

Device for the secured connection of two end fittings, particularly of a pipe.

Field of the invention

5 The invention relates to a connecting device between two end fittings, in particular end fittings of a pipe.

State of the art and problems arising:

10 The connecting device has the function of providing the mechanical connection by screwing of a first end fitting onto a second end fitting, and of avoiding the untimely unscrewing of the elements, in particular in applications where the elements are subjected in service to vibrations or jarring.

15 The invention relates more particularly but non-limitatively to the standardized end fittings of pipes to be connected, one of the end fittings having a nipple intended to be pressed into a corresponding flare of the other end fitting, for example a nozzle, under the tightening action of a nut being captive of one of the end fittings and engaging a thread formed on the other end fitting.

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One of the end fittings to be connected can comprise an area provided with several concavities, this denoting any hollow form (with respect to a relief or to an outer surface of the end fitting) evenly distributed on its periphery over an angle of 360° about the longitudinal axis of the end fitting, said
25 concavities being intended to receive anti-rotation means or at least being capable of slowing the relative rotation between the elements during untimely unscrewing. Connection devices are known that are provided with balls or mobile pistons capable of entering these concavities or emerging therefrom under the effect of a torque exceeding a given threshold, said
30 means making it possible to oppose untimely rotation between the elements for torques below this threshold. However, these means are complex, costly, constituted by a large number of elements and involve lengthy and difficult assembly. Moreover, they can cause malfunctions in the event of breaking, for example a piece being trapped

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in one of the concavities which then prevents the intentional unscrewing of the elements.

5 According to patent US 6 857 665 B2, a spring formed by a metal wire corrugated in a radial plane is lodged in an inner peripheral groove of the nut. In order to prevent untimely unscrewing, the lobes defined by the corrugations of the wire interfere with flutes formed around the extremity of the end fitting bearing the nut. The angular pitch of the lobes is different to that of the flutes. Thus, the lobes interfere in turn with a respective flute.
10 Every time, a lobe that passes the apex of a flute is flattened and this results in the elongation of the circumferential dimension of the spring. This device does not allow effective locking because the angular pitch between two locking portions is extremely small and the variation in the energy of deformation of the spring between two locking positions is low. The groove
15 must be relatively deep and weakens the nut.

Purpose of the invention:

The purpose of the invention is to overcome all or some of the aforementioned drawbacks.

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Subject matter(s) of the invention:

To this end, the subject matter of the invention is a device for connecting a first end fitting onto a second end fitting, in particular of a pipe, the device comprising a nut provided at a first extremity with a threaded bore into
25 which is screwed the first end fitting along a longitudinal axis to a tightened position in which the first end fitting is subject to axial stress with the second end fitting received in the nut, said nut and the second end fitting being shaped to limit the axial displacement of the nut with respect to the second end fitting in the direction of screwing of the nut, characterized in
30 that said device comprises anti-rotation means located between the nut and at least one of the first and second end fittings, called the locking end fitting, said anti-rotation means being constituted by at least one strip placed around the locking end fitting and extending over a determined angular sector about the longitudinal axis, said strip comprising

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at least one protrusion cut out of its thickness, which is capable of entering radially and elastically into at least one concavity, during the relative rotation between the nut and the locking end fitting, and emerging therefrom when a torque exceeding a predetermined threshold is applied
5 between the nut and the locking end fitting, the strip and the concavity being respectively mounted and formed on the nut and on the locking end fitting or vice-versa.

Each strip of the device supports one or more protrusions and constitutes a
10 one-piece means that is secure and not very costly to produce. The nut comprising one or more strips of this type is extremely compact and has a small radial space requirement since the strip is placed in the nut so as to present its (relatively small) thickness in the radial direction. Mounting each strip inside the nut is quick and easy. This device thus constitutes a
15 particularly optimized self-locking connection means.

According to further advantageous features of the invention, the locking end fitting is the second end fitting.

20 According to still further advantageous features of the invention, the strip is mounted bowed inside the nut while the concavity is formed on the periphery of the locking end fitting.

According to still further advantageous features of the invention, the device
25 comprises at least two strips, in particular made of metal, joining end-to-end at their extremities and extending globally over an angular sector of 360° about the longitudinal axis.

