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# (54) Device for lifeline

(57) A device (6) for a lifeline (1), the device comprising a main body (7) having a first portion (8) and a second portion (9), opposed to the first one; a first secondary body (10) coupled to said main body (7) by placing therebetween a spring system (12) and intended to be hooked to an element (5) of the lifeline on the side of the first portion (8); a second secondary body (11) bound to the main body and intended to be hooked to an additional element (2) of the lifeline on the side of the second portion (9); wherein the spring system, when subjected to a force of 2 kN, has a total length differing from the total length thereof without applied forces of at least 3 mm.

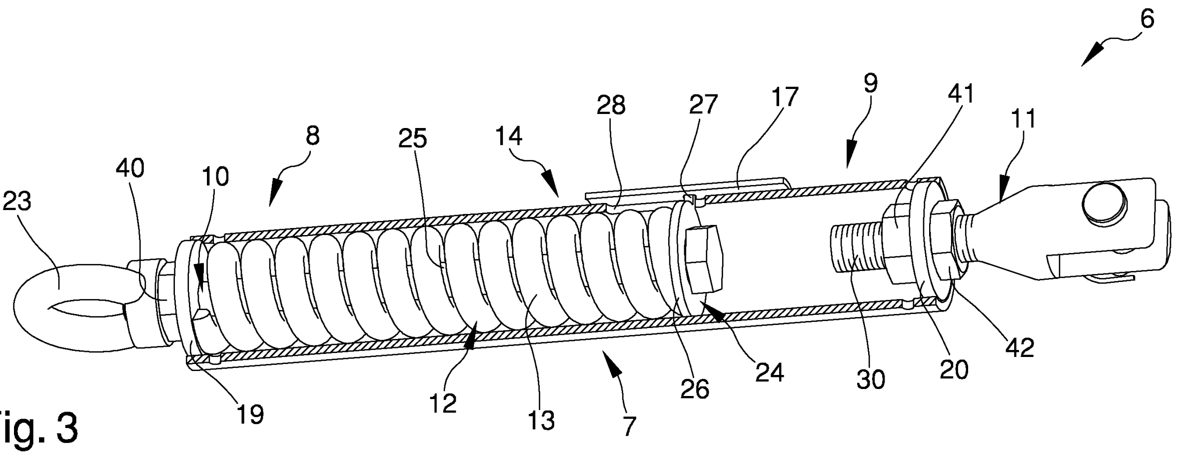


Fig. 3

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## Description

**[0001]** The present invention relates to a device for lifelines, to the lifeline including this device and to a method for installing this lifeline.

**[0002]** It is known about lifelines, such as those disclosed in document W02008/081375, designed to be mounted onto structures typically located at a certain height from the ground, such as building roofs, walls or beams, as a safety system for operators working at this height from the ground. These lifelines, though not ensuring to prevent the operator from losing balance and from slipping down, do however prevent in this case the operator from colliding with underlying structures or with the ground, or do anyhow limit the violence thereof.

**[0003]** Known lifelines generally comprise two supporting stakes designed to be fastened at mutually distanced positions, typically along a sloping ridge of a roof of a building structure, such as e.g. a house, a block of flats, an industrial building or the like. In order to enable the supporting stakes to be fastened onto the structures, each supporting stake is provided with a base plate having a plurality of fastening holes for engaging corresponding fastening elements. A connecting rope, preferably made of steel, is fastened between the supporting stakes, to which rope an operator can be hooked by suitable harnesses and spring catches or similar safety equipment, thus being able to shift between the supporting stakes.

**[0004]** The connecting rope, also for safety reasons, is tightened to a suitable tension of normal operation, typically of few kN (in the range from about 1 kN to about 3 kN, typically 2 kN). To this purpose, in document W02008/081375 a first end of the connecting rope is hooked to a supporting stake by means of a tensioning element made up of a small cylinder having at its ends respective threaded holes into which respective threaded bodies are inserted. During use, by rotating the cylinder with respect to the two threaded bodies the total length of the tensioning element is varied, thus varying the tension of the connecting rope.

**[0005]** Furthermore, in document W02008/081375 a second end of the connecting rope opposed to the first one is hooked to the other supporting stake by means of a shock absorbing element, apt to soften the shock which the operator is subjected to when falling down. This shock absorbing element is made up of a main body and a secondary body, hooked in a substantially non-elastic manner to the two supporting stakes, respectively, and a two-spring system placed between the main body and the secondary body. The lifeline further comprises an intermediate retaining element, placed at a distance between the supporting stakes in order to counter any transversal shifts of the connecting rope according to predefined limits.

**[0006]** The Applicant has found that the lifeline described in W02008/081375 has some drawbacks.

**[0007]** Among these, it is not equipped with any system for indicating the tension which the connecting rope is subjected to, so that the fitter and/or the user cannot easily know the exact value thereof.

**[0008]** The Applicant has further found that in lifelines present on the market, such as those described in W02008/081375, the spring system (typically comprising two or three springs) of the shock absorbing element is sized so that, when subjected to operating tension (about 1 to about 3 kN, e.g. 2 kN), it undergoes an extremely small (typically less than 3 mm) variation of total length with respect to the state of complete release (absence of forces). Therefore, these spring systems do not promote the integration of an indicating system into the shock absorbing system, since the mutual shift between the main body and the secondary body is so small to be negligible or insufficient to provide a sufficiently accurate indication of tension.

