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(54) **LIFE-SAVING DEVICE FOR LADDER**

(57) The present invention is placed in the field of the accident prevention devices and, in particular, of the safety devices associated to ladders and it relates to a device for securing an operator when he/she climbs a ladder, in particular a pull-down ladder, leaned against a vertical structure, for example a pole or a tree.



FIG. 6

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Description

TECHNICAL FIELD

[0001] The present invention is placed in the field of the accident prevention devices and, in particular, of the safety devices associated to rung or step leaning ladders of, for example, simple, pull-down or telescopic type (hereinafter ladder(s)).

BACKGROUND OF THE INVENTION

[0002] The present invention relates to a device for securing an operator when he/she climbs a ladder leaned against a vertical structure. The fall-prevention protection systems protecting workers typically comprise a safety harness worn by the user, a lifeline connected to the harness and a supporting structure thereto the lifeline is connected. This system usually is sufficient when a stable and fixed supporting structure for fastening is available.

[0003] However, with the portable climbing systems, such as a ladder, a supporting structure is not always available. The use of ladders, especially extendable ladders, in particular of pull-down or telescopic type, always involves high risks or dangers of accidents, injuries or deaths caused by fall, especially for the operators for technical intervention on power lines, or any other operator whose job requires to climb high structures, in particular poles or trees.

[0004] The risk of falling increases considerably with the height of the leaning site and when the ladder is not put up correctly. Moreover, the use of ladders to climb poles and trees may add an additional risk, since the upper rung of the ladder generally is leaned against one single point of the pole or the tree. The upper portion of the ladder then can easily swing and the inevitable motion of the user and/or intervention of atmospheric agents (for example wind), vibrations of the leaning structure or vibrations of the ladder due to forces applied by third parties at the base of the ladder, all factors which may cause the top of the ladder to rotate around the pole or the tree, by compromising the stability thereof and cause the fall of the user.

[0005] Nowadays there are several devices to fasten the top of the ladders to poles or trees and to reduce the risk of falling, with the purpose of reducing the risk that the ladder slips accidentally or pivots on the pole or the tree once the ladder has been put up. However, such devices have several deficiencies, thereamong an excessive complexity, unreliable locking mechanisms, poor resistance, excessive weight and operation difficulty.

[0006] Especially, all these devices provide to secure the user and the ladder only when the ladder has been already positioned and the operator has already climbed. Generally, after having extended and leaned the ladder against the pole, the operator climbs the ladder as far as the wished position to perform the work, and only in that moment he/she is secured by anchoring to the pole

through a rope to avoid accidental fall. Once finished, the operator unties from the pole to descend the ladder. This means that the operator does not result to be tied up while climbing or descending the ladder.

[0007] The problem of the ladders with fall-prevention device of known type is that the lifeline is constrained to the ladder itself and therefore in case of accidental fall of the operator, the stresses deriving from the fall are transferred to the ladder.

[0008] An additional problem is linked to the possibility to bring to a height the fastener of the lifeline together with the apical portion of the ladder, thus avoiding that the operator has to climb to a height even for the procedure of fastening the lifeline before starting the work at a height under safety conditions.

[0009] Then, a device is necessary allowing to secure the operator in all phases of his/her work, from climbing to descending.

SUMMARY OF THE INVENTION

[0010] The problem underlying the present invention is then to overcome the drawbacks shown by the known art.

[0011] Within such task, an object of the present invention is to provide a device for securing an operator since the first phase for leaning the ladder against the supporting structure, without the operator being forced to climb preliminarily said ladder.

[0012] An additional object of the present invention is to allow the operator to lean and anchor a pull-down or telescopic and not lengthened ladder to a pole (or tree) and to proceed with extending the ladder in a subsequent phase, so as to eliminate the risk of loss of contact of the ladder with the supporting structure.

BRIEF DESCRIPTION OF DRAWINGS

[0013] Other advantages and features of the present invention will result evident from the following detailed description of some embodiments, shown by way of example and not for limitative purposes, by making reference to the enclosed drawings, wherein:

- Figure 1 shows a first embodiment of the invention;
- Figures 2 e 3 show a front view of a safety device according to a second embodiment of the present invention;
- Figure 4 is a side view of a ladder and the safety device shown in Figures 2 and 3, leaned against a pole around to which an anchor cable passes thereto a lifeline is fastened;
- Figure 5 is the same view of Figure 4, wherein said lifeline is pulled so as to tighten the anchor cable around the pole;
- Figures 6, 7 show an operator respectively before and after securing by hooking his/her own harness to the lifeline of the ladder;

- Figure 8 shows a not extended pull-down ladder and a safety device according to an embodiment of the present invention, wherein the anchor cable is slack around the pole;
- Figure 9 is the same view of Figure 8, wherein the lifeline is pulled and the anchor cable is tightened around the pole;
- Figures 10 e 11 show the same configuration of Figures 8 and 9, from a different view;
- Figure 12 shows the pull-down ladder of Figure 8, in lengthened configuration;
- Figure 13 shows a side view of the ladder of Figure 12.