According to still further advantageous features of the invention, each strip
30 comprises at its extremities a radial extension entering a corresponding aperture formed in the body of the nut, in order to prevent any relative rotation between the strip and the nut.

According to still further advantageous features of the invention, the nut comprises an inner groove receiving the strip.

5 According to still further advantageous features of the invention, each strip comprises an axial extension cooperating with at least one protuberance formed on the inside of the nut, in order to prevent any relative movement between the strip and the nut.

10 According to still further advantageous features of the invention, the axial extension comprises a region placed between two protuberances. This arrangement constitutes a means of bilateral locking in rotation.

15 According to still further advantageous features of the invention, the at least one protuberance is engaged in a window having a shape corresponding to the axial extension. This arrangement constitutes a means of bilateral locking in rotation, as well as a means of locking in translation.

20 According to still further advantageous features of the invention, the strip is mounted on a third cylindrical guidance area.

25 According to still further advantageous features of the invention, the nut comprises at least one inner notch allowing the at least one protrusion to move radially outwards in order to emerge radially from the at least one concavity.

30 According to still further advantageous features of the invention, each protrusion is delimited by a generally U-shaped cutout, the protrusion being obtained by embossing, into a spherical shape, the material situated between the arms of the U, in the direction of the longitudinal axis. The spherical shape of the protrusions makes it possible to control and move smoothly over the sticking points generated during the rotary movement between the nut and the locking end fitting (by a slope effect at the base of the spherical shapes), when a torque above a given threshold is applied. This capability is present not only in rotation, but also in translation along
35 the longitudinal axis of the nut and

the locking end fitting, when it is necessary to slide the locking end fitting inside the nut in order to put sealing means in place. In the latter case, the adjustment between the locking end fitting and the nut requires that the anti-rotation means move easily and smoothly over the obstacles on the
5 outer shape of the locking end fitting (shoulder, etc.).

According to still further advantageous features of the invention, as each cutout is generally U-shaped, the extremities of the arms of the U open out into holes provided through the strip (14).

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According to still further advantageous features of the invention, the device comprises between four and eight protrusions distributed over an angular sector of 360° with respect to the longitudinal axis, and between eight and fourteen concavities shaped for receiving said protrusions.

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According to still further advantageous features of the invention, the strip has a thickness less than 5 mm, for example from 1 to 2 mm, and each protrusion reaches a height of less than 5 mm with respect to an adjacent area of the strip, this height being for example comprised between 1 and 2
20 mm.

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According to still further advantageous features of the invention, each aperture is produced so as to open out between the inside and the outside of the nut, the area opening to the outside being closed by a weld bead, in
25 particular for sealing purposes.

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According to still further advantageous features of the invention, each protrusion is supported by a tab delimited by a generally U-shaped cutout, the free extremity of the tab being curved so as to present a boss facing the
30 side opposite the protrusion.

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According to a further aspect of the invention, the subject matter of the invention is an end fitting for implementing a connecting device according to

any one of the previous claims, characterized in that it comprises concavities having the form of faces arranged in the shape of a polygon.

Detailed description of the invention:

- 5 The invention will be better understood on reading the following description of a non-limitative embodiment of the invention and in the light of the attached drawings, in which:
- 10 - Figure 1 shows a perspective view of the connecting device according to a first embodiment of the invention mounted on the first and second end fittings,
 - Figure 2 shows an exploded perspective view of the device in Figure 1 and of the end fittings,
 - Figure 3 shows a perspective view of the first end fitting in Figure 1,
 - 15 - Figures 4 and 5 are respectively perspective and plan views of a strip according to the first embodiment of the invention provided with protrusions according to the invention,
 - Figures 6 and 7 are respectively external and longitudinal cross-sectional perspective views of the nut according to the first embodiment of the invention,
 - 20 - Figure 8 is a longitudinal cross-sectional plan view of the nut in Figures 6 and 7,
 - Figure 9 is a perspective view in longitudinal cross section of the nut according to the first embodiment of the invention, in which is mounted a strip according to the invention,
 - 25 - Figures 10 to 12 show chronological views of the method of assembly and installation of the connecting device according to the first embodiment of the invention on the two end fittings,
 - Figure 13 shows a further embodiment of a strip according to the invention,
 - 30 - Figure 14 shows an exploded perspective view of the connecting device according to a second embodiment of the invention, mounted on the first and second end fittings,

- Figure 15 is a longitudinal cross-sectional perspective view of the nut and of the strip according to the second embodiment of the invention, and
- Figure 16 is a longitudinal cross-sectional plan view of the connecting device in Figure 14.