**[0009]** The Applicant has also found that in lifelines present on the market, such as those described in W02008/081375, the aforesaid main body is mechanically completely bound to an additional secondary body arranged on the opposite side with respect to the aforesaid secondary body so as to hook the main body to its respective supporting stake. For instance, though being in assembly the aforesaid additional secondary body screwed to the main body by means of a threaded coupling system, it is then welded to the main body, so as to prevent any further mutual rotation, both during installation and during use. As a result, the shock absorbing element, once assembled, is not designed to vary in a controlled manner its length and thus act as a tension device.

**[0010]** It is also known about a multifunctional device for lifelines, which acts as an energy dissipator in case of fall, as a tension device and as a tension indicator.

**[0011]** The Applicant has found that also the latter solution has some drawbacks. Among these, the separation between the shock absorbing unit ("shock absorber") in case of fall and the preliminary tensioning unit which absorbs small stresses on the rope, makes the construction and operation of the device quite complex, thus increasing the costs thereof.

**[0012]** Within this framework, the technical task underlying the present invention is to propose a device for lifelines, a lifeline comprising this device and an installation method, which overcome one or more of the drawbacks of the prior art as referred to above.

**[0013]** One of the aims of the present invention in one or more of its various aspects is to provide a device for lifelines, a lifeline comprising this device and a corresponding installation method, which are able to ensure a high level of safety.

**[0014]** One of the aims of the present invention in one or more of its various aspects is to propose a device for lifelines which can act as a shock absorber in case of fall and also as a tension indicator, as well as preferably also as a tensioner.

**[0015]** One of the aims of the present invention in one or more of its various aspects is to propose a device for lifelines with a small size, particularly along the direction of main development of the device.

**[0016]** One of the aims of the present invention in one or more of its various aspects is to propose a device for lifelines and a lifeline comprising this device, which are simple and cheap to manufacture and/or store and/or install and/or use.

**[0017]** One or more of the technical tasks and/or of the aims referred to are basically achieved by a device for lifelines, a lifeline comprising this device and a corresponding installation method, comprising the technical features listed below.

**[0018]** In one aspect, the invention relates to a device for a lifeline comprising: a main body having a first portion and a second portion, opposed to the first one, stiffly bound to one another; a first secondary body movably coupled to the main body and intended to be hooked to an element of the lifeline on the side of the first portion; a second secondary body, distinct and separate from the first one, coupled to the main body and intended to be hooked to an additional element of the lifeline on the side of said second portion; a spring system interposed between said main body and said first secondary body.

**[0019]** In one aspect of the invention, the spring system, when subjected to a force of 2 kN, has a total length differing from the total length without forces of at least 3 mm, preferably at least 4 mm, still more preferably at least 5 mm.

**[0020]** In one aspect of the invention, the spring system has an elastic behavior when subjected to a force up to at least 5 kN, preferably up to at least 6 kN, still more preferably up to at least 7 kN. "Elastic behavior" means that the variation of total length undergone by the spring system (with respect to the length without applied forces) is about directly proportional to the applied force.

**[0021]** In one aspect, the minimum force which, applied to the spring system, causes the maximum possible compression of the latter (e.g. at least one spring of the spring system has its turns in mutual contact) is of 5 kN or above, preferably of 6 kN or above, still more preferably of 7 kN or above.

**[0022]** In one aspect, the spring system comprises one and only one spring.

**[0023]** In one aspect, the device comprises a display system having a first portion integral with said main body and a second portion integral with said first secondary body, so that the relative position of said first portion with respect to said second portion, this relative position being determined by the force acting upon the spring system only, provides an easily understandable indication of this force acting upon the spring system.

**[0024]** In one aspect, the first and/or the second portion of the display system comprises a display graph (e.g. a graduated scale or a series of bands of different appearance, e.g. of different color).

**[0025]** In one aspect, the first portion of the display system comprises a a display graph (e.g. a graduated scale or a series of bands of different appearance, e.g. of different color) placed on an outer surface of the main body, and the second portion of the display system comprises a cursor shifting in correspondence of said display graph and with respect to it.

**[0026]** In one aspect, the second portion of the display system comprises a a display graph (e.g. a graduated scale or a series of bands of different appearance, e.g. of different color) placed on an outer surface of the first secondary body, and the first portion comprises a cursor shifting in correspondence of said display graph and with respect to it.

**[0027]** In one aspect, the first and the second portion of the display system comprise a first and a second element, respectively, placed so that when the spring system is subjected to a force above 5 kN, preferably of 6 kN or above, the first and the second element enter into mutual contact and cause a permanent change in at least one of the first and the second element. Preferably, the first element or alternatively the second element coincides with the aforesaid shifting cursor. Preferably, the first element and/or the second element are made of permanently deformable material, e.g. plastic.

**[0028]** In one aspect, the second secondary body is coupled to the main body by means of a threaded coupling system.

**[0029]** In one aspect, the main body can rotate with respect to said second secondary body and, as a result of the mutual rotation between said main body and said second secondary body, said threaded coupling system causes a variation of the total length of said device.

**[0030]** In one aspect, said main body can rotate with respect to said first secondary body.

**[0031]** In one aspect, said main body is substantially shaped as a hollow cylinder with two end walls on the first and second portion, respectively.

**[0032]** In one aspect, the spring system is interposed between said first portion of the main body and said first secondary body, so as to be subjected to a compression force when the first and second secondary body are subjected to forces pulling them apart.

**[0033]** In one aspect, the first secondary body has a first end portion protruding from an end wall of said first portion of the main body and intended to be hooked to said element of the lifeline, and a second end portion opposed to the first portion with respect to said end wall of the main body, wherein said spring system is interposed between said main body and said second end portion. In this latter aspect, the first secondary body can further have an elongated intermediate portion, stiffly connecting the first to the second end portion, inserted with clearance into a through hole located on said end wall.

**[0034]** In one aspect, the spring system comprises a helical spring into which an intermediate elongated portion of the first secondary body is inserted with clearance.