DETAILED DESCRIPTION

[0014] A device and method according to the present invention allows an operator to be secured, by hooking to a lifeline hooked to the ladder already during the phase of leaning the ladder itself against a supporting structure, for example a tree or a pole. The proposed solution allows to bring the lifeline to a height by raising the ladder itself and at the same time it allows to discharge the stresses deriving from an accidental fall of the operator onto the pole and not onto the ladder, thus by guaranteeing higher safety for the operator both upon climbing and upon accidental fall. For sake of simplicity, in the present description, one will refer to a leaning pole for the ladder but it will be obvious that the device, the present invention relates to, can be used to secure a ladder on any leaning structure having mainly vertical development, for example a tree, a column, a pillar, and so on.

[0015] The safety device 100,110 according to the present invention comprises a frame configured to be constrained one end of a ladder, wherein said frame has connecting means 1,6; 11a, 11b for connecting the device 100,110 to the ladder 20, and leaning means 2 to allow leaning the device 100,110 against the pole itself.

[0016] The leaning means 2 comprises a through-bracket 13 located on a face opposite to a face leaning against the pole.

[0017] The safety device according to the present invention comprises an anchor cable 3 configured to allow anchoring the ladder to the pole, wherein the cable 3 is sized to form, when applied, a ring around the pole.

[0018] As shown in figures, the safety device according to the present invention provides hooking means 15 configured to allow hooking a lifeline 17 to the anchor cable 3. Advantageously, the overall configuration of the device according to the present invention allows, in use, the anchoring of the ladder 20 and lifeline 17 to the pole, by passing the anchor cable 3, closed in a ring around the pole itself, in the through-bracket 13.

[0019] By making reference to Figure 1, this shows a first embodiment of the safety device according to the present invention, designated with 110.

[0020] In the first embodiment of the device 110, shown in Figure 1, the means for connecting to the ladder 20

provides a first 11a and a second 11b cup element. Such first 11a and second 11b cup element are preferably shaped to be coupled to the ladder 20 at the terminal ends of the posts of the ladder itself.

[0021] By making reference to Figure 2, this shows a second embodiment of the safety device according to the present invention, designated with 100.

[0022] In the second embodiment of the device 100, shown in Figure 2, the means for connecting to the ladder 20 provides a base portion 1 of the above-mentioned frame, shaped to be coupled to the ladder 20 at an terminal rung of the ladder 20.

[0023] In particular, in order to prevent a translation of the base portion 1 with respect to a main extension direction of the ladder 20, that is to prevent the device from removing from the rung of the ladder, the device 100 provides fastening means 16.

[0024] The fastening means 16 can be implemented in the shape of pins which are inserted (manually or automatically, for example through a spring element) below the rung, so as to prevent the device from being able to lift and remove from the rung itself.

[0025] Preferably, as shown in figures 2 and 3, the fastening means 16 is shaped like one or more levers positioned transversally to the base 1 movable transversally with respect to an extension size of the base. In particular, the fastening levers 16 are movable through a gripping element, for example a ring-like element, between an opening position in which a translation upwards of the base 1, leaned against the rung, is allowed and a locking position in which a translation upwards of the base 1, leaned against the rung, is prevented by an interference between the extension of the lever and the ladder rung.

[0026] Preferably, the means for connecting to the ladder 20 further comprises at least an oblong stabilizing member 6 having a first end connected to said base 1 and a second end shaped to be coupled to the ladder 20, at a rung near said terminal rung of the ladder 20. Advantageously, the fact of providing the stabilizing member 6 allows to re-distribute the loads stressing the ladder 20. The loads will be then distributed not only on the terminal rung of the ladder, but even on the rung near said terminal rung of the ladder 20.

[0027] In order to allow an additional division of the loads, as shown in figures 2 and 3, two stabilizing members are provided, respectively positioned near the ladder posts, which are constrained, in particular through a terminal portion 7a, for example having a 'wrench'-like section, for engaging with the rung near said terminal rung of the ladder 20.

[0028] Advantageously, the fact of providing the two stabilizing members 6 allows the device 100 to stay in axis with the ladder 20 without being able to rotate around the base 1.

[0029] The device 100 comprises spacing means 8, positioned between the base portion 1 and the leaning means 2. As shown in figures, the spacing means 8 is constrained, in particular through a terminal portion 7b,

for example having a 'wrench'-like section, for engaging with the base portion 1.

[0030] In order to ease a sliding, in a vertical direction, of the leaning means 2 relative to the pole, the safety device according to the present invention comprises means 14, for example one or more rolling members positioned at the head portion 2, for sliding on a face opposite to the one at which the through-bracket 13 is positioned. As shown in figures 10 or 11, the sliding means 14 can include one or more rollers and/or wheels installed on the frame face of the device 100 intended to come in contact with the pole, so as to ease the sliding of the ladder 20 in vertical direction along said pole, as described hereinafter.