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As these embodiments are in no way limitative, it is possible in particular to envisage variants of the invention comprising only a selection of features described below, in isolation from the other features described, if said selection of features is sufficient to confer a technical advantage or to
10 differentiate the invention with respect to the state of the prior art. The selection comprises at least one, preferably functional, feature without structural details, or with only some of the structural details if this part only is sufficient to confer a technical advantage or to differentiate the invention with respect to the state of the prior art.

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Figures 1 and 2 show a connecting device between a first end fitting 1 and a second end fitting 2 which are typically end fittings mounted on sections of a pipe connected together. The end fittings are therefore hollow in order to ensure the continuity of the pipe. The assembly extends along a longitudinal
20 axis X.

The first end fitting 1 comprises a nipple 3 having an ovoid shape intended to be pressed into a tapered flare 4 of the second end fitting 2, said assembly being intended to provide a sealed connection between the two
25 end fittings 1, 2.

Starting from the nipple 3, the first end fitting 1 comprises a male thread 5 then a flange bearing on its periphery a rotation drive configuration 6 such as a hexagonal configuration.

The second end fitting 2 comprises a cylindrical outer shape 7 provided with
30 several concavities 8 angularly distributed on the periphery of the second end fitting, about the longitudinal axis X. These concavities denote any form that is hollow with respect to a relief (edges, teeth, notches) or an outer surface of the end fitting: in the example shown, these concavities have

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the form of faces arranged in a polygonal shape (in particular hexagonal, octagonal, or decagonal): the concavity is formed by a central area of each face that is set back towards the axis of the end fitting with respect to the edges of the polygon and with respect to the cylindrical outer surface 7 of the end fitting 2. In variants of the invention (not shown), the concavities can have diverse forms, such as flutes having various profiles extending along the longitudinal axis of the end fitting. An example variant is given below with reference to Figure 14. The concavities are intended to accommodate anti-rotation means 14 (Figures 4 and 5) which are described hereafter. At its extremities, the second end fitting 2 comprises for example a bevel 9, as provided at a first extremity facing the first end fitting 1, or a more complex rotational form, provided with one or more concave toroidal forms(s) intended to cooperate in contact with one or more o-ring seal(s) and/or forming a stop, of one or more cylindrical or frustoconical area(s). In the example shown in Figures 2 and 3, the second end fitting 2 comprises successively, from the cylindrical outer shape 7 away from the first extremity, a concave toroidal surface 10, a cylindrical segment 11, and a frustoconical area 12 and a cylindrical segment 13. In a variant, (not shown), a single cylindrical or frustoconical segment can be provided connecting to the cylindrical outer shape 7 via the concave toroidal surface. The cylindrical outer shape 7 is the portion of the second end fitting 2 having the greatest diameter.

The first end fitting 1 is fitted onto the second end fitting 2 via a nut 15 that is installed and made captive on the second end fitting 2, while being screwed onto the male thread 5 of the first end fitting 1.

As shown in Figures 6 to 8, the nut 15 has a generally rotational shape comprising on its periphery a rotation drive configuration 16, typically a hexagonal shape, allowing the nut 15 to be driven in rotation using a suitable tool, for the purpose of screwing it onto the first end fitting 1 while the latter is immobilized in rotation using a tool suitable for the rotation drive configuration 6 of the first end fitting 1. The rotation drive configuration 16 of the nut 15 is situated at one

extremity of the nut, for example the extremity remote from the first end fitting 1 as shown in the figures.

The nut comprises an inner bore in which several functional areas are successively identified, starting from its extremity facing the first end fitting 1 and continuing towards its opposite extremity: an inside thread 17 of the nut cooperating with the male thread 5 of the first end fitting 1, a first cylindrical guidance area 18 substantially following the cylindrical outer shape 7 of the second end fitting 2 in order to ensure satisfactory positioning and guidance of the nut 15 on said second end fitting 2, a first groove 19 for receiving the anti-rotation means 14 which will be described hereinafter, a second groove 20 having a toroidal shape for receiving an o-ring seal 21 (Figures 2, 11 and 12), and a second cylindrical guidance area 18' having a diameter substantially equal to the first cylindrical guidance area 18.