**[0035]** In one aspect, the second end portion of the first secondary body comprises a foil, preferably circular in shape, onto which said spring system abuts.

**[0036]** In one aspect, said foil has a degree of rotational freedom with respect to the remaining portions of the first secondary body (including the remaining parts of the second end portion). In this latter aspect, said foil can have an extension located on the peripheral edge and configured for sliding inside a window obtained on the main body. Preferably, the aforesaid display graph is located on said window or near it.

**[0037]** In one aspect, the second secondary body has a respective first portion protruding from a respective end wall of said second portion of the main body and intended to be hooked to said additional element of the lifeline, and a respective second portion on the opposite side with respect to the first portion, wherein said threaded coupling system is interposed between said main body and said second portion. In this aspect, the second portion of the second secondary body can be threaded externally and inserted into a threaded through hole placed on said respective end wall of said second portion of the main body.

**[0038]** In one aspect, the present invention relates to a lifeline comprising at least a first and a second supporting stake intended to be fastened to a structure in a mutually spaced manner, and a connecting line between said first and second stake, wherein said connecting line comprises at least one cable and the device according to any one of the previous aspect, connected one to the other.

**[0039]** In one aspect, the present invention relates to a method for installing a lifeline according to the above, comprising the steps of fastening to the structure the first and second supporting stake; rotating said second secondary body with respect to said main body thanks to said threaded coupling system, until the total length of said device reaches a predefined maximum length; hooking said connecting line to the first and second stake; and rotating said main body with respect to said second secondary body so that said threaded coupling system causes a reduction in the total length of the device until a suitable tension of the connecting line is achieved.

**[0040]** Further characteristics and advantages of the present invention will appear better from the indicative, and therefore non-limiting, description of some exemplary though not exclusive embodiments of a device for lifelines, of a lifeline comprising this device and of the corresponding installation method according to the present invention, including a preferred though not exclusive embodiment thereof, thanks to the accompanying drawings, in which:

- Figure 1 is a perspective view of a lifeline according to an aspect of the present invention and shown in an installation configuration, in particular for roofs (not shown);
- Figure 2 is a perspective view of a shock absorbing and tensioning device according to an aspect of the present invention;
- Figure 3 is a perspective view of the device of Figure 2 partially sectioned.

**[0041]** With reference to the accompanying figures, the numeral 1 globally refers to a lifeline, in particular for roofs, according to an aspect of the present invention.

**[0042]** As shown in Figure 1, the lifeline 1 comprises at least a first supporting stake 2 and at least a second supporting stake 3, preferably basically identical one to the other, which can be placed one beside the other at a suitable distance. During use, the supporting stakes 2, 3 are fastened with their basis to a building structure (not shown in the figure) such as a roof (preferably on top of it), a wall, a beam or other. Each supporting stake 2, 3 is preferably of the type described in document W02008/081375 mentioned above, and for a detailed description thereof reference is made to the description contained therein.

**[0043]** The lifeline 1 comprises a connecting line 4 apt to physically and continuously connect the first and the second stake 2, 3. The connecting line 4 comprises at least one cable 5, preferably made of steel, and a device 6 connected one to the other. For instance, the cable 5 has a first end 5a (directly) hooked to a hooking ring of the second supporting stake 3, and a second end 5b, opposed to the first end 5a, (indirectly) hooked to a respective hooking ring of the first supporting stake 2 so as to provide an elongated hooking structure for the aforesaid hooking and/or safety equipment, along which it can slide between the supporting stakes 2, 3.

**[0044]** By way of example, the second end 5b of the cable is hooked to the respective supporting stake 2 by placing therebetween at least one device 6. It is obvious that the lifeline can comprise several devices 6 (e.g. at both ends of the cable) and that the device 6 can be installed so as to be rotated of 180° with respect to the Figure 1.

**[0045]** Advantageously, the lifeline 1 can further comprise at least an intermediate retaining element (not shown in the figure) interposed between the supporting stakes 2, 3 for contrasting any transversal shifts of the connecting line 4 according to predefined limits. This intermediate element is preferably of the type described in document W02008/081375 mentioned above, and for a detailed description thereof reference is made to the description contained therein.

**[0046]** The device 6 for lifelines comprises a main body 7 having a first portion 8 and a second portion 9, opposed to the first one 8, stiffly bound to one another; a first secondary body 10 movably coupled to the main body 7 and intended to be hooked to an element of the lifeline (in the example the cable 5, but it could also be the stake 2 and/or 3) on the side of the first portion 8; a second secondary body 11, distinct and separate from the first one 10, coupled to the main body 7 and intended to be hooked to an additional element of the lifeline (in the example the stake 2, but it could also be the cable 5) on the side of said second portion 9; and a spring system 12 interposed between said main body 7 and said first secondary body 10. The spring system 12 contains one or more springs 13 with parallel arrangement (in cases of serial arrangement, one series of springs is regarded as one spring). Preferably (as shown), the spring system comprises one and only one spring 13, e.g. of torsion type (i.e. a helical spring). Thus the device is compact and reliable.

**[0047]** Preferably, the spring system 12 is interposed between the first portion 8 of the main body 7 and the first secondary body 10 (as shown in Figure 3), so as to be subjected to a compressive force when the first 10 and second secondary body 11 are subjected to forces pulling them apart (i.e. in use when the cable 5 is under tension).

**[0048]** Alternatively or in addition, the spring system 12 may be interposed (not shown) between the second portion 9 of the main body 7 and the first secondary body 10, so as to be subjected to a tensile force when the first 10 and second secondary body 11 are subjected to forces pulling them apart (i.e. in use when the cable 5 is under tension). In this case the ends of the spring system 12 must be fastened to the two abutting bodies, e.g. by welding.