[0031] Said bracket 13 can be installed on said head portion 2 and one or more guiding elements 9 can be further installed, for example rollers, as illustrated in Figure 2, which guide the sliding of the cable 3 inside the bracket 13 in the phases of pulling and releasing the cable 3, as described hereinafter.

[0032] According to an additional embodiment of the present invention, the safety device further comprises attracting means 5, for example a return spring, configured to ensure that, under a resting condition, the cable 3 closed in a ring remains slack around the pole.

[0033] According to a use mode of the device 100 and of the ladder 20 according to the present invention, an operator on the ground can connect said device 100 to said ladder 20, for example by connecting to the ladder itself the connecting means, that is the base portion 1 of the frame to the terminal rung of the ladder and the stabilizing elements 6 to the rung near the terminal rung of the ladder 20 through said engagement means 7.

[0034] According to a use mode of the device 110 and of the ladder 20 according to the present invention, an operator on the ground can connect said device 110 to said ladder 20, for example by connecting said first 11a and second 11b cup element at the terminal ends of the posts of the ladder itself.

[0035] In all embodiments of the present invention, the ladder 20 is then leaned against a pole, so that the device 100, 110 is in contact with said pole and connected to the ladder through said connecting means. The presence of sliding means 14 can support this leaning by avoiding useless frictions between the device 100, 110 and the pole against which it is leaned.

[0036] Subsequently, the operator can secure said ladder 20 to the pole through said anchor cable 3 so that said cable passes through said through-bracket 13, he/she can hook a first end of a lifeline to said hooking means 15 and a second end of the lifeline 17 to the base of said ladder 20, for example to one of the two posts near the ground or to the rung of the ladder 20 nearest to the ground and, finally, he/she can hook himself/herself to the lifeline 17, as illustrated in figure 7. This results to be particularly advantageous with respect to what is present in the state of art since the operator can secure himself/herself 3 and the ladder 20 without requiring to

climb the ladder 20.

[0037] Usually, the operator can wear a harness, a safety belt or any type of individual protection device known in the state of art, for example comprising a fall-prevention locking karabiner, as shown in Figure 7. The connection between operator and lifeline 17 can take place by connecting said harness to said lifeline 17 through said fall-prevention karabiner or other individual protection device.

[0038] The fact of securing ladder 20 and operator is obtained by the combined action of cable 3 and lifeline 17. During a usual phase of using the ladder 20, the operator can start climbing having the ladder 20 leaned against said pole through the device 100, 110 according to the present invention. Usually, the cable 3 is slack around the pole, since the ladder results to be leaned firmly to the pole itself and the operator can start to climb. Moreover, the attracting means 5 acts on the lifeline so that, at rest, the anchor cable 3 remains slack around the pole.

[0039] In case of loss of equilibrium, slipping or loss of leaning of the operator, the lifeline thereto he/she is anchored pulls the hooking means 15 of the cable 3 which, supported in sliding by the guiding elements 9, will tighten around the pole so that the latter supports both the weight of the operator in difficulty, whose harness keeps him/her hooked to the lifeline by preventing him/her from falling, and the weight of the ladder 20 itself which, pulled backwards by the weight of the operator, is kept firmly near the pole, as illustrated for example in Figure 5.

[0040] The advantage of the present invention results still more evident in case the ladder 20, according to an embodiment of the present invention, is a pull-down ladder. The securing of the pull-down ladder 20 by the operator follows the same above passages, wherein the ladder is kept in not extended configuration, that is at the minimum required length. Once secured himself/herself and the ladder 20, the operator can proceed with lengthening the pull-down ladder in vertical direction integrally with said pole when said operator is hooked to said lifeline while keeping slack said cable 3. The presence of the sliding means 14 can support this motion by avoiding useless frictions between the device 100, 110 and the pole against which it is leaned.

[0041] Although the present invention has been described and illustrated in relation to preferred embodiments, it has to be understood that several variations of these embodiments can be implemented without leaving the protective scope of the present invention, which is defined by the enclosed claims.

Claims

1. Safety device (100; 110) for anchoring a ladder (20) vertically to a pole, comprising:

- a frame configured to be constrained to one

end of a ladder,

- said frame presenting connecting means (1, 6; 11a, 11b) for connecting said device (100; 110) to the ladder (20) and leaning means (2) for allowing said device (100; 110) to lean against the pole, said leaning means (2) comprising a through bracket (13) located on a face opposite to a face leaning against the pole;
- an anchor cable (3) configured to allow an anchorage of the ladder to the pole, said cable (3) being sized to form, when applied, a ring around the pole;
- hooking means (15) configured to allow an attachment of a lifeline (17) to said anchor cable (3);

the overall configuration of the device (100; 110) being such that the passage of said anchor cable (3), closed in a ring around the pole, in said through bracket (13) allows, when in use, the anchoring of the ladder (20) and lifeline (17) to the pole itself.

