficiency and relative low cost.

Another object of the present invention is to provide a connector having a high

hydraulic and / or mechanical seal even in case of extendible flexible hoses.

Another object of the present invention is to provide a connector for flexible hoses that does not twist the hose upon the screwing of the ring nut on the threaded end member.

Another object of the present invention is to provide a connector for flexible hoses having easy insertion thereon.

Such objects, as well as others that will be clearer hereinafter, are fulfilled by a connector having one or more of the features herein described, shown and / or claimed.

Advantageous embodiments of the invention are described according to the appended claims.

Brief description of the drawings

Further features and advantages of the invention will become more evident by reading the detailed description of a preferred but not exclusive embodiment of the invention, shown by way of not limitative example with the help of the annexed drawings, wherein:

FIGs. 1 and **2** are an axonometric view in axial section of a connector **1** in two different operating phases;

FIGs. 3, **4** and **5** are an axial section view of a connector **1** in different operating phases;

FIGs. 6 and **7** are an enlarged view of some details respectively of FIG. 3 and FIG. 5;

FIGs. 8, **9** and **10** are schematic views of an example of a flexible hose **H**, an end member **T** and a connector **1** during use;

FIG. 11 is a schematic side view of the flexible hose **H** at rest;

FIG. 12 is a schematic side view of the flexible hose **H** of FIG. 11 under pressure.

Detailed description of some preferred embodiments

With reference to the above mentioned figures, it is described a connector **1** for the reciprocal conection of an end member **T** of a water supply or of a sprayer and a hose **H**.

In particular, the hose **H** may be a garden hose to transport irrigation water.

The hose **H** may be a conventional flexible hose made, for instance, according to the teachings of European Patent EP0623776 on behalf of the same Applicant, or it may be an extendible flexible hose made, for example, according to the teachings of PCT/IB2016/059765, always on behalf of the same Applicant. On the other hand, the hose

may be a flexible hose that enlarges under pressure made, for example, according to the teachings of PCT/IB2016/052435, always on behalf of the same Applicant.

The connector **1** may comprise a main body **10** of a substantially tubular shape that may define an axis **X**. In particular, the main body **10** may have a male or female end portion **11** for the coupling with the end member **T** and an opposite end portion **12** for the coupling with the hose **H**.

The end member **T** and the main body **10** may be coupled in a *per se* known manner, for example by means of male-female fast-coupling systems, by means of thread and counter-thread, or the like.

The end member **T** may be, for example, a tap connected to the water network or the end of a sprayer.

Suitably, as particularly shown in Fig. 1, the end portion **12** may comprise an abutment wall **13** and an elongated spigot **20** extending from the latter, the spigot may be substantially coaxial to the main body **10**. Therefore, the abutment wall **13** may be substantially annular and perpendicular to the axis **X**.

The flexible hose **H** may have at least one end **E** that may be fitted on the spigot **20** so as the water flows between the flexible hose **H** and the end member **T**. Suitably, therefore, the spigot **20** may include at least one inlet **21** and one outlet **22** for the water.

It is understood that the inner diameter of the end **E** of the flexible hose **H** may be substantially equal or slightly lower than the outer diameter of the spigot **20** to allow the former to be fitted on the latter.

According to an aspect of the invention, the spigot **20** may be configured so as to facilitate the insertion of the end **E** of the flexible hose **H** thereon.

As shown in Figs. 1 and 2, the spigot **20** may include at least one annular projection, preferably at least two annular projections **23'**, **23''**, diverging along the insertion direction of the flexible hose **H**. For example, the annular projections **23'**, **23''** may have a truncated shape having a maximum diameter increasing towards the abutment wall **13** of the main body **10**.

Preferably, the annular projection **23'** distal from the abutment wall **13** may have a maximum diameter lower than the maximum diameter of the annular projection **23''** proximal to the abutment wall **13**.

In this way the insertion of the end **E** of the flexible hose **H** on the spigot **20** may be promoted, while the disengagement of the flexible hose **H** from the connector **1** may be penalized.

According to a particular embodiment, the connector **1** may comprise valve means **50** configured to block the outflow of water from the flexible hose **H** once the connector **1** is decoupled from the sprayer.

In particular, as shown in Figs. 1 and 2, the valve means **50** may comprise a stem **51** with an end plug **52** coaxially inserted through the spigot **20** to selectively block the inlet thereof **21**.

Suitably, the plug **52** may be diverging along the insertion direction of the flexible hose **H** so as to facilitate the insertion of the flexible hose **H** thereof on the spigot **20**.

For example, the plug **52** may have a substantially semi-spherical shape. More particularly, the plug **52** may have a maximum diameter substantially equal to the inner diameter of the spigot **20** so as the latter and the plug **52** cooperate to define a substantially continuous invitation surface.

In this way, the reciprocal configuration of the plug **52** and of the spigot **20** may promote the insertion of the flexible hose **H** on the latter.

In particular, as better described hereinafter, the flexible hose **H** and the main body **10** may be coupled so as no water flows from the connector **1** during use.

To the object, at least one portion **E1** of the end **E** of the flexible hose **H** may be radially pressed against the spigot **20** and then against the annular projections **23'**, **23''** so as to obtain such a hydraulic seal of the connector **1**.

Moreover, the latter may comprise a substantially tubular shaped ring nut **30** that may be placed peripherally to the spigot **20** so as to remain coaxial to the latter.

Suitably, as shown in Figs. 3, 4 and 5, the ring nut **30** and the main body **10** may be reciprocally screwable so as to reciprocally move along the axis **X** upon the reciprocal twisting. For example, the main body **10** may have at least one threaded portion **15**, while the ring nut **30** may have at least one respective counter-threaded portion **31** with respect to the former so as they are reciprocally screwable.

In particular, the portion **E1** of the flexible hose **H** may then be interposed between the ring nut **30** and the spigot **20**. Advantageously, the latter may be reciprocally configured

so as the axial translation of the ring nut **30**, that is upon the screwing thereof on the main body **10**, corresponds to the radial compression of the portion **E1** thereof of the flexible hose **H** as shown in Fig. 2.

To the object, the ring nut **30** may have an inner surface **32** at least partially truncated diverging with respect to the coupling direction of the flexible hose **H** and of the main body **10**, that is, with respect to the axis **X**.

According to a particular aspect of the invention, the connector **1** may comprise an annular pressure element **40** interposed between the ring nut **30** and the spigot **20** coaxially to the latter. In particular, the pressure element **40** may have a substantially annular edge **42** faced to the abutment wall **13** of the main body **10**.

As particularly shown in Fig. 7, the ring nut **30**, and in particular at least one portion **33** of the inner surface **32** thereof, may interact with the pressure element **40** upon the screwing thereof on the main body **10** so as the latter exerts a radial pressure on the portion **E1** of the flexible hose **H**.

In other words, the end **E** of the flexible hose **H** may have an outer surface **SE** in contact with the inner surface **41** of the pressure element **40**, and an inner surface **SI** in contact with one or more annular projections **23'**, **23"** of the spigot **20** so as to obtain the hydraulic seal of the connector **1**.

Moreover, thanks to such a feature, the mechanical seal of the connector **1** may also be obtained.