**[0049]** Preferably, the spring system 12, when subjected to a force of 2 kN (approximately 200 kg), has a total length differing from the total length without forces of at least 3 mm, preferably at least 4 mm, still more preferably at least 5 mm (in the example about 5 mm). Thus, the movement of the two bodies is sufficient to provide a sufficiently accurate indication of the tension of the cable 5. As a matter of fact, once the lifeline is installed, the force which the spring system is subjected to corresponds approximately to the tension of the connecting line 4.

**[0050]** Preferably, the spring system 12 has an elastic behavior when subjected to a force up to at least 5 kN, preferably up to at least 6 kN, still more preferably up to at least 7 kN.

**[0051]** Preferably, the minimum force which, applied to the spring system 12, allows to reach the minimum possible length of the latter (e.g. when at least one spring of the spring system has its turns in mutual contact) is of 5 kN or above, preferably of 6 kN or above, still more preferably of 7 kN or above. It should be pointed out that with forces which are higher than or equal to the aforesaid minimum force for reaching the minimum possible length (turns in mutual contact), the spring does not behave elastically (and typically also for forces slightly lower than this force). When at least one spring of the spring system is under maximum compression, the spring system can no longer act as a shock absorber and stiffly transfers the load applied thereto. Advantageously, the device 1 can also be used as a tension indicator (see further below) in a static test performed with a tension of about 5 kN or above. Moreover, the spring system 12 can act as a shock absorber with quite high tensions (of 5 kN or above and typically up to 7 or 8 kN), which can occur e.g. in case of fall.

**[0052]** "Elastic behavior" means that the variation of length undergone by the spring system (with respect to the position without applied forces) is about directly proportional to the applied force (Hook's law). In further detail, a real spring can typically have deviations from the ideal elastic behavior, e.g. - though not only - with applied forces below a threshold value (typically approximately 100 kN). By mere way of example, in the case of only one spring 13 working under compression as shown in Figure 3, with respect to the length without applied forces, the free end 24 (with respect to the main body 7) of the spring 13 can move back (towards the left of the figure) according to the following table:

| Applied force (kN) | Moving back (mm) |
|---|---|
| 100 | 2 |
| 200 | 5 |
| 300 | 9 |
| 400 | 13 |
| 500 | 18 |
| 600 | 20 |
| 700 | 25 |
| 800 | 30 |
| 850 | 32 (max) |

**[0053]** Preferably, the maximum moving back of the free end of the spring system 12 until it reaches the minimum possible length (turns in mutual contact) is of at least 15 mm, preferably 20 mm. In the example above, the maximum moving back of the end before reaching the minimum possible length (turns in mutual contact) is of about 32 mm and occurs with a force of about 8.5 kN.

**[0054]** Preferably, the device 1 comprises a display system 14 having a first portion 15 integral with the main body 7 and a second portion 16 integral with the first secondary body 10, so that the relative position of the first 15 portion with respect to the second portion 16, this relative position being determined by the force (tension) acting upon the spring system 12 only, provides the operator with a clear and intelligible indication of this force acting upon the spring system 12.

**[0055]** In the example shown, the first portion 15 of the display system 14 comprises a display graph (e.g. a graduated scale, as shown, or a series of bands of different appearance, e.g. of different color) placed on an outer surface 7a of the main body 7. The second portion 16 comprises a cursor 17 (e.g. a plate) shifting in correspondence of the display graph and with respect to it. This plate 17 is integral with a foil or washer 26, being part of the first secondary body 10, onto which the spring 12 abuts (see further below).

**[0056]** In another embodiment, the first portion 15 of the display system 14 can comprise, further to the display graph, a series of slots or through holes located on the outer surface 7a of the main body 7, configured for enabling to see from outside the position of the first secondary body 10 (e.g. the position of the foil 26 with respect to the display graph). The main body 7 may also be transparent, at least in the portion corresponding to the display graph.

**[0057]** As an alternative or in addition to the previous embodiments, the second portion 16 of the display system may comprise (not shown) a display graph (e.g. a graduated scale or a series of bands of different appearance, e.g. of different color) placed on an outer surface of the first secondary body 10 (preferably on the portion thereof located on the end wall 19 of the portion 8 of the main body 7), and the first portion 15 comprises a cursor (preferably the outer face of the aforesaid end wall 19 or, in the example shown in Figure 3, of the nut 40 associated thereto) shifting in correspondence of the display graph and with respect to it.

**[0058]** Preferably, the display system 14 (e.g. the display graph) is configured for indicating a tension of at least 5 kN. For instance, the aforesaid series of bands of different appearance can comprise a red band for positions of the cursor 17 corresponding to tensions significantly below 2 kN (e.g. below 1.8 kN), a green band for tensions approximately of 2 kN (e.g. 1.8 to 2.2 kN), and a red band for tensions significantly above 2 kN (e.g. above 2.2 kN). Moreover, it may comprise a band of different color (e.g. a yellow band) for tensions of approximately 5 kN (e.g. 4.8 to 5.2 kN).

**[0059]** Preferably, the display system 14 is configured for permanently indicating when a tension above 5 kN is reached (e.g. in case of operator's fall). For instance, the first portion of the display system can comprise a first element (not shown) placed (typically on the display graph) so that when the spring system is subjected to a force above 5 kN, preferably of 6 kN or above, the cursor 17 gets in contact with the first element causing a permanent change of the latter. Preferably, the first element is made of permanently deformable material, e.g. plastic, so that the cursor may deform, break and/or permanently mark it.