2. Device (110) according to claim 1, wherein said connecting means comprises a first (11a) and a second (11b) cup element, said first (11a) and second (11b) cup element being shaped to be coupled to the ladder (20) at the end ends of the ladder poles (20).
3. Device (100) according to claim 1, wherein said connecting means comprises a base portion (1) of said frame, shaped to be coupled to the ladder (20) at an end rung of the ladder (20).
4. Device (100) according to the preceding claim, wherein said connecting means further comprises at least one oblong stabilizing member (6), said stabilizing member (6) having a first end connected to said base (1) and a second end shaped to be coupled to the ladder (20) at a rung near said end rung of the ladder (20).
5. A device (100) according to any one of claims 3 or 4, comprising spacing means (8) between said base portion (1) and said support means (2), said spacing means (8) being constrained to said base portion (1) to provide a spacing between said base portion (1) and the pole, in a condition of sliding of said leaning means (2) along the pole.
6. Device (100) according to any one of claims 4 or 5, comprising fastening means (16) configured to constrain a translation of said base portion (1) relative to a main extension direction of the ladder (20).
7. A device (100; 110) according to any of the preceding claims, comprising sliding means (14) configured to allow sliding in a vertical direction of said leaning means (2) relative to the pole.

8. Device (100; 110) according to any one of the preceding claims, comprising guiding means (9) for said cable.

9. Device (100; 110) according to any one of the preceding claims, comprising attracting means (5) of said cable (3), configured to ensure that, in a resting condition, said cable (3) closed in a loop remains slack around the pole.

10. A device (100; 110) according to the preceding claim, wherein said attracting means (5) comprises a spring.

11. Ladder (20) comprising a safety device (100; 110) according to any one of claims 1 to 10, for anchoring said ladder (20) to a pole.

12. Ladder (20) according to the preceding claims, wherein said ladder (20) is a pull-down ladder.

13. A method of securing an operator on a vertical ladder comprising a safety device (100; 110) according to any one of claims 1 to 10, the method comprising the steps of:

- leaning said ladder (20) against a pole, so that the device (100; 110) is in contact with the pole through said leaning means (2) and connected to the ladder through said connecting means (1, 6; 11a, 11b);
- secure said ladder (20) to the pole through said anchor cable (3) so that said cable (3) passes through said through-bracket (13);
- hook a first end of a lifeline (17) to said hooking means (15);
- hook a second end of said lifeline (17) to the base of said ladder (20);
- hook said operator to said lifeline (17).

14. A method according to claim 13, wherein said vertical ladder (20) is a pull-down ladder and comprising the step of extending said pull-down ladder in a vertical direction integral with the pole when the operator is hooked to said lifeline while keeping said cable slack.