Suitably, the pressure element **40** may be of variable configuration. In particular, the latter may be configured so as upon the screwing of the ring nut **30** the pressure element moves from an enlarged configuration to a contracted configuration to exert the radial pressure on the portion **E1** of the flexible hose **H**.

For example, the pressure element **40** may have an annular shape and may consist of a substantially truncated shape single body formed by a continuous full-length tubular structure with a constant cross-section.

In this way, upon the contraction thereof, the pressure element **40** may exert a uniform pressure on the peripheral development of the portion **E1** of the flexible hose **H** so as to preserve the entirety of the flexible hose **H** thereof.

Advantageously, the pressure element **40** thanks to the configuration thereof may be

in contact with the outer surface **SE** of the end **E** of the flexible hose **H** during the passage from the enlarged configuration to the contracted configuration.

Moreover, during the screwing of the ring nut **30** on the hinge body **10**, the pressure element **40** may radially compress to assume the contracted configuration thus avoiding to rotate around the axis **X** integrally with the ring nut **30**. In this way, upon the coupling with the main body **10**, the twisting of the flexible hose **H**, and particularly of the end **E**, may be avoided and, therefore, the damage thereof.

According to another aspect of the invention, as shown in Figs. 6 and 7, the edge **42** and the abutment wall **13** may be reciprocally spaced apart so as to obtain an annular seat **61** therebetween.

In particular, the end **E** of the flexible hose **H** may comprise the portion **E1** susceptible to be compressed by the pressure element **40** and a portion **E2** susceptible to expand in the annular seat **61** as better explained hereinafter.

Suitably, the connector **1** may comprise spacer means **60** to keep the pressure element **40** and the abutment wall **13** reciprocally spaced apart so as to define the thickness of the annular seat **61**.

In particular, the spacer means **60** may include a plurality of elongated elements **62** interposed between the pressure element **40** and the abutment wall **13**. More in detail, the elongated elements **62** extend from the annular edge **42** of the pressure element **40** to come in contact with the abutment wall **13**.

In this way, even after the screwing of the ring nut **30** on the main body **10**, the pressure element **4**0 may remain spaced apart from the abutment wall **13** to form the annular seat **61**.

According to a further aspect of the invention, the main body **10**, the ring nut **30** and the pressure element **40** may be reciprocally dimensioned and / or configured so as the radial pressure of the latter is exerted more near the annular projection **23''** of the spigot **20** proximal to the abutment wall **13**, that is, the annular projection opposite to the annular projection **23'** proximal to the inlet **21**.

Possibly, the pressure element **40** may have a substantially truncated configuration.

Moreover, the annular projection **23''** and the spacer means **60** may be reciprocally dimensioned so as the annular projection **23''** remains spaced apart from the annular seat

61.

In particular, the elongated elements **62** may have a length such that a tubular interspace **63** cooperating with the annular seat **61** to define an expansion chamber **64** may be defined between the annular projection **23"** and the abutment wall **13**.

In this way, as a result of the action of the pressure element **40**, the portion **E2** of the flexible hose **H**, that is the portion downstream of the annular projection **23"**, may occupy the expansion chamber **64**.

Possibly, such a portion **E2** may expand due to the pressure variation inside the flexible hose **H** due to the passage of water inside the flexible hose **H** thereof.

In this way, the hydraulic seal and the mechanical seal of the connector may be locally increased during use.

Furthermore, advantageously, the tubular interspace **63** may have a narrow portion **63'** in correspondence to the annular projection **23"** so as sto define an area designed to counteract the pulling of the flexible hose **H**.

Suitably, the space between the annular projection **23"** and the annular projection **23'** may define a tubular interspace **65**. In particular, the latter may have a narrow portion **65'** in correspondence to the annular projection **23'** so as to create a further area designed to counteract the pulling of the flexible hose **H**.

In this way, it may be impossible to decouple the end **E** of the flexible hose **H** and the main body **10** during use.

Such a feature may be particularly advantageous in case the flexible hose **H** is an extendible hose.

Operatively, the user may first insert the ring nut **30** and then the pressure element **40** around the flexible hose **H**.

Subsequently, the user may insert the end **E** of the flexible hose **H** on the spigot **20** so as the former is close to / in contact with the abutment wall **13**.

By acting on the outer surface **34** of the ring nut **30**, the user may screw the latter on the coupling portion **12** of the main body **10** so as to radially compress the pressure element **40** and, therefore, the end **E** of the flexible hose **H** so as to obtain a hydraulic and mechanical seal of the connector **1** as described above.

The connector **1** is particularly advantageous in case of extendible flexible hose **H**.

The flexible hose **H** may have a not corrugated nor coiled tubular structure, typical of irrigation hoses or garden hoses. The polymeric layers may be tubular.

An example of corrugated hose is known from document US3028290, while an example of coiled hose is known from document US4009734.

The extendible flexible hose **H** may comprise at least one inner layer **H1** made of a first elastic polymeric material, at least one outer layer **H3** made of a second elastic polymeric material and at least one textile reinforcement layer **H2** interposed therebetween.

The at least one inner layer **H1** and the at least one outer layer **H3** may be coupled therebetween to form a unitary tubular element that embeds, that is, embodies, at least one textile layer **H2**.

To the object, the at least one outer layer **H3** and the at least one inner layer **H1** may be reciprocally coupled in correspondence to the areas of the outer surface of the at least one inner layer **H1** that are not covered by the textile reinforcment layer **H2**. In other words, the at least one outer layer **H3** and the at least one inner layer **H1** may be reciproclly coupled except in the areas occupied by the textile yarns of the at least one textile layer **H2**.

Suitably, the unitary tubular element may have an elasticity such to automatically elongate and enlarge under the working pressure imparted by the liquid flowing therethrough to increase the original length thereof and such to automatically recover once the working pressure stops to assume again the original length and diameter.

The elongation is considerabe and significant to the naked eye, while the enlargement may be more limited and possibly not significant to the naked eye.

To the object, the first and second elastic polymeric materials that form the unitary tubular element should be suitably chosen.

The first and second polymeric materials may be elastomers or thermoplastic elastomers (TPE).

Possible TPE may be TPE-S, such as PP/SEBS or PP/EPDM, or TPE-O, such as Ethylene-Ottene copolymer.

Possible elastomers may be natural rubber or latex.

Suitably, the unitary tubular element as a whole may have a Shore A hardness measured according to ASTM D2240 (3 '') of 30 ShA to 50 ShA.

The textile yarns that make the at least one textile layer may be polyester, nylon 6,6,

Polyvinyl Alcohol, para-aramid fibers, meta-aramid fibers, Rayon®.

Advantageously, the textile yarns forming the at least one textile layer **H2** may have an elongation at break measured according to BISFA (Cap 7) lower than 30% and preferably lower than 25%.

Advantageously, the textile yarns forming the at least one textile layer **H2** may have a toughness measured according to BISFA (Cap 7) of at least 50 cN / tex.

In a *per se* known manner, the elongation and the automatic enlargement of the latter are promoted by one or more restrictions or flow restrictors inserted in or connected to the hose, for instance as taught in EP 2520840 and / or EP2778491 which reference is made for consultation.

Preferably, the conenctor **1** may act as a flow restrictor and it promotes the elongation of the hose **H**. For example, the plug **52** and / or the spigot **20** may act as flow restrictors.