**[0060]** In one embodiment, the second secondary body 11 is integrally bound (e.g. welded or made as one piece) to the main body 7.

**[0061]** Preferably, the second secondary body 11 is coupled to the main body 7 by means of a threaded coupling system. Thus, the main body 7 can be rotated in a controlled manner with respect to the second secondary body 11 and, as a result of the mutual rotation between the main body 7 and the second secondary body 11, the threaded coupling system causes a variation of the total length of the device 1. During use, this variation is partially reduced by the variation of length of the spring system 12 due to the tension of the line 4.

**[0062]** It is obvious that any other coupling system between main body 7 and second secondary body 11 alternative to the threaded coupling system and performing the aforesaid function of varying in a controlled manner the mutual position of the two bodies and therefore the total length of the device, though keeping the two bodies firmly bounded together, is a technical equivalent of the latter.

**[0063]** Advantageously, the main body 7 is basically shaped as a hollow cylinder 18 with two end walls 19, 20 on the first and second portion 8, 9, respectively, fastened (e.g. welded) to the cylinder 18.

**[0064]** Preferably, the main body 7 has on its lateral surface one or more through holes 21 for letting water out, which may otherwise turn into ice and cause an improper function of the device 6

**[0065]** In a preferred embodiment, the first secondary body 10 has a first end portion 22 protruding from an end wall 19 of the first portion 8 of the main body 7 and intended to be hooked (e.g. by means of an eyebolt 23 first screwed onto the threaded portion 22 and then welded thereto) to the aforesaid element (e.g. the cable 5) of the lifeline 1, and a second end portion 24 opposed to the first portion 22 with respect to the end wall 19 of the main body 7 (and typically located inside the cavity of the latter). The spring system 12 is preferably interposed between the main body 7 (e.g. between its aforesaid end wall 19) and the second end portion 24, inside the cavity of the main body 7. The first secondary body 10 can further have an elongated intermediate portion 25 stiffly connecting the first 22 to the second end portion 24, which gets through with clearance a through hole located on the end wall 19, so that the first secondary body 10 can slide longitudinally within the aforesaid hole. Preferably, the elongated intermediate portion 25 of the first secondary body 10 is inserted with clearance (e.g. basically not in contact) into the aforesaid torsion spring 13. In the example shown, the first secondary body 10 is a bolt with a head being part of the second end portion 24 and a stem (at least whose end is threaded) being part of the portions 22 and 25. This stem is inserted with clearance into the through hole of the wall 19 so as to slide longitudinally with respect to it. The nut 40, having an inner hole with a larger diameter than the first secondary body 10 (e.g. the portion 24 getting through it), is welded to the main body 7 for helping the rotation thereof with respect to the second secondary body 11 by means of an adjustable wrench.

**[0066]** Advantageously, the second end portion 24 of the first secondary body 10 comprises a foil 26, preferably circular in shape, onto which the spring system 12 abuts.

**[0067]** This foil 26 can be firmly connected (e.g. welded) to the first secondary body 10 or preferably, as shown in Figure 3, it may have a degree of rotational freedom (with longitudinal axis, e.g. along the direction of main development of the device 6) with respect to the remaining portions (e.g. 22, 25 but also the rest of the second end portion 24) of the first secondary body 10 (such as e.g. a washer 26). In this latter case, the foil 26 can rotate integrally with the main body 7 (and typically with the spring system 12) creeping against the retaining head (e.g. bolt head) belonging to the second end portion 24, thus advantageously allowing an easier rotation of the main body 7 with respect to the first secondary body 10. Moreover, the foil 26 enables to obtain the display system 14 disclosed by way of example, since it can rotate integrally with the main body 7, though the first secondary body 10 remains still.

**[0068]** As shown by way of example, the foil 26 may have an extension 27 located on the peripheral edge thereof and configured for sliding longitudinally inside a window 28 obtained on the lateral wall 7a of the main body 7. Preferably, the aforesaid display graph 15 is located in the immediate nearness of said window 28, so that the cursor 17, integral with the foil 26 since it has a hole engaged by the extension 27, with its position with respect to this graph 15, can indicate the tension of the line 4.

**[0069]** Preferably, the main body 7 can rotate with respect to the first secondary body 10, as shown in the example and in the embodiments described above. If the main body 7 cannot rotate or cannot easily rotate with respect to the second secondary body 10, it is advantageous to apply between the first secondary body 10 and the cable 5 (or anyhow the supporting stake 3) a device apt to enable the rotation of the first secondary body 10 with respect to the supporting stake 3 (e.g. when adjusting tension as described below).

**[0070]** Preferably, the second secondary body 11 has a respective first portion 29 protruding from a respective end wall 20 of the second portion 9 of the main body 7 and intended to be hooked to the aforesaid additional element 2 of the lifeline 1, and a respective second portion 30 on the opposite side with respect to the first portion 29, wherein said threaded coupling system is interposed between the main body 7 and the second portion 30. In one embodiment (not shown), the second portion 30, threaded internally, can surround the main body, threaded externally. In a preferred embodiment, the second portion 30 of the second secondary body 11 can be threaded externally and engaged into a threaded through hole placed on the end wall 20 of the main body 7. In the example shown, this threaded hole is obtained by welding a threaded nut 41 to the wall 20, wherein the threaded inner hole of the nut 41 is the aforesaid threaded hole. The nut 42, engaged onto the threading 30 of the second secondary body 11 outside the wall 20, acts by way of example as a counter-nut for fastening the secondary body 11 to the main body 7, once their mutual position has been adjusted.

**[0071]** Optionally, an end stop (not shown) can be provided on the free end of the portion 20 of the second secondary body 11.