The first groove 19 comprises a cylindrical base 22. This groove receives anti-rotation means 14 constituted by one or more identical strips made of metal (Figures 4 and 5) configured according to an annular and cylindrical pattern, to be placed at the base of the groove 19 around the second end fitting 2. These strips are formed from sheet metal or flat-band steel. The width or height of the strips along the longitudinal axis X is less than the dimension of the form in the same direction. In the example described, two metal strips 14 are provided having a thickness typically less than 5 mm, for example of the order of 1 to 2 mm. In variant embodiments of the invention (not shown), three or more strips can be provided, or even a single strip open on its periphery, for the purpose of insertion into the nut and positioning in the groove 19. When several strips are provided, the latter are placed end-to-end, extending globally over the periphery of the second end fitting 2, over an angular sector of 360°. The strips 14 are placed in the groove 19 so as to be fully accommodated (with the exception of the protrusions 23 described hereinafter), in the direction of their thickness, in the depth of the groove 19, i.e. in a radial direction with respect to the longitudinal axis X. The strips 14 are therefore (with the exception of said protrusions 23) substantially flush with the cylindrical guidance areas 18 and 18'.

The strips 14 comprise at their ends radial extensions 24 directed towards the outside of the nut 15 and intended to be inserted into apertures 25 of conjugate shape formed in the body of the nut 15. In the example shown, where two strips 14 are provided, two apertures 25 are situated in the base
5 22 of the groove 19, in a diametrically opposed manner. Each of these apertures 25 accommodates the two respective juxtaposed extensions of the two strips 14 placed end-to-end, in order to ensure their correct positioning in the groove 19 and secure them in rotation with respect to the nut 15. It is of the utmost importance that these strips 14 do not rotate
10 with respect to the nut 15 while it is being screwed onto the first end fitting 1.

According to an essential aspect of the invention, the strips 14 comprise cutouts 26 forming protrusions 23 in the direction of the second end fitting 2. These protrusions 23 are intended to enter radially and elastically into
15 the concavities 8 of the second end fitting 2 when the angular positions of the two elements 2, 15 coincide. The end fitting 2 thereby constitutes a locking end fitting in the sense that it slows and/or prevents the rotation of the nut 15, below a determined torque, so as to prevent any untimely unscrewing. The protrusions 23 act like elastic lugs opposing any divergence
20 from their natural position engaged in the corresponding concavities. A torque exceeding a predetermined threshold must be applied to the nut with respect to the second end fitting 2 for the purpose of intentionally unscrewing it, which then causes the protrusions to diverge from their engaged position and allows the rotation of the nut. Continuing this rotation
25 by a further angle, each protrusion again finds itself opposite a concavity of the second end fitting, involving its elastic return to an engaged position, and so on.

The protrusions 23 are typically formed by embossing the material delimited by generally U-shaped cutouts, and more precisely material situated
30 between the lateral arms of the U. The protrusions have a spherical shape so as to facilitate their emergence from the concavities (by a slope effect, when the edges of the concavities 8 come into contact with the spherical base of the corresponding protrusion and then slide on the spherical surface of this

protrusion, causing its radial displacement). The height of the protrusions with respect to the adjacent surface of the strip 14 is for example 1 to 2 mm, and preferably does not exceed the thickness of the strip 14.

Provision is made for example for between eight and fourteen concavities
5 evenly distributed on the periphery of the second end fitting 2, and between four and eight protrusions evenly distributed over an angular sector of 360°. In the case shown on figures 4 and 5, where two strips 14 are provided, each strip supports for example three protrusions, bringing the total to six protrusions 23 around the second end fitting 2.

10 A description will now be given of the method of assembling the nut and connecting the end fittings 1, 2 with reference to Figures 10 to 12.