Suitably, one of the ends of the hose **H** may be connected to delivery means of the fluid to be transported, such as a tap, by means of the connector **1**.

As known, in a flexible hose a textile reinforcement layer **H2** if stressed tends to axially elongate and radially expand, depending on the type.

Advantageously, the at least one textile reinforcement layer **H2** of the extendible flexible hose of the present invention may be susceptible to move between a rest configuration that it assumes at rest, that is when the liquid does not flow through the unitary tubular element, and a working configuration that it assumes when the unitary tubular element is stressed by the working pressure of the liquid flowing therethrough.

In the working configuration, the at least one textile reinforcement layer **H2** axially elongates and radially enlarges to accompany the elongation and the enlargement of the unitary tubular element.

Depending on whether the yarns forming the textile reinforcement layer are elastic or rigid, such elongation and enlargement are more or less marked.

However, the yarns forming the textile reinforcement layer may be preferably rigid, so as to effectively act upon the unitary tubular element upon the elongation thereof.

Preferably, the at least one textile reinforcement layer and the unitary tubular element may be reciprocally configured so as the former intercepts the latter upon the

elongation and enlargement thereof so as to determine the maximum length and diameter thereof.

In other words, with the same inner pressure of the hose the axial elongation and the maximum radial enlargement of the at least one textile reinforcement layer is lower than the axial elongation and the maximum radial enlargement of the unitary tubular element, so that the axial elongation and the maximum radial enlargement of the at least one textile reinforcement layer determines the axial elongation and the maximum radial enlargment of the flexible hose as a whole.

Suitably, the automatic recovery of the unitary tubular element may allow the at least one textile reinforcment layer to assume again the rest configuration once the inner pressure of the flexible hose stops.

Such an automatic recovery of the unitary tubular element may only be accomplished thanks to the elasticity thereof, without any other help. In particular, the flexible hose of the present invention may be free of helical springs or similar automatic recovery means.

Thanks to one or more of the previous features, it is possible to obtain an extendible flexible hose that is manageable and practical to use.

As above mentioned, the stress of the inner pressure inside the hose may tend not only to axially elongate it, but also to make it expand radially.

In this case, the unitary tubular element may have the original diameter thereof when the at least one textile reinforcement layer is in the rest configuration and an expanded diameter when the at least one textile reinforcement layer is in the working configuration.

Preferably, the flexible hose **H** may comprise at least one first textile layer **H2** and at least one second textile layer **H2'**, reciprocally superimposed but not necessarily in reciprocal contact.

The at least one first textile layer **H2** and the unitary tubular element may be reciprocally configured so as the former intercepts the latter upon the elongation thereof to determine the maximum length thereof, while the at least one second textile layer **H2'** and the unitary tubular element may be reciprocally configured so as the former intercepts the latter upon the enlargment thereof so as to determine the maximum diameter thereof.

The extendible flexible hose **H** may be realized by means of a method that may

sequentially comprise the following steps: a) providing of the at least one inner layer; b) making on the at least one inner layer of the at least one textile reinforcement layer to produce a semi-finished product; and c) extrusion on the semi-finished product of the at least one outer layer.

Suitably, the step c) of extrusion of the at least one outer layer may include a step of coupling of the latter and of the at least one inner layer to form the unitary tubular element so as the at least one textile layer is embedded therein.

Advantageously, the first and second elastic polymeric materials may be reciprocally compatible so as the coupling between the at least one inner layer and the at least one outer layer is accomplished upon the step of c) of extrusion of the at least one outer layer.

Preferably, the steps b) of making of the at least one textile reinforcment layer and c) of extrusion of the at least one outer layer may be realized with the at least one inner layer elongated with respect to the original length thereof.

In a preferred embodiment of the invention, the elongation step of the at least one inner layer may be accomplished by drawing theteof, preferably by means of two or more pairs of rotating facing cylinders susceptible to press the hose.

A first pair of cylinders may press the hose before step b) of making of the at least one textile reinforcement layer, while a second pair may press the hose after step c) of extrusion of the at least one outer layer. Advantageously, the second pair of cylinders may rotate faster than the first pair of cylinders.

In order to facilitate the detachment of the inner layer once pressed by the above mentioned cylinders, the at least one inner layer may internally include a detachable film.

In light of the foregoing, it is understood that the invention fulfils the intended objects.

The invention is susceptible of numerous modifications and variations, all falling within the inventive concept expressed by the appended claims. All details may be replaced by other technically equivalent elements and the materials may be different according to requirements without departing from the scope of the invention defined by the appended claims.

CLAIMS

1. A connector for the reciprocal connection of an end member (**T**) of a water supply or of a sprayer and a flexible hose (**H**), comprising:

- a main tubular body (**10**) defining an axis (**X**) having a first end portion (**11**) for the coupling with the end member (**T**) and a second end portion (**12**) that includes an elongated spigot (**20**) whereon an end (**E**) of the flexible hose (**H**) may be fitted and an abutment wall (**13**) wherefrom said spigot (**20**) extends;

- a substantially tubular shaped ring nut (**30**) placed peripherally to said spigot (**20**), said ring nut (**30**) and said main body (**10**) being reciprocally screwable;

- an annular pressure element (**40**) interposed between said ring nut (**30**) and said spigot (**20**) coaxially to the latter (**20**), said ring nut (**30**) upon the screwing thereof on said main body (**10**) interacting with said pressure element (**40**) to exert a radial pressure on the end (**E**) of the flexible hose (**H**) once the latter is fitted on said spigot (**20**), so as to promote during use the expansion of the end (**E**) thereof of the flexible hose (**H**);

- spacer means (**60**) to maintain reciprocally spaced apart said pressure element (**40**) and said abutment wall (**13**) so as to define therebetween an annular seat (**61**) susceptible to receive the expanded end (**E**) of the flexible hose (**H**), so as to locally increase the hydraulic seal of the connector (**1**).

2. Connector according to claim 1, wherein said pressure element (**40**) has a substantially annular edge (**42**) faced to said abutment wall (**13**), said spacer means (**60**) including a plurality of elongated elements (**62**) interposed between said substantially annular edge (**42**) and said abutment wall (**13**).

3. Connector according to claim 2, wherein said elongated elements (**62**) extend from the annular edge (**42**) of said pressure element (**40**) to come in contact with said abutment wall (**13**).

4. Connector according to one or more of the preceding claims, wherein said spigot (**20**) includes an inlet (**21**) and an outlet (**22**) for the fluid.

5. Connector according to the preceding claim, further comprising valve means (**50**) cooperating with said spigot (**20**) to selectively block said inlet thereof (**21**).

6. Connector according to the preceding claim, wherein said valve means (**50**)

comprise a stem (**51**) coaxially inserted through said spigot (**20**) and an end plug (**52**) connected to the stem (**51**) to selectively block said inlet (**21**).

7. Connector according to one or more of the preceding claims, wherein said spigot (**20**) includes a plurality of annular projections (**23'**, **23''**) of substantially truncated shape diverging along the insertion direction of the flexible hose (**H**).

8. Connector according to the preceding claim, wherein said annular projections (**23'**, **23''**) have a maximum diameter increasing towards said abutment wall (**13**).

9. Connector according to claims 6 and 7 or 6, 7 and 8, wherein also said plug (**52**) has a shape diverging along the insertion direction of the flexible hose (**H**) so as to simplify the latter operation.