**[0072]** A preferred method for installing the lifeline 1 comprises the steps of fastening to the structure the first and second supporting stake 2, 3; rotating the second secondary body 11 with respect to the main body 7 thanks to the threaded coupling system, until the total length of the device reaches a predefined maximum length (secondary body 11 taken out as much as possible of the main body 7); then hooking the connecting line 4 (cable 5 plus device 6) to the first and second stake 2, 3; and rotating the main body 7 with respect to the second secondary body 11 so that the threaded coupling system causes a reduction in the total length of the device 6 until a suitable tension of the connecting line 4 (e.g. 2 kN) is achieved.

**[0073]** Preferably, the aforesaid method comprises the execution of a static test, wherein said tension of the connecting line 4 is of at least 5 kN. Preferably, the device 1 (typically the display system 14) is used as an indicator for this tension.

**[0074]** Preferably, after the static test has been performed, the method comprises the step of rotating the main body 7 with respect to the second secondary body 11, so that the threaded coupling system causes an increase in the total length of the device 6 until an operating tension (e.g. in the range of about 1 kN to about 3 kN, typically 2 kN) of the connecting line 4, below the aforesaid tension of at least 5 kN, is achieved.

## Claims

**1.** A device (6) for a lifeline (1), the device including:

- a main body (7) having a first portion (8) and a second portion (9), opposite to the first one;
- a first secondary body (10) coupled to said main body (7) and intended for being hooked to a member (5) of said lifeline on the side of said first portion (8),
- a second secondary body (11) coupled to the main body and intended for being hooked to an additional member (2) of said lifeline on the side of said second portion (9);
- a spring system (12) interposed between said main body (7) and said first secondary body (10);

**characterized in that** the spring system, when subjected to a force equal to 2 kN, has a total length which differs from its own total length in the absence of applied forces for at least 3 mm.

**2.** A device according to claim 1, wherein the minimum force which, when applied to the spring system (12), determines the highest possible compression of this latter is higher or equal to 5 kN, preferably higher or equal to 6 kN.

**3.** A device according to claim 1 or 2, wherein the spring system (12) includes one and only one spring (13).

**4.** A device according to any one of the preceding claims, the device further including a display system (14) having a first portion (15) integral to said main body (7) and a second portion (16) integral to said first secondary body (10), such that the relative position of said first portion (15) of the display system relative to said second portion (16) of the display system, such relative position being only determined by the force acting on the spring system, provides an indication of such force acting on the spring system.

5. A device according to any one of the preceding claims, wherein the second secondary body (11) is coupled to the main body (7) through a threaded coupling system and the main body can rotate relative to said second secondary body and, following to the relative rotation between said main body and said second secondary body, said threaded coupling system causes a variation of the total length of said device (6).

6. A device according to any one of the preceding claims, wherein the main body (7) consists of a preferably substantially cylindrical-shaped hollow body (18), having two end walls (19, 20) placed in correspondence with the first (8) and the second (9) portions, respectively.

7. A device according to any one of the preceding claims, wherein the first secondary body (10) has a first end portion (22) exiting from an end wall (19) of said first portion (8) of the main body (7) and intended for being hooked to said member (5) of the lifeline (1), a second end portion (24) opposite to the first end portion (22) relative to said end wall (19) of the main body (7), and an elongated intermediate portion (25), firmly connecting the first (22) and the second (24) end portions, which crosses with clearance a through-hole arranged in correspondence with said end wall (19), wherein said spring system (12) is attested between said end wall (19) and said second end portion (24) and includes a helical spring (13) in which said elongated intermediate portion (25) of the first secondary body (10) is inserted with clearance, the second end portion (24) of the first secondary body including a preferably circular shaped-foil (26), on which said helical spring (13) is attested and which has a rotational degree of freedom relative to the remaining parts of the first secondary body (10).

8. A device according to any one of the preceding claims, wherein the second secondary body (11) has a respective first portion (29) exiting from a respective end wall (20) of said second portion (9) of the main body (7) and intended for being hooked to said additional member (2) of the lifeline (1) and a respective second portion (30) opposite to its own first portion (29), wherein said threaded coupling system is interposed between said main body (7) and said second portion (30), the second portion (30) of the second secondary body (11) being externally threaded and inserted in a threaded through-hole arranged in correspondence with said respective end wall (20) of said second portion (9) of the main body (7).

9. A lifeline (1) including at least a first (2) and a second (3) support stake intended for being fixed to a structure in a mutually spaced way and a connecting line (4) between said first and second stakes (2, 3), wherein said connecting line (4) includes, connected therebetween, at least a cable (5) and the device (6) according to any one of the preceding claims.

10. An installation method of a lifeline according to the preceding claim, including the steps of:

- fixing to the structure the first (2) and the second (3) support stakes;
- rotating said second secondary body (11) relative to said main body (7) thanks to said threaded coupling system, until the total length of said device (6) reaches a predetermined maximum length;
- hooking said connecting line (4) to the first and second stakes (2, 3); and
- rotating said main body (7) relatively to said second secondary body (11) such that said threaded coupling system determines a decrease of the total length of the device (6), until to reach a proper tension of the connecting line (4).