The nut 15 is inserted following the arrow F (Figure 10) onto the second end fitting 2, via the free extremity of the latter, which is facing the first end fitting 1 to be connected. It is assumed that the other extremity of the
15 second end fitting 2 is connected to a pipe section, which prevents the mounting of the nut 15 from this side. The nut 15 is guided onto the second end fitting 2 by the cylindrical guidance areas 18 and 18' of the nut 2 and the cylindrical outer shape 7 of the second end fitting 2, which are adjusted in relation to each other and cooperate in mutual contact. During the
20 movement of the nut following the arrow F, the strips 14 and their protrusions 23 surmount discontinuities in the shape of the second end fitting 2, for example the bevel 9 situated at the first extremity of the second end fitting, as well as the concavities 8. The strips 14 are in fact fully accommodated in the body of the nut 15 and are substantially flush
25 with the cylindrical guidance areas 18, 18'. The protrusions 23 diverge radially from their natural position under the force of the outer surface of the second end fitting 2, so as to allow the nut 15 to advance following the arrow F. When the nut 15 reaches an axial position that is sufficiently advanced with respect to the second end fitting 2 (Figure 11), and an
30 extremity of the nut 15 remote from the first end fitting 1 is substantially in vertical alignment with the second extremity of the second end fitting 2, which comprises a smaller diameter in comparison with the outer cylindrical surface 7, a space becomes free and allows the insertion of an o-ring seal 21 into

the nut 15, so that it can be positioned in the second groove 20. This seal 21 is open on its periphery for its installation around the second end fitting 2.

5 This seal 21 constitutes not only a sealing means for the assembly but also forms a stop making the nut 15 captive on the second end fitting 2. The seal is formed in order to follow the concave toroidal shape 10 made on the second end fitting 2 when the nut 15 is moved in the opposite direction, i.e. in the direction of the arrow G (Figure 12). The nut 15 therefore cannot be separated from the second end fitting 2 while the nut 15 is being screwed
10 onto the first end fitting as shown in Figure 12. The nut therefore moves with respect to the second end fitting following the arrow G, being pushed against by the first end fitting 1 during the screwing process, to a final tightened position in which the second end fitting 2 is stressed both by the o-ring seal 21 and by the first end fitting 1. During this movement
15 following the arrow G, the protrusions 23 again surmount discontinuities in the shape of the outer surface of the second end fitting 2, for example the edge 27 joining the concave toroidal shape 10 and the outer cylindrical guiding surface 7. In the final tightened position shown in Figure 12, the protrusions are situated axially in line with the concavities 8, and at least
20 some of them, by returning elastically to their natural position, enter the corresponding concavities of the second end fitting. The connection thus made is secured against untimely unscrewing.

The apertures 25 receiving the extensions 24 of the strips are shown opening out onto the outside of the nut (Figures 9 and 10). In order to seal
25 the assembly, the apertures 25 can be closed from the outside of the nut by a weld bead.

In the second embodiment, the elements having similar structures and functions have references increased by 100 with respect to the first
30 embodiment.

With reference to Figures 14 to 16, a second embodiment of the connecting device according to the invention will be described only to the extent that it differs from the first embodiment. In this second embodiment, the connecting device comprises substantially the same elements and a
35 similar arrangement to that of the first embodiment. This embodiment

includes both the first end fitting 101, the second end fitting 102 and the nut 115 provided with anti-rotation means constituted by at least one strip 114. The essential difference compared to the first embodiment lies in the fact that the strip is not mounted in a groove, but
5 directly on a third cylindrical guidance area 118'' defined between the first cylindrical guidance area 118 and the second cylindrical guidance area 118'. The third cylindrical guidance area 118'' is separated from the first cylindrical guidance area 118 by a third groove 132, and from the second cylindrical guidance area 118' by the second groove 120.

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The example shown in the drawings in Figures 14 to 16 comprises a single strip 114 which is open at a location on its periphery, so as to be inserted by radial elastic compression into the nut 115. The strip 114 released in the nut 115 retains a radial compression that allows the strip
15 114 to be held against the inside of the nut 115. The strip 114 moreover comprises at least one axial extension 133 cooperating with at least one protuberance 134 formed on the inside of the nut, at the same time allowing the axial positioning of the strip 114 in the nut 115 and preventing any relative rotation between the strip 114 and the nut 115. In
20 the example shown, the strip 114 comprises no radial extension, and the nut 115 comprises no aperture. The protuberance 134 is positioned on the third cylindrical guidance area 118'', and protrudes radially towards the inside thereof so as to be substantially flush with an inner face of the strip 114. In the example described, an axial extension 133 is provided,
25 extending substantially in the axial continuation of the strip 114, and comprises orifices 135 having a shape complementary to that of the protuberances 134, which are three in number in the example. According to a feature, the at least one protuberance 134 is placed next to the third groove 132 in order to reduce the axial space requirement of the nut 115.
30 In further variants (not shown), the at least one protuberance 134 is separate from the third groove 132.