10. Connector according to the preceding claim, wherein said plug (**52**) has a maximum diameter substantially equal to the inner diameter of said spigot (**20**) so as the latter and said plug (**52**) cooperate to define a substantially continuous invitation surface.

11. Connector according to the preceding claim, wherein said plug (**52**) has a substantially semi-spherical shape, said proximal annular projection (**23'**) having a substantially truncated shape.

12. Connector according to one or more of the preceding claims, wherein said pressure element (**40**) is configured so as upon the screwing of said ring nut (**30**) said pressure element (**40**) moves from an enlarged configuration to a contracted configuration to exert said radial pressure.

13. Connector according to the preceding claim, wherein said pressure ring (**40**) is a single body of substantially truncated shape made of a continuous full-length tubular structure with a constant cross-section so as upon the contraction thereof it exerts uniform pressure on the whole peripheral development of the hose (**H**).

14. Connector according to claim 6 or 7, wherein said main body (**10**), said ring nut (**30**) and said pressure element (**40**) are reciprocally dimensioned and / or configured so as the radial pressure of the latter is exerted more near the annular projection (**23''**) of said spigot (**20**) proximal to said abutment wall (**13**), the latter and said spacer means (**60**) being reciprocally dimensioned so as said proximal annular projection (**23''**) is spaced apart from said annular seat (**61**), so as between said proximal annular projection (**23''**) and said abutment wall (**13**) a first tubular interspace (**63**) is created cooperating with said annular

seat (**61**) to define an expansion chamber (**64**) for the portion of the flexible hose (**H**) downstream of said proximal annular projection (**23''**).

15. Connector according to the preceding claim, wherein said first tubular interspace (**63**) has a narrow portion (**63'**) in correspondence to said proximal annular projection (**23''**) so as to define a first area designed to counteract the pulling of the flexible hose (**H**).

16. Connector according to the preceding claim, wherein the space between the annular projections (**23'**, **23''**) defines a second tubular interspace (**65**), the latter having a narrow portion (**65'**) in correspondence to said annular projection (**23'**) distal from said abutment wall (**13**) so as to define a second area designed to counteract the pulling of the flexible hose (**H**).

17. A connector for the reciprocal connection of an end member (**T**) of a water supply or of a sprayer and a flexible hose (**H**) to transport a fluid, comprising:

- a tubular main body (**10**) defining an axis (**X**) having a first end portion (**11**) for the coupling with the end member (**T**) and a second end portion (**12**) that includes an elongated spigot (**20**) whereon an end (**E**) of said flexible hose (**H**) may be fitted, said spigot (**20**) including an inlet (**21**) and an outlet (**22**) for the fluid;

- valve means (**50**) comprising a stem (**51**) with an end plug (**52**) coaxially inserted through said spigot (**20**) to selectively block said inlet thereof (**21**);

wherein said spigot (**20**) includes a plurality of annular projections (**23'**, **23''**) diverging along the insertion direction of the flexible hose (**H**), said plug (**52**) further having a diverging shape along the insertion direction of the flexible hose (**H**) to simplify the latter operation.

18. Connector according to the preceding claim, wherein said plug (**52**) has a maximum diameter substantially equal to the inner diameter of said spigot (**20**) so as the latter and said plug (**52**) cooperate to define a substantially continuous invitaton surface.

19. Connector according to the preceding claim, wherein said plug (**52**) has a substantially semi-spherical shape, said proximal annular projection (**23'**) having a substantially truncated shape.

20. Connector according to any one of claims 17 to 19, wherein said main body (**10**) includes an abutment wall (**13**) wherefrom said spigot (**20**) extends, said annular projections (**23'**, **23''**) having a maximum diameter increasing towards said abutment wall (**13**).

21. Connector according to any one of claims 17 to 20, further comprising a

substantially tubular shaped ring nut (**30**) placed peripherally to said spigot (**20**), said ring nut (**30**) and said main body (**10**) being reciprocally screwable, the connector (**1**) further comprising an annular pressure element (**40**) interposed between said ring nut (**30**) and said spigot (**20**) coaxially to the latter, said ring nut (**30**) upon the screwing thereof on said main body (**10**) interacting with said pressure element (**40**) to exert a radial pressure on the end (**E**) of the flexible hose (**H**) once the latter is fitted on said spigot (**20**) so as to cause during use the radial expansion thereof (**E**).

22. Connector according to one or more of claims 17 to 21, wherein said pressure element (**40**) is configured so as upon the screwing of said ring nut (**30**) said pressure element (**40**) moves from an enlarged configuration to a contracted configuration to exert said radial pressure.

23. Connector according to the preceding claim, wherein said pressure element (**40**) is a single body of substantially truncated shape made of a continuous full-length tubular structure with a constant cross-section, so as upon the contraction thereof it exerts uniform pressure on the whole peripheral development of the flexible hose (**H**).

24. Connector according to claim 22 or 23, wherein said main body (**10**), said ring nut (**30**) and said pressure element (**40**) are reciprocally dimensioned and / or configured so as the radial pressure of the latter (**40**) is exerted more near the annular projection (**23''**) of said spigot (**20**) proximal to said abutment wall (**13**), said pressure element (**40**) and said abutment wall (**13**) being reciprocally spaced apart to define an annular seat (**61**), said proximal annular projection (**23''**) being spaced apart from said annular seat (**61**) so as between said proximal annular projection (**23''**) and said annular seat (**61**) a tubular interspace (**63**) is created cooperating with said annular seat (**61**) to define an expansion chamber (**64**) for the portion (**E2**) of the flexible hose (**H**) downstream of said proximal annular projection (**23''**).

25. Connector according to the preceding claim, wherein said first tubular interspace (**63**) has a narrow portion (**63'**) in correspondence to said proximal annular projection (**23''**) so as to define a first area designed to counteract the pulling of the flexible hose (**H**).

26. Connector according to the preceding claim, wherein the space between the annular projections (**23'**, **23''**) defines a second tubular interspace (**65**), the latter having a narrow portion (**65'**) in correspondence to said annular projection (**23'**) distal from said

abutment wall (**13**) so as to define a second area designed to counteract the pulling of the flexible hose (**H**).

27. A flexible hose / connector assembly comprising:

- an extendible flexible hose (**H**) to transport liquids, in particular water;

- at least one connector according to one or more of claims 1 to 16 or according to one or more of claims 17 to 26.

28. Assembly according to claim 27, wherein the extendible flexible hose comprises:

- at least one inner layer (**H1**) made of a first elastic polymeric material;

- at least one outer layer (**H3**) made of a second elastic polymeric material;

- at least one textile reinforcement layer (**H2**, **H2'**) interposed between said at least one inner layer (**H1**) and at least one outer layer (**H2**);

wherein said at least one inner layer (**H1**) and at least one outer layer (**H3**) are reciprocally coupled to form a unitary tubular element, said at least one textile reinforcement layer (**H2**, **H2'**) being embedded therein;

wherein said unitary tubular element has an elasticity such to automatically elongate and enlarge under the working pressure imparted by the liquid flowing therethrough to increase the original length and diameter thereof and such to automatically recovery once the working pressure stops to assume again said original length and diameter;

wherein said at least one textile reinforcement layer (**H2**, **H2'**) is susceptible to move between a rest configuration that it has when no liquid flows through said unitary tubular element and a working configuration that it has when said unitary tubular element is elongated and enlarged by the working pressure.