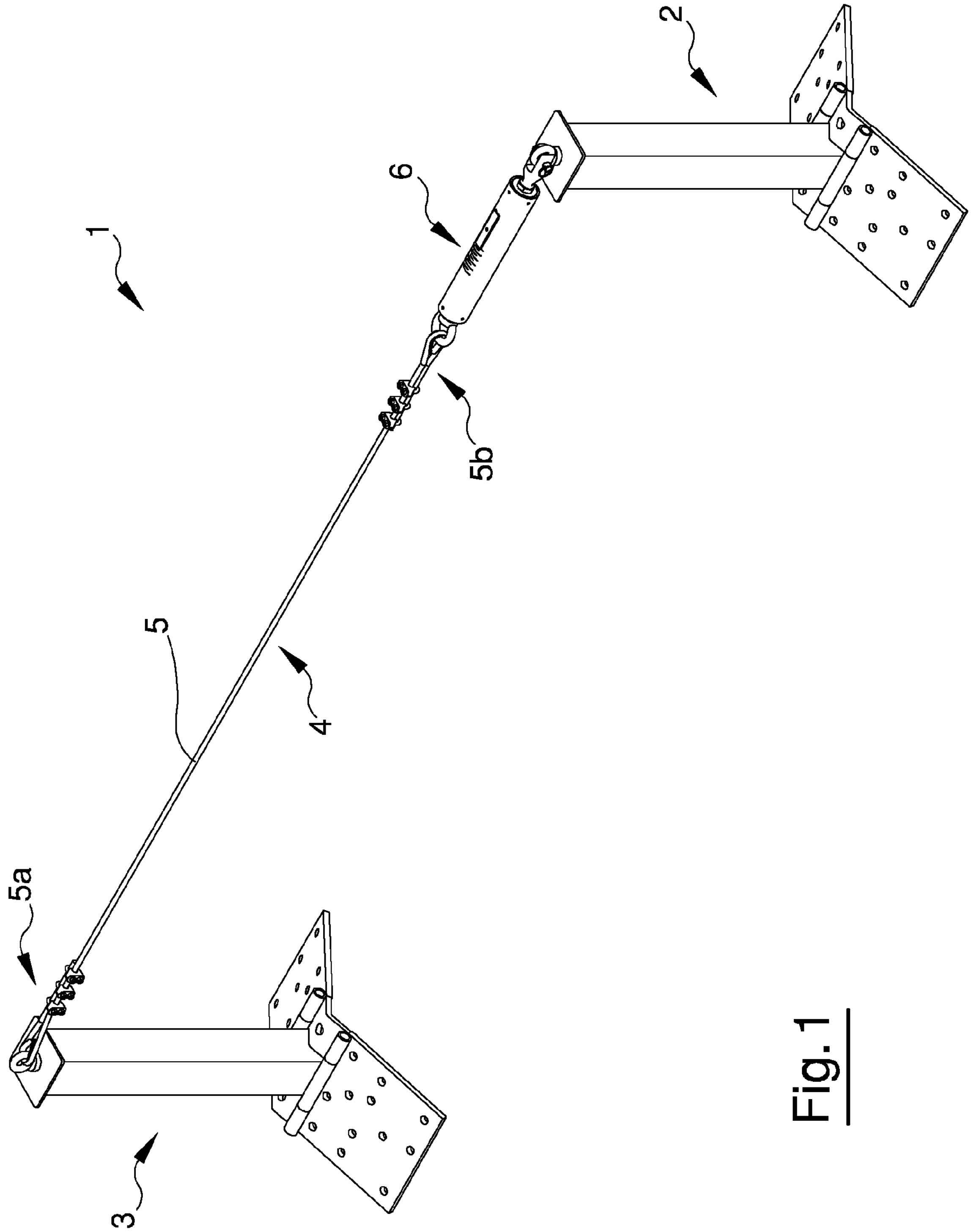


Fig.1

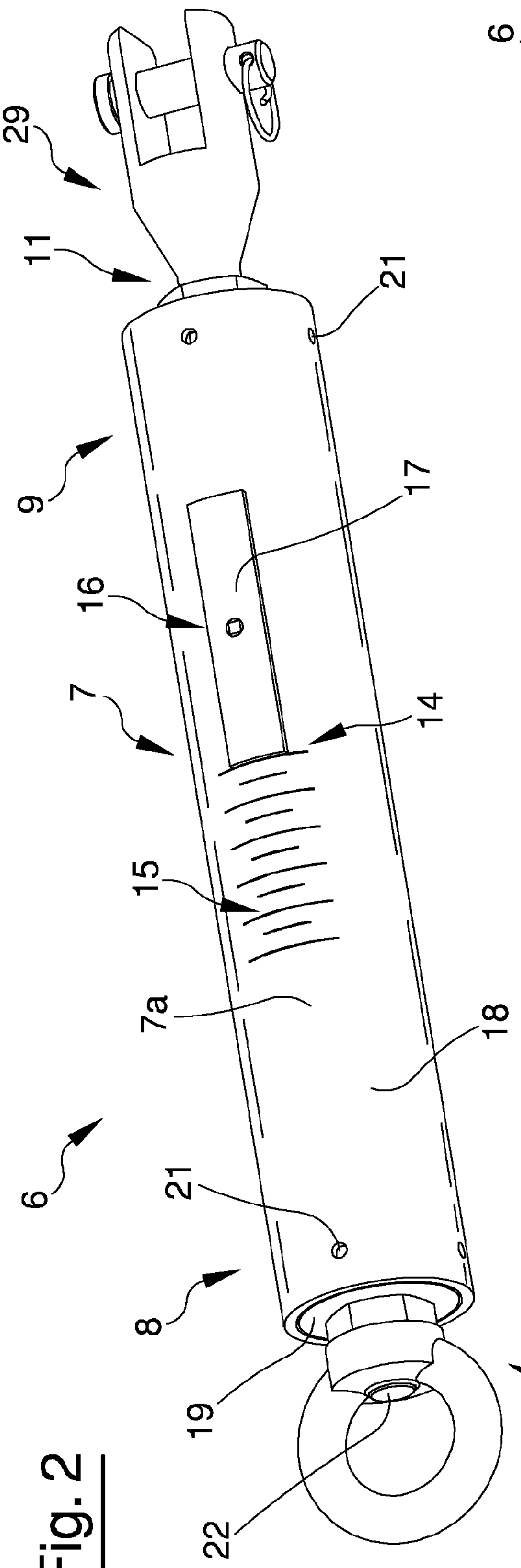
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Fig. 2