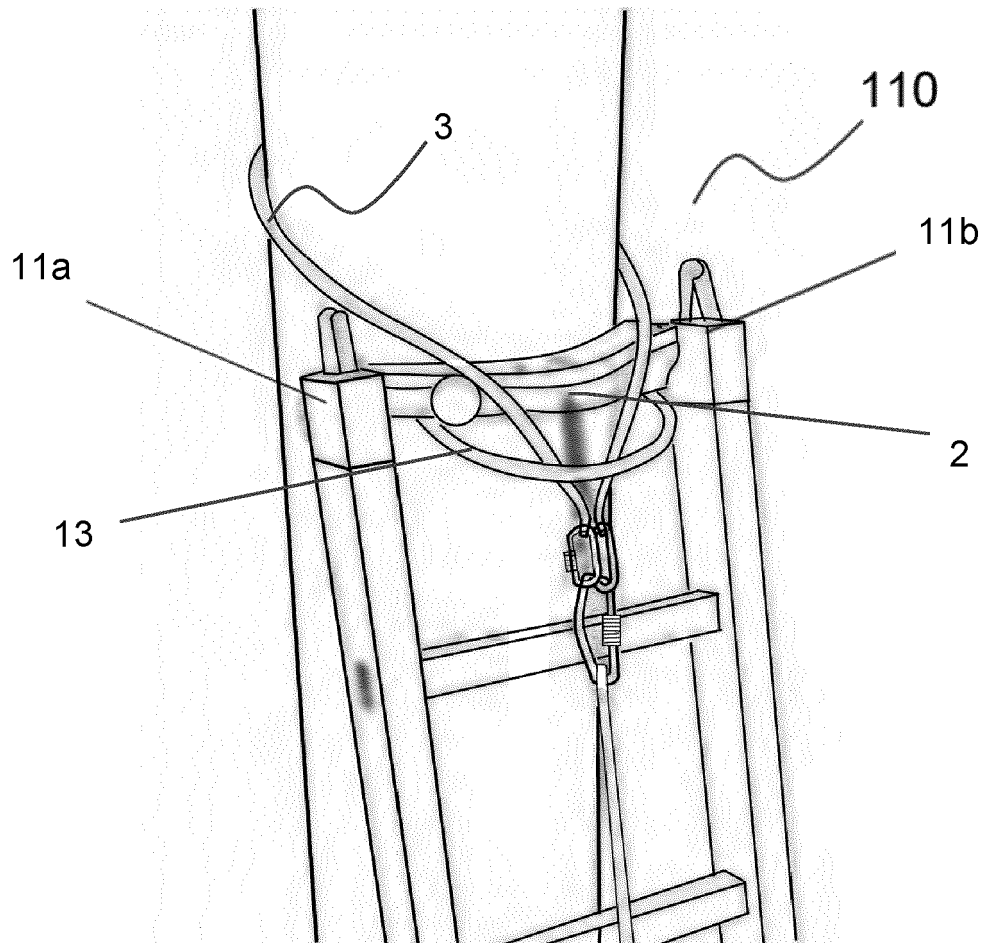


FIG. 1

FIG. 2

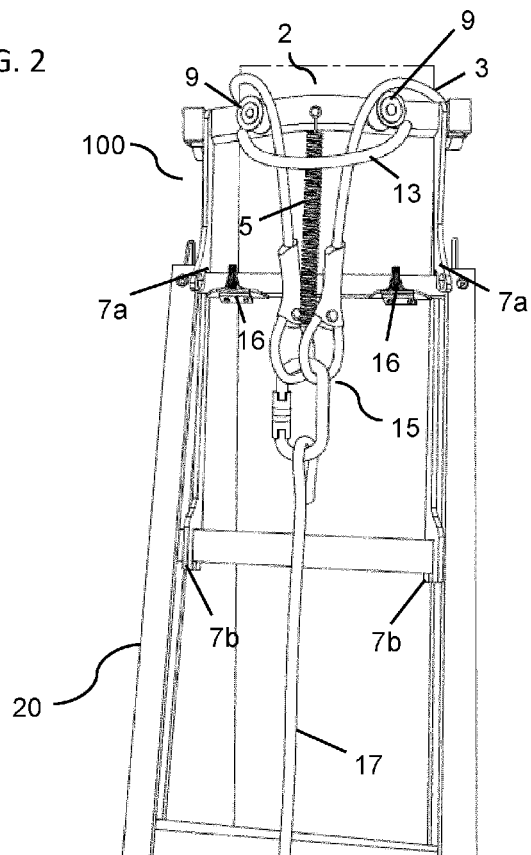


FIG. 3