29. Assembly according to the preceding claim, wherein the automatic elongation and enlargement of said unitary tubular element promotes the passage of said at least one textile layer (**H2**, **H2'**) from the rest to the working configuration, the automatic recovery of said unitary tubular element promoting the passage of said at least one textile layer (**H2**, **H2'**) from the working to the rest configuration.

30. Assembly according to claim 27, 28 or 29, wherein said at least one textile reinforcement layer (**H2**, **H2'**) and said unitary tubular element are reciprocally configured so as the former (**H2**, **H2'**) intercepts the latter upon the elongation and enlargement thereof so as to determine the maximum length and diameter thereof.

31. Assembly according to claim 27, 28, 29 or 30, wherein said at least one textile reinforcement layer (**H2**, **H2'**) is placed on the outer surface of said at least one inner layer (**H1**) so as to leave thereon a plurality of uncovered areas, said at least one outer layer (**H3**) and at least one inner layer (**H1**) being reciprocally coupled in correspondence to said uncovered areas.

32. Assembly according to any one of the claims 27 to 31, wherein said unitary tubular element has the original diameter and length when said at least one textile reinforcement layer (**H2**, **H2'**) is in the rest configuration, said unitary tubular element being enlarged and elongated when said at least one textile reinforcement layer (**H2**, **H2'**) is in the working configuration.

33. Assembly according to the preceding claim, comprising at least one first textile reinforcement layer (**H2**) and at least one second textile reinforcement layer (**H2'**), said at least one first textile reinforcement layer (**H2**) and said unitary tubular element being reciprocally configured so as the former (**H2**) intercepts the latter upon the elongation thereof to determine the maximum length thereof, said at least one second textile reinforcement layer (**H2'**) and said unitary tubular element being reciprocally configured so that the former (**H2'**) intercepts the latter upon the enlargement thereof so as to determine the maximum diameter thereof.

34. Assembly according to the preceding claim, wherein said second textile reinforcement layer (**H2'**) is placed externally with respect to said first textile reinforcement layer (**H2**), said at least one first textile reinforcement layer (**H2**) being selected in the group consisting of knitting, weaving or knotting, said at least one second textile reinforcement layer (**H2'**) being a spiral or a braiding.

35. Assembly according to any one of claims 27 to 34, wherein said unitary tubular element and said at least one textile reinforcement layer (**H2**, **H2'**) reciprocally cooperate so as under a working pressure of 2 bar the hose increases the length thereof of at least 1.5 times with respect to its original length, preferably of at least 2 times with respect to its original length and even more preferably of at least 2.5 times with respect to its original length.

36. Assembly according to any one of claims 27 to 35, wherein said unitary tubular element once elongated and enlarged by the working pressure recovers back to the original

length thereof exclusively thanks to the elasticity thereof, without any other biasing means.

37. Assembly according to any of claims 27 to 36, wherein said connector (**1**) comprises at least one restriction or at least one flow restrictor (**52**) to create a working pressure in the hose susceptible to promote the elongation and enlargement thereof.

38. Assembly according to any one of claims 27 to 37, wherein the hose (**H**) is a garden flexible hose to transport water.

39. Assembly according to any one of claims 17 to 38, wherein the hose (**H**) is a not corrugated and a not coiled hose.

40. Assembly according to any one of claims 27 to 39, wherein said first and said second elastic polymeric materials are elastomers or thermoplastic elastomers.

41. Assembly according to any one of claims 27 to 40, wherein said unitary tubular element has a Shore A hardness measured according to ASTM D2240 (3'') of 30 ShA to 50 ShA.

42. Assembly according to any one of claims 27 to 41, wherein said at least one textile reinforcement layer (**H2**, **H2'**) consists of not elastic rigid yarns.

43. Assembly according to the previous claim, wherein said rigid yarns have an elongation at break measured according to BISFA (Cap 7) lower than 30% and preferably lower than 25%.

44. Assembly according to claim 42 or 43, wherein said rigid yarns have a toughness measured according to BISFA (Cap 7) of at least 50 cN/tex.

45. Assembly according to any one of claims 27 to 44, wherein said unitary tubular element and said at least one textile reinforcement layer (**H2**, **H2'**) reciprocally cooperate so as under a working pressure of 5 bar the radial enlargment of the inner diameter of said unitary tubular element is lower than 20% with respect to the inner diameter when in said unitary tubular element (**50**) the liquid does not flow, and preferably lower than 15% with respect to the inner diameter when the liquid does not flow in said unitary tubular element.

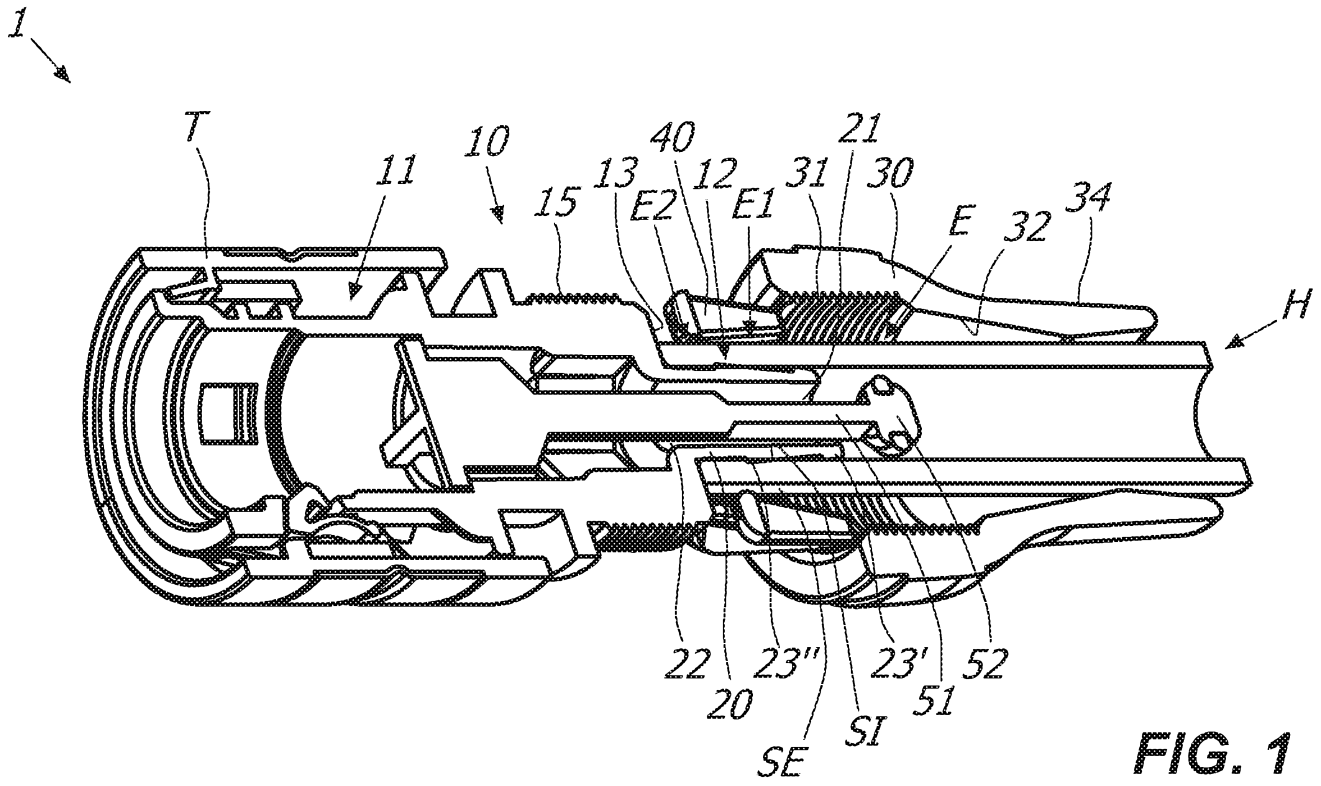
1
T
11
10
15
13
E2
40
12
E1
21
31
30
E
32
34
H
22
20
23''
SE
SI
23'
51
52

