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(71) Applicant: **Escaleras Aguerri, S.L.**
31300 Tafalla (Navarra) (ES)

(72) Inventor: **ORIOL, Florent**
F-31300 Tafalla (Navarra) (FR)

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(74) Representative: **Pons Ariño, Angel**
Pons Patentes y Marcas Internacional, S.L.
Glorieta Rubén Dario 4
28010 Madrid (ES)

(54) **VERTICAL LIFELINE FOR ELEVATED WORK**

(57) The present invention relates to a vertical lifeline for working at heights which includes an upper system for anchoring the cable which enables gradual stopping of the user in the event of a fall and prevents injuries thereto, absorbing a part of the impact when the fall-arrester system locks by means of an energy-absorbing system, such that the user does not have to absorb the entirety of said impact, in which the lifeline also includes a secondary anchor point for connecting at least one user during the operations of locking and unlocking the fall-arrester device, as well as a means for detecting the fall..

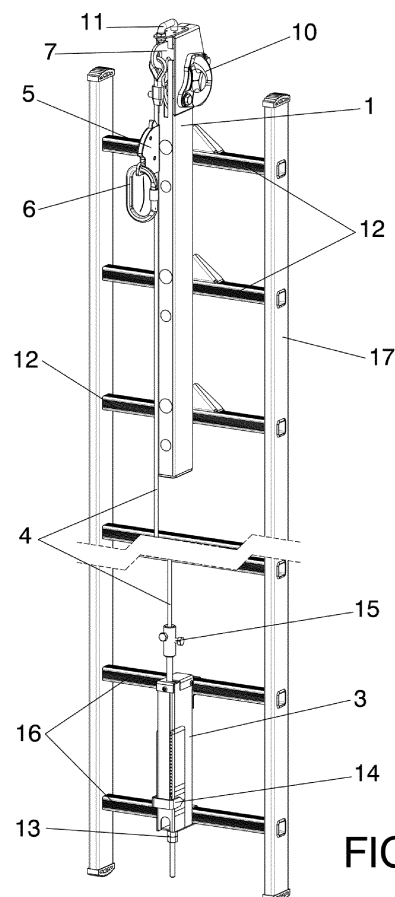


FIG. 1

Description

OBJECT OF THE INVENTION

[0001] The present invention refers to a vertical lifeline having a cable for elevated work, wherein the lifeline comprises an upper anchoring system for anchoring the cable, which enables the user to gradually stop in the event of a fall, and prevents injuries to the user, absorbing part of the impact when the a prevention device is locked, so that the user does not have to absorb the entire impact.

BACKGROUND OF THE INVENTION

[0002] Lifelines for vertical work are known in the state of the art, especially when said work is performed at great heights, such as in inner staircases in wind turbine towers, telecommunication towers, buildings undergoing rehabilitation, or in any vertical work requiring climbing through any climbing means, which may be manual, such as stairs, or mechanical, such as elevators. These lifelines guarantee the safety of the users in the event that they fall from great heights.

[0003] Known lifelines incorporate a cable that is arranged parallel to the climbing system, so that the users are anchored to said cable with some locking means that are capable of being released by easy manipulation to slide through the cable, thus enabling the user to climb, but also, if the user gets detached from the elevation system, said user will remain attached to the cable without falling.

[0004] Said lifeline's cable should be safely anchored to the upper part, since this is the point that must bear the weight of the cable and the entire load attached to said cable.

[0005] For that purpose, there is the solution featured in the Spanish Utility Model having publication number ES1055904U, which discloses an anchor for a lifeline in a vertical ladder, of the type comprising an upper suspension fastener in order to hang a cable at the front of the ladder to be used, wherein the suspension fastener consists of a "U" shape piece, whose lateral branches are provided with two slits open from the end, while the central branch features an opening in the central area from which the lifeline's cable fastener is established, the piece being thereby arranged in a coupling anchor, by means of its lateral branches, over some attachment plates of the ladder in the installation assembly.

[0006] Attached to said anchor or upper anchoring system is the cable to which a fall prevention device is coupled, to which, in turn, some anchoring means are attached where the user hooks the body harness. The fall prevention device is movable along the cable and can be locked/unlocked along said cable by the user during the process of climbing or descending the vertical ladder.

[0007] The aforementioned upper anchoring system for the cable may cause injuries for the user if the latter falls, due to the rigidity of said system, since the area of

the user's body where the body harness is attached must instantly absorb all of the impact resulting from the fall prevention device being locked.

[0008] Besides, the systems known in the state of the art do not allow instantly informing of the user's fall, with the subsequent delay in establishing an appropriate rescue and/or safety plan in the event it becomes necessary.

[0009] Furthermore, said systems have the disadvantage of breaking the safety chain during the operation of attaching or detaching the fall prevention device.

[0010] The lifeline of the present invention solves all of the previously discussed disadvantages.

DESCRIPTION OF THE INVENTION

[0011] The present invention refers to a vertical lifeline for elevated work which comprises an upper anchoring system arranged on the upper part of the installation where the lifeline is arranged and a lower anchoring system placed on the lower part of said installation, wherein these systems enable the attachment of a cable to which a fall prevention device, which moves along the cable where the user is attached by a body harness or similar device, is coupled.

[0012] The cable's upper anchoring system further comprises an energy absorption system to gradually stop the user in the event of a fall and to prevent injuries to said user, since said energy absorption system takes on part of the impact when the fall prevention device is locked, so that the user does not have to absorb the entire impact.

[0013] The cable's upper anchoring system further comprises a secondary anchor point for the attachment of at least one user during the fall prevention system's lock and unlock operations, which prevents the safety chain from being broken, ensuring that the user is attached to the lifeline at all times throughout the use of the installation.

[0014] The lifeline further comprises some fall detection means which enable to instantly inform of the user's fall, with the subsequent advantages that arise from quickly being able to establish an appropriate rescue and/or safety plan in the event that it becomes necessary.

[0015] The lifeline for elevated work may be used in essentially vertical installations, i.e., which features a certain slope with respect to the vertical, but which fulfill the same aforementioned function.

DESCRIPTION OF THE DRAWINGS

[0016] To complement the description being made and in order to help better understand the features of the invention, according to a preferred embodiment thereof, a set of