The protuberance 134 can have different shapes. In the example described, in cross-section the protuberance has substantially the shape of a cylinder of axis X, said cross-section having an axial dimension smaller than its
35 peripheral dimension, making it possible

to space the anti-rotation means apart on the periphery of the third cylindrical guidance area 118''' to prevent the axial extension 133 passing over the protuberance 134, and/or locking the second end fitting 102 in the nut 115 under the effect of the torque. This form of protuberance 134 makes it possible to stop the rotation of the strip 114 on the nut 115 for high torques without increasing the dimensions of the connecting device. In the example shown, the axial extension 133 comprises two orifices 135 each working together with a protuberance 134. In variants (not shown) an axial extension 133 can cooperate with two separate protuberances 134, in particular if the axial extension is T-shaped projecting axially from the strip 114 and has a form complementary to the parts of the protuberances 134 adjacent to the radial extension 133. In other variants (not shown), the strip 114 can comprise several separate radial extensions 133.

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Moreover, as shown in Figures 15 and 16, the nut 115 can comprise at least one inner notch 136 allowing the at least one protrusion 123 to move radially outwards to emerge radially from the at least one concavity 108 during the rotation of the nut 115 on the second end fitting 102. In the example shown, a single inner notch 136 in the form of a groove is arranged in line with four protrusions 123. In variants (not shown), the nut 115 comprises several inner notches 136 each in line with a protrusion, the inner notches 136 having different possible shapes allowing the at least one protrusion 123 to emerge radially.

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Provision is also made for the extremities of the arms of the U of each generally U-shaped cutout forming the protrusions 123 to open into holes 137 passing through the strip 114. The holes 137 allow in particular a better distribution of the mechanical stresses undergone by the strip 114 in order to reduce the elastic fatigue of the strip 114.

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In the example in Figure 14, the end fitting 102 comprises several concavities 108 in the form of splines along the longitudinal axis of the end fitting, inset towards the axis of the end fitting with respect to the cylindrical outer surface 107 of the end fitting 102, said splines being open
5 on the side of the end fitting 102 opposite the flare 104. Non-limitatively, the splines of the example in Figure 14 are produced with a spherical milling cutter forming a spline in a segment of a circle in a plane of section normal to the longitudinal axis X.

10 Of course, the invention is not limited to the means that have just been described and includes all the technical equivalents.

In particular the different features, forms and variant embodiments of the invention can be combined with each other in various combinations insofar as they are not incompatible or mutually exclusive.

15 In particular, provision can also be made for the anti-rotation means to be provided between the nut and the first end fitting 1 (not shown). Provision can also be made for the strips to be mounted on one of the end fittings and for the protrusions to enter concavities formed on the nut.

20 Moreover, as shown in Figure 13, each strip 14' can have a protrusion 23' supported by a tab 28 itself delimited by a generally U-shaped cutout 26'. The free extremity of the tab 28 that is not supporting the protrusion 23' comprises in this example a curved shape via two successive folds, so as to present a boss facing the nut 15, on the opposite side to the protrusion 23'.

25 The stiffness of each protrusion is thereby increased, due to the boss resting on the base 22 of the first groove of the nut 22. This option thus stresses three edges 29 (at the base of the tab 28), 30 (first fold, on the side of the protrusion 23') and 31 (second fold, on the side of the free extremity of the tab 28).