FIG. 1

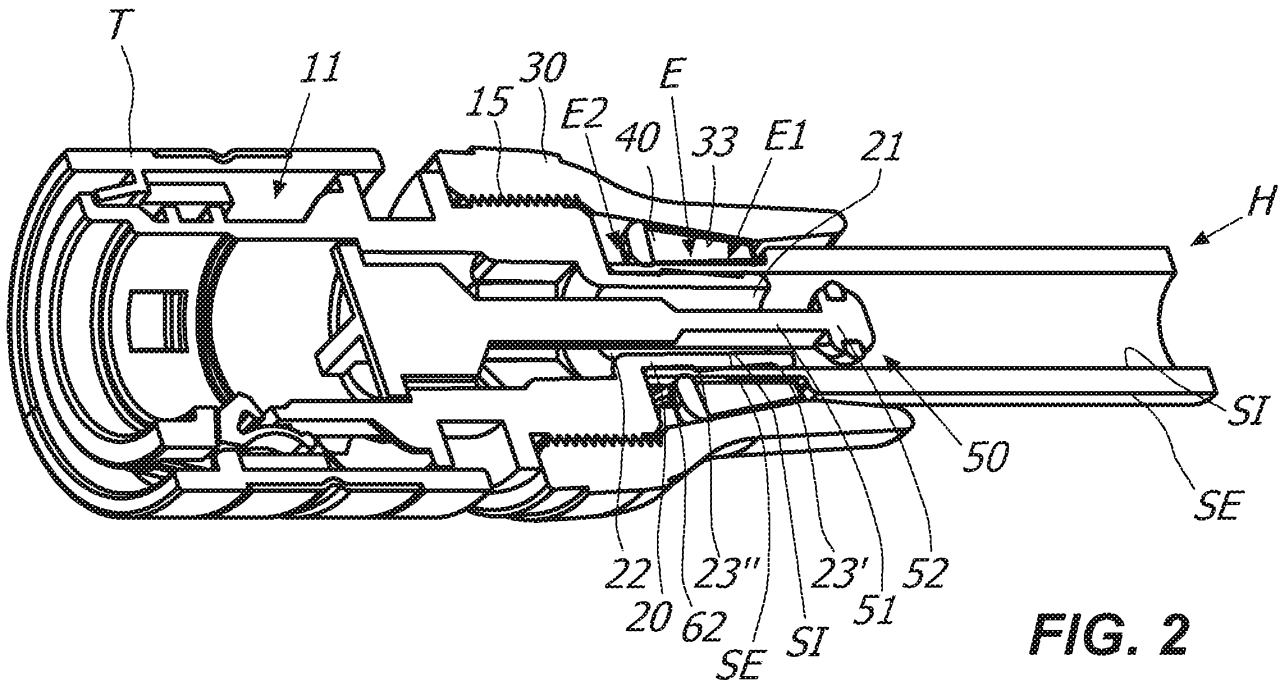
T
11
15
30
E2
E
40
33
E1
21
H
SI
50
SE
22
20
62
23''
SE
SI
23'
51
52