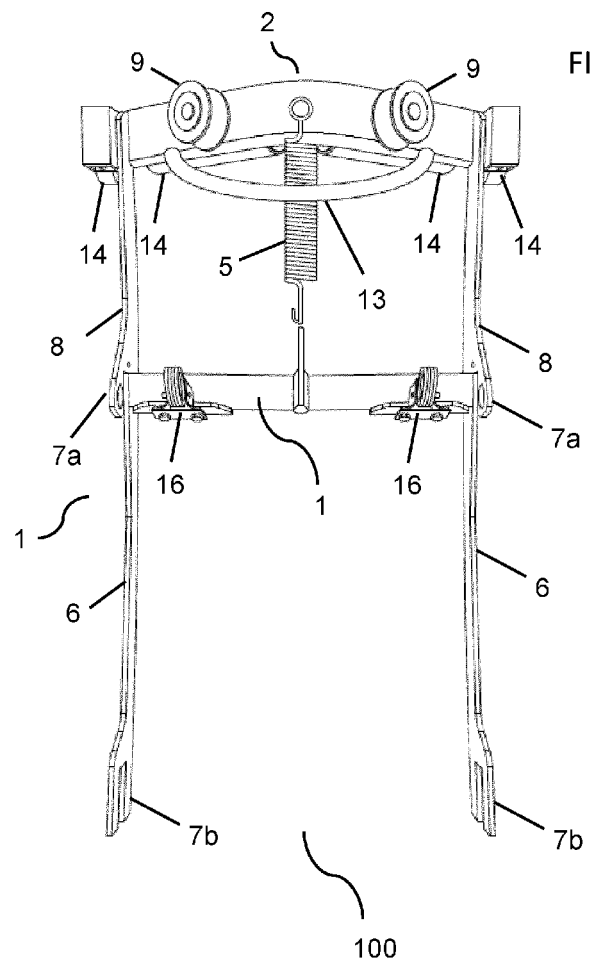


FIG. 4

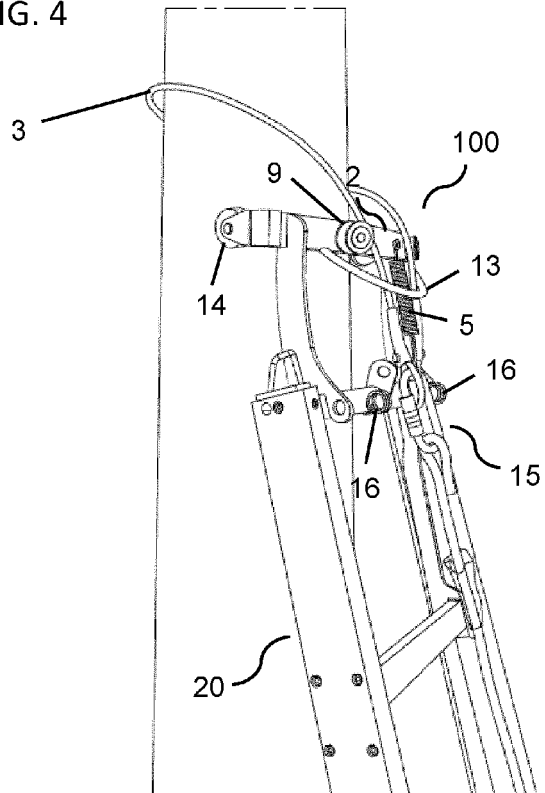
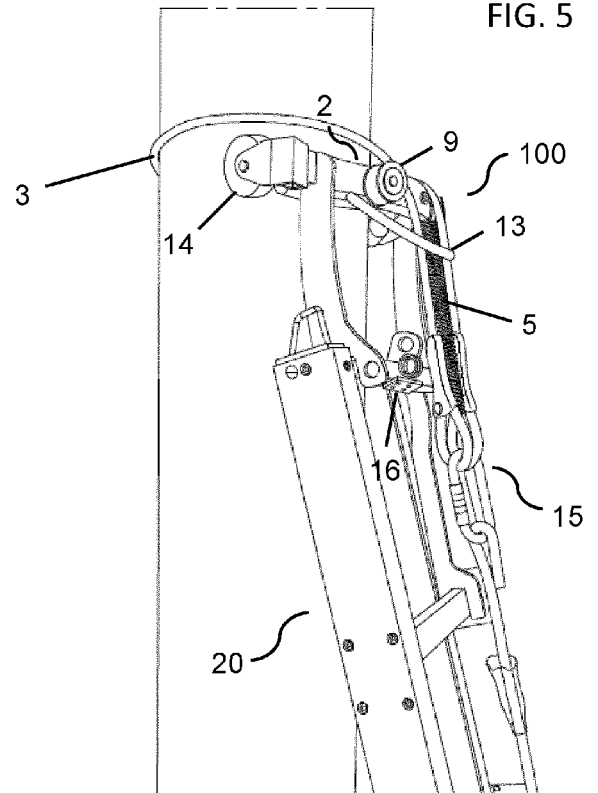