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CLAIMS

1. Device for the connection of a first end fitting (1, 101) onto a second end fitting (2, 102), in particular of a pipe, the device comprising a nut (15, 115) provided at a first extremity with a threaded bore (17, 117) into which is screwed the first end fitting (1, 101) along a longitudinal axis (X) to a tightened position in which the first end fitting (1, 101) is subject to axial stress with the second end fitting (2, 102) received in the nut, said nut (15, 115) and the second end fitting (2, 102) being shaped so as to limit the axial displacement of the nut (15, 115) with respect to the second end fitting (2, 102) in the direction of screwing of the nut, characterized in that said device comprises anti-rotation means located between the nut (15, 115) and at least one of the first (1, 101) and second (2, 102) end fittings, called the locking end fitting, said anti-rotation means being constituted by at least one strip (14, 114) placed around the locking end fitting and extending over a determined angular sector about the longitudinal axis (X), said strip comprising at least one protrusion (23, 23', 123) cut out of its thickness, which is capable of entering radially and elastically into at least one concavity (8, 108), during the relative rotation between the nut (15, 115) and the locking end fitting (2, 102), and emerging therefrom when a torque exceeding a predetermined threshold is applied between the nut (15, 115) and the locking end fitting (2, 102), the strip (14, 114) and the concavity (8, 108) being respectively mounted and formed on the nut (15, 115) and on the locking end fitting (2, 102) or vice-versa.
2. Connecting device according to claim 1, characterized in that the locking end fitting is the second end fitting (2, 102).
3. Connecting device according to claim 1 or 2, characterized in that the strip (14, 114) is mounted bowed inside the nut (15, 115) while the concavity (8, 108) is formed on the periphery of the locking end fitting (2, 102).
4. Connecting device according to claim 3, characterized by comprising at least two strips (14, 114), in particular made of metal,

joining end-to-end at their extremities and extending globally over an angular sector of 360° about the longitudinal axis (X).

- 5 5. Connecting device according to claim 4, characterized in that each strip (14) comprises at its extremities a radial extension (24) entering a corresponding aperture (25) formed in the body of the nut (15), in order to prevent any relative rotation between the strip (14) and the nut (15).
- 10 6. Connecting device according to claim 5, characterized in that each aperture (25) is produced so as to open out between the inside and the outside of the nut (15), the area opening to the outside being closed by a weld bead.
- 15 7. Device according to any one of claims 3 to 6, characterized in that the nut (15) has an inner groove (19) receiving the strip (14).
- 20 8. Connecting device according to any one of claims 3 to 6, characterized in that each strip (114) comprises an axial extension (133) cooperating with at least one protuberance (134) formed on the inside of the nut, in order to prevent a relative movement between the strip (114) and the nut (115).
- 25 9. Connecting device according to claim 8, characterized in that the axial extension (133) comprises a region placed between two protuberances (134).
10. Connecting device according to claim 8 or 9, characterized in that the at least one protuberance (134) is engaged in a window having a shape corresponding to the axial extension (133).
- 30 11. Connecting device according to any one of claims 8 to 10, characterized in that the strip (114) is mounted on a third cylindrical guidance area (118").

12. Connecting device according to any one of claims 8 to 11, characterized in that the nut (115) comprises at least one inner notch (136) allowing the at least one protrusion (123) to move radially outwards in order to emerge radially from the at least one concavity (108).

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13. Connecting device according to any one of claims 3 to 12, characterized in that each protrusion (23, 23', 123) is delimited by a generally U-shaped cutout, the protrusion (23, 23', 123) being obtained by embossing, into a spherical shape, the material situated between the arms of the U, in the direction of the longitudinal axis (X).

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14. Connecting device according to claim 13, characterized in that for each generally U-shaped cutout, the ends of the arms of the U open out into holes (137) provided through the strip (114).

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15. Connecting device according to any one of claims 1 to 14, characterized by comprising between four and eight protrusions distributed over an angular sector of 360° with respect to the longitudinal axis (X), and between eight and fourteen concavities shaped for receiving said protrusions.

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16. Connecting device according to any one of claims 1 to 15, characterized in that the strip (14, 114) has a thickness less than 5 mm, for example 1 to 2 mm, and in that each protrusion (23, 23', 123) reaches a height of less than 5 mm with respect to an adjacent area of the strip, this height being for example comprised between 1 and 2 mm.

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17. Connecting device according to any one of claims 13 to 16, characterized in that each protrusion (23') is supported by a tab (28) delimited by a generally U-shaped cutout,

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the free extremity of the tab (28) being curved so as to present a boss facing the side opposite the protrusion (23').

18. End fitting (2.102) for implementing a connecting device according to
5 any one of the previous claims, characterized in that it comprises concavities (8, 108) having the form of faces arranged in a polygonal shape.