FIG. 2

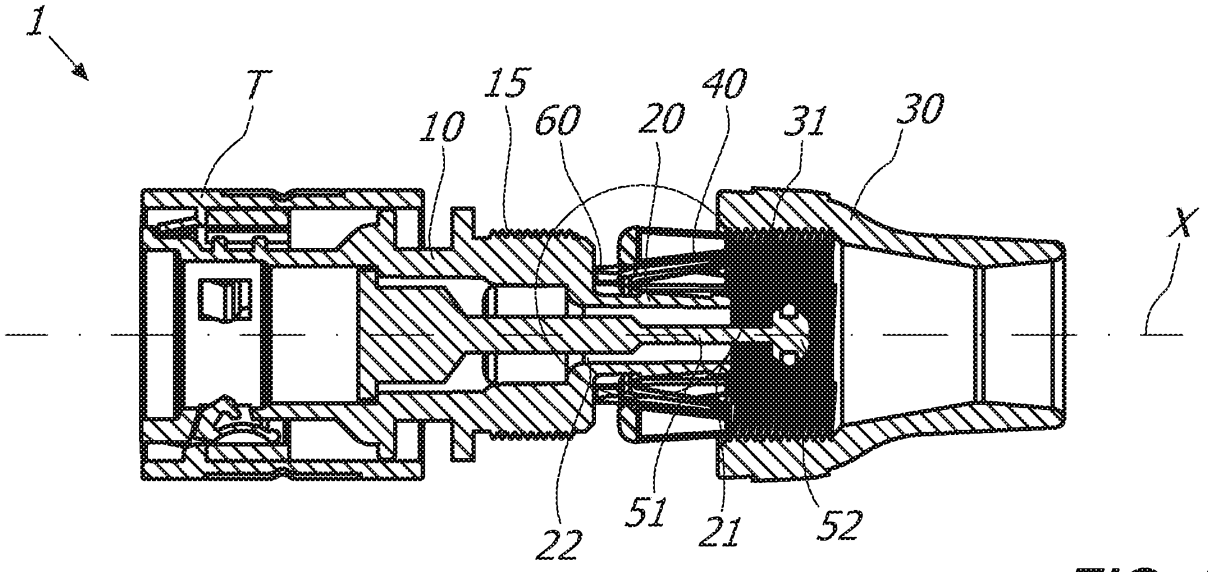

FIG. 3

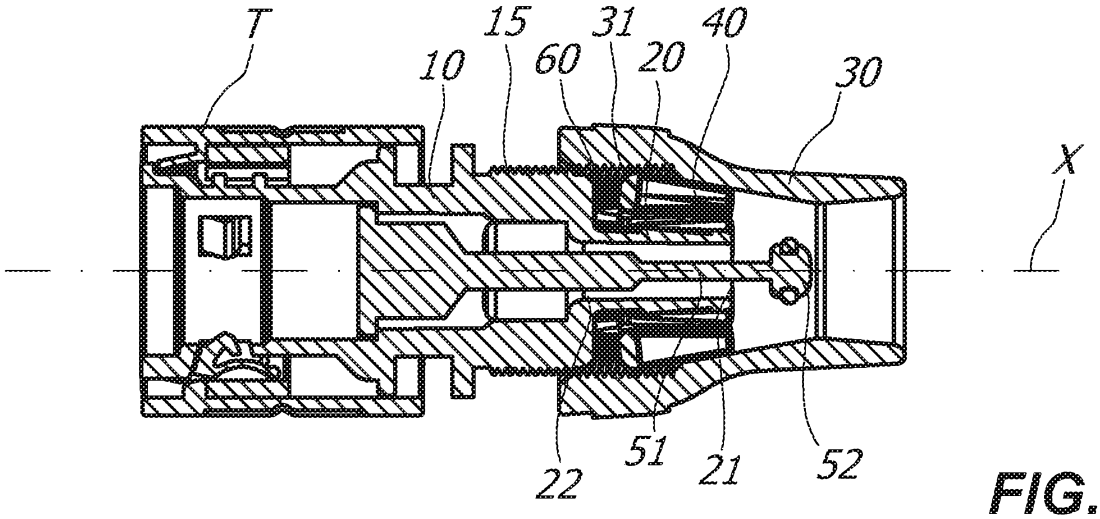

FIG. 4

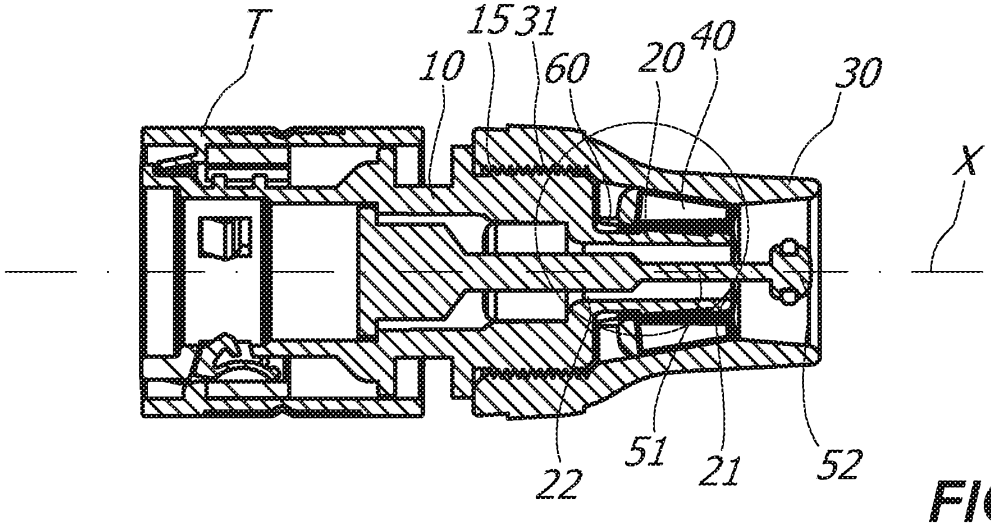

FIG. 5

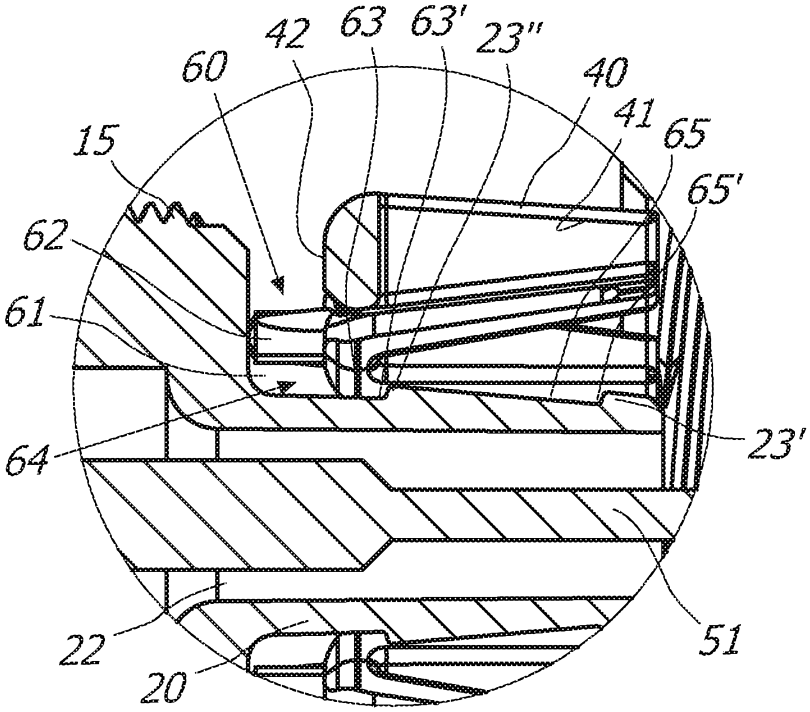
42
63
63'
23"
60
40
41
65
65'
15
62
61
64
23'
22
20
51

FIG. 6

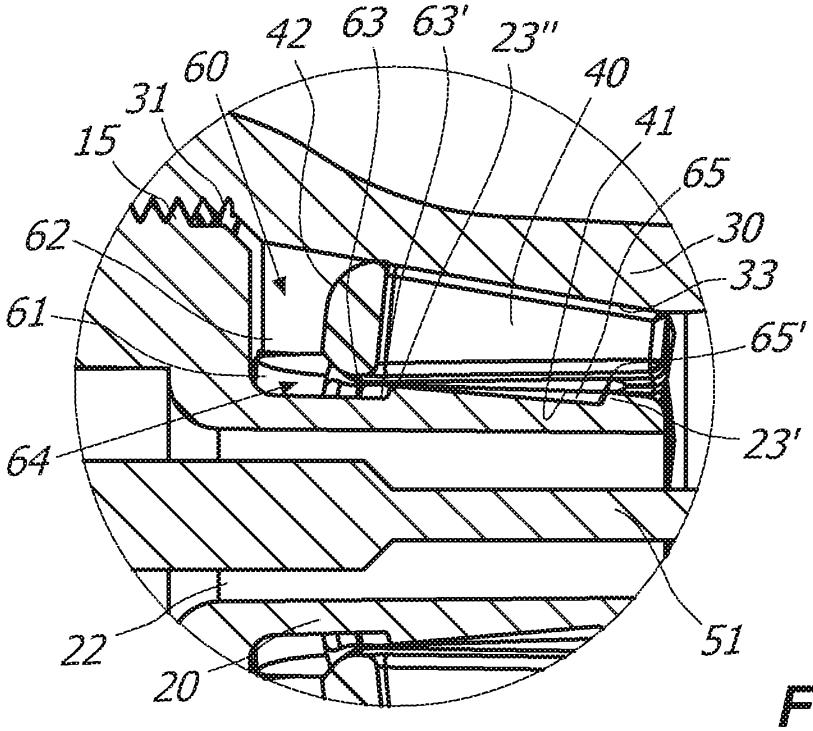
42
63
63'
23"
60
40
31
41
15
65
30
62
33
61
65'
64
23'
22
20
51