FIG. 5



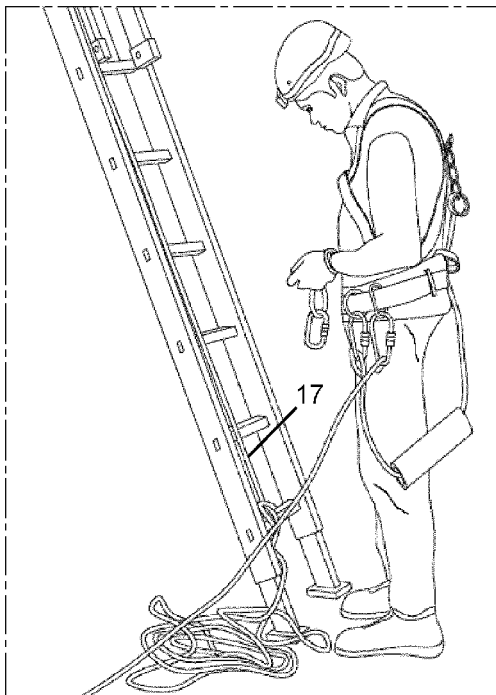


FIG. 6

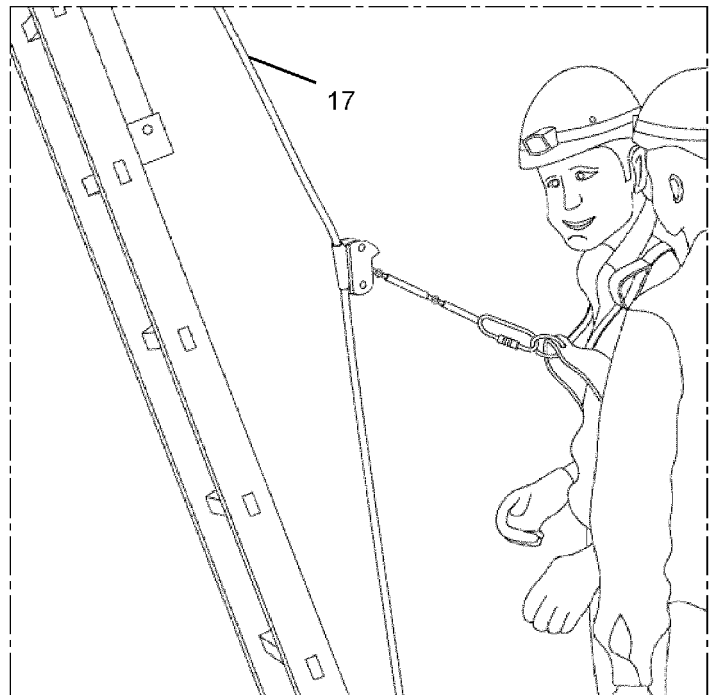


FIG. 7

FIG. 8

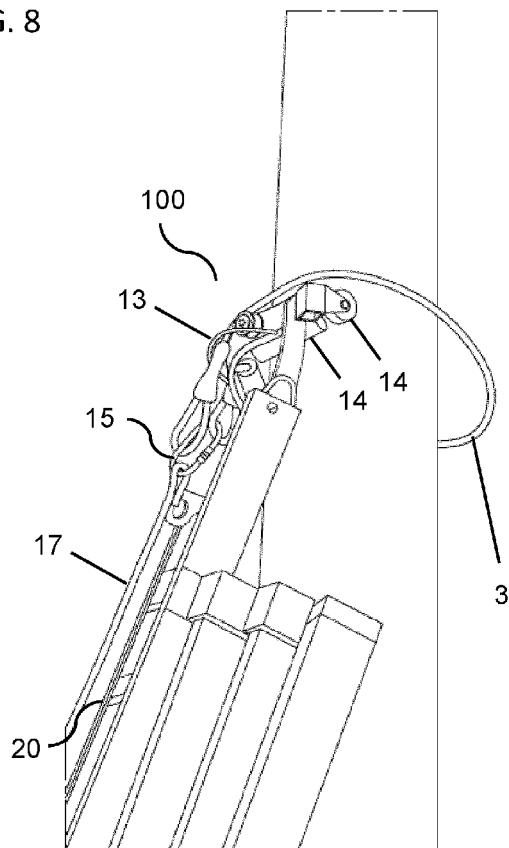
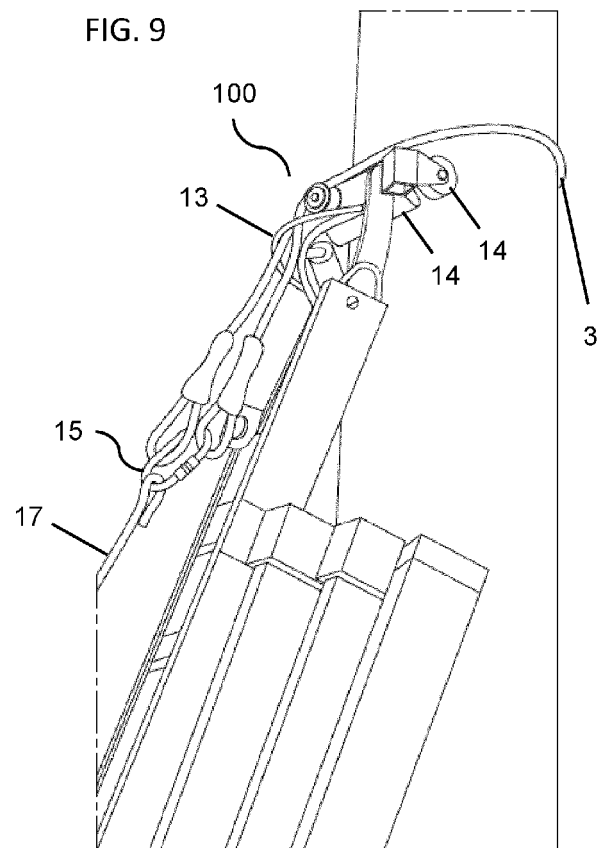