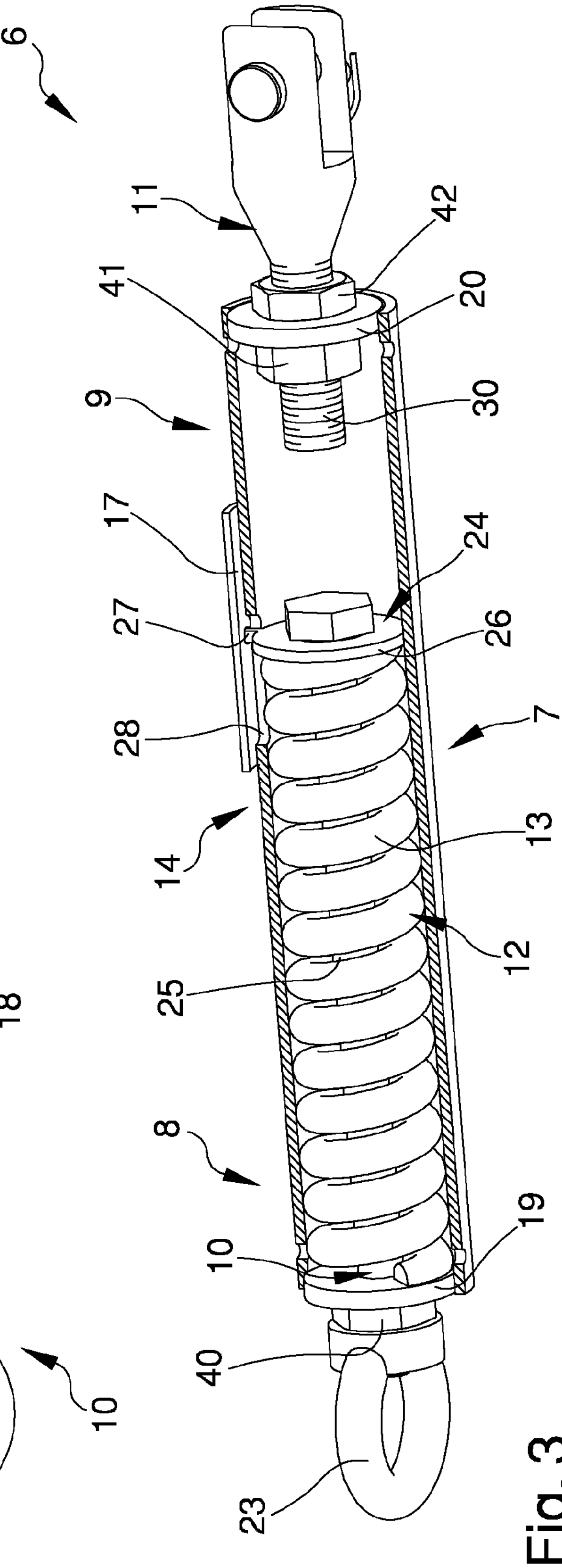
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Fig. 3

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# EUROPEAN SEARCH REPORT

Application Number
EP 10 15 1838

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (IPC) |
|---|---|---|---|
| X<br>Y | DE 20 2005 014359 U1 (SKYLOTEC GMBH [DE]) 17 November 2005 (2005-11-17)<br>* the whole document * | 1-7<br>8-10 | INV.<br>E04D13/12<br>A62B1/04<br>E04G21/32 |
| Y,D | WO 2008/081375 A1 (SI AL S R L [IT]; GANDELLINI ALBERTO [IT]; MIGLIO SIMONE [IT]) 10 July 2008 (2008-07-10)<br>* the whole document * | 8-10 | |
| A | GB 2 351 789 B (HANEM SITE SAFETY EQUIPMENT LT [GB] HANEM SITE SAFETY EQUIPMENT LT [GB)<br>22 January 2003 (2003-01-22)<br>* page 9, line 30 - page 10, line 2 * | 1 | |
| A | US 5 358 068 A (WHITMER GERALD T [US]) 25 October 1994 (1994-10-25) | 1 | |
| A | US 5 332 071 A (DUNCAN CHARLES W [US]) 26 July 1994 (1994-07-26) | 1 | TECHNICAL FIELDS SEARCHED (IPC) |
| A | FR 2 857 270 A1 (SOMAIN [FR]) 14 January 2005 (2005-01-14) | 1 | E04D<br>A62B<br>E04G |

1

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| Munich | 26 March 2010 | Vratsanou, Violandi |

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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## ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 10 15 1838

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26-03-2010

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
| DE 202005014359 U1 | 17-11-2005 | EP 1762274 A1 | 14-03-2007 |
| WO 2008081375 A1 | 10-07-2008 | CA 2692012 A1<br>EP 2099984 A1 | 10-07-2008<br>16-09-2009 |
| GB 2351789 B | 22-01-2003 | GB 2351789 A | 10-01-2001 |
| US 5358068 A | 25-10-1994 | NONE | |
| US 5332071 A | 26-07-1994 | CA 2116886 A1 | 10-09-1994 |
| FR 2857270 A1 | 14-01-2005 | NONE | |

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

## REFERENCES CITED IN THE DESCRIPTION

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### Patent documents cited in the description


- WO 2008081375 A **[0002] [0004] [0005] [0006] [0008] [0009] [0042] [0045]**