FIG. 7

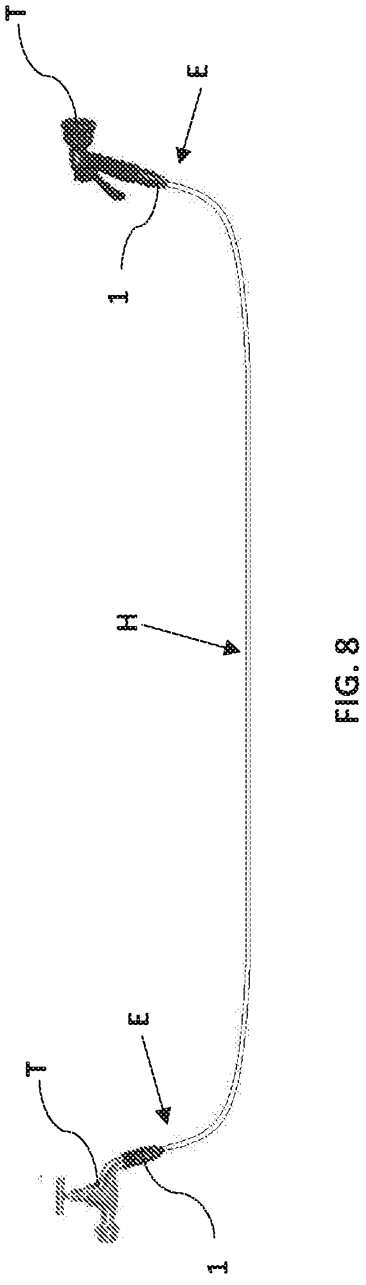

FIG. 8

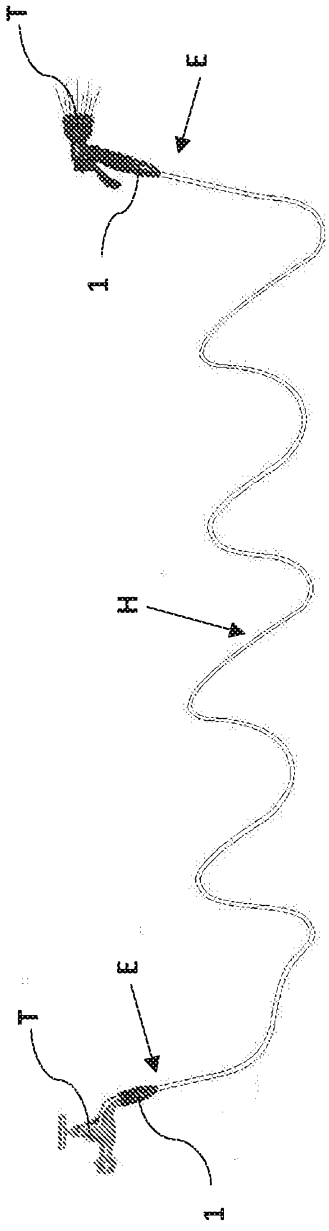

FIG. 9

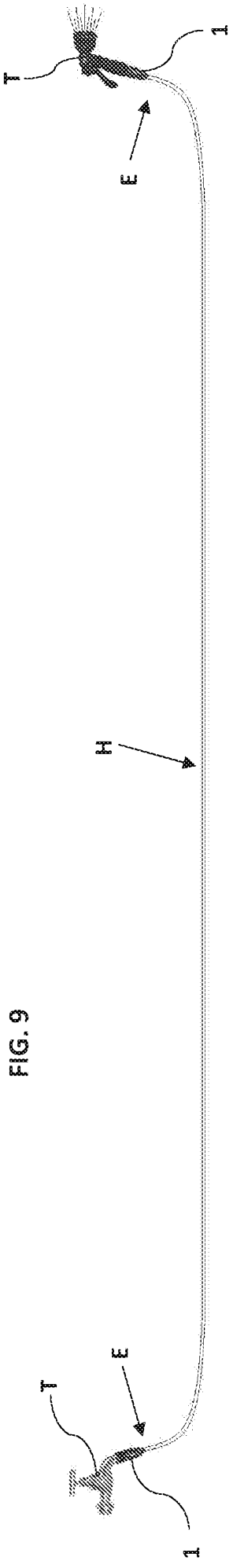

FIG. 10

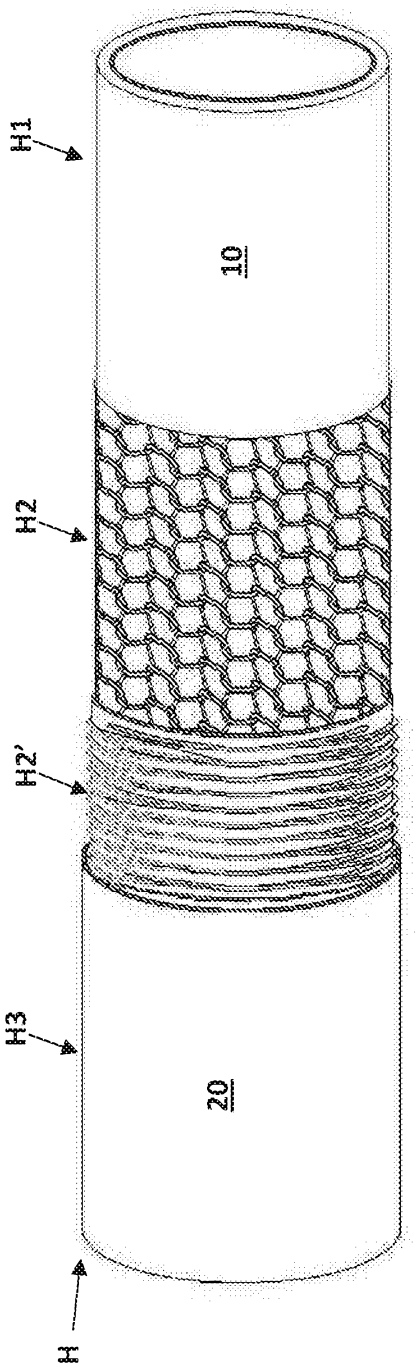

FIG. 11

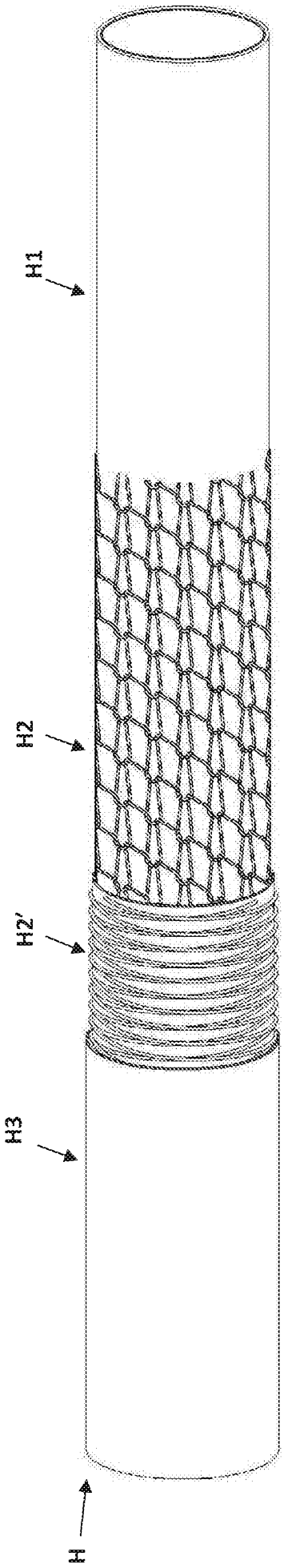

FIG. 12