FIG. 9



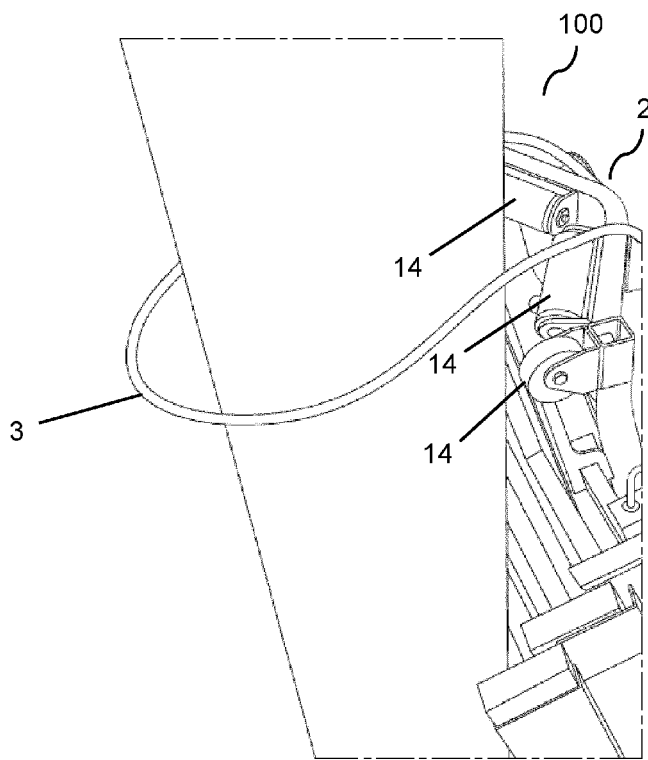


FIG. 10

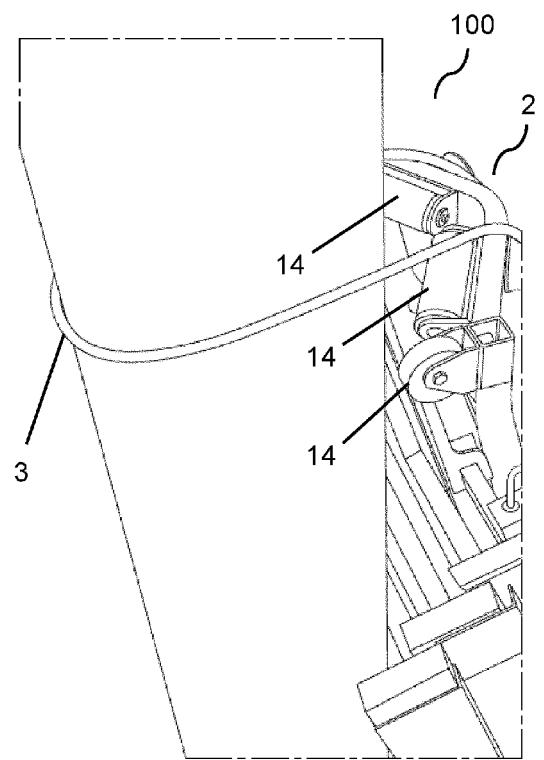
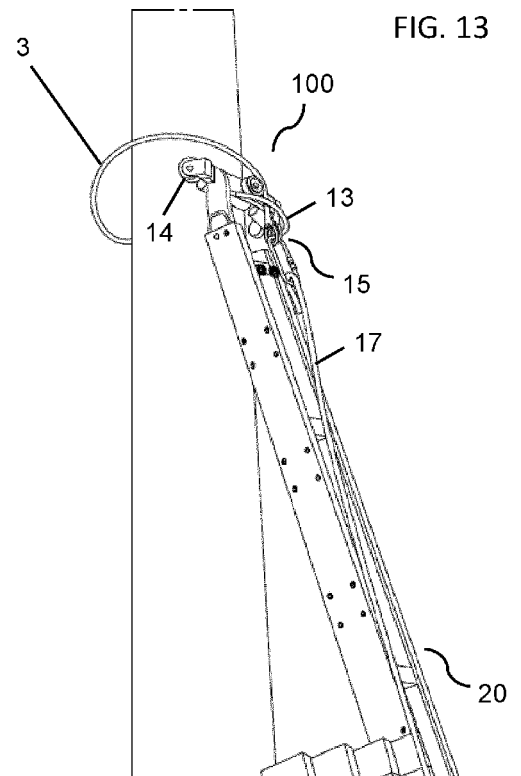
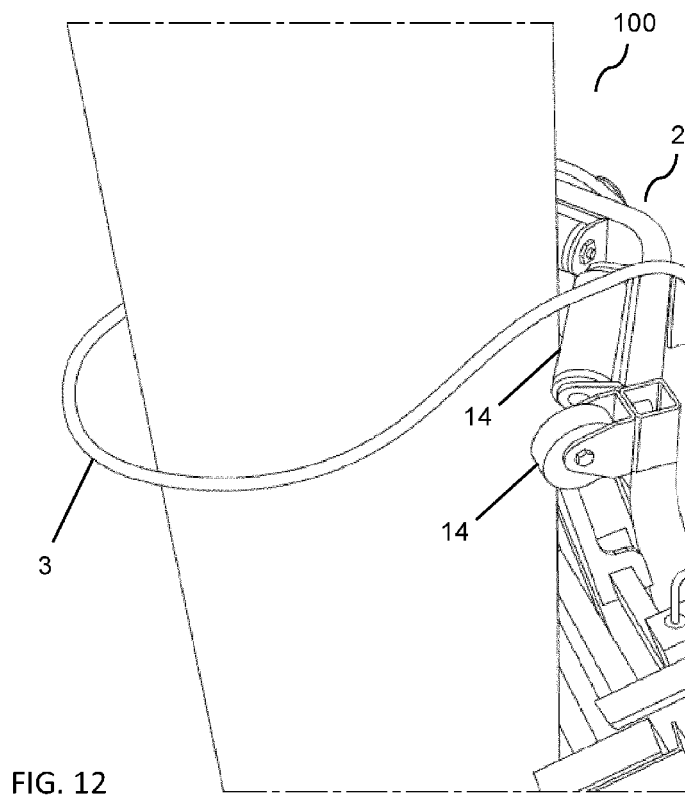


FIG. 11





EUROPEAN SEARCH REPORT

Application Number

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EPO FORM 1503 03.82 (P04C01)

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Y	* paragraph [0015] - paragraph [0025] *	2	
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 28 March 2024	Examiner Nehrdich, Martin
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28-03-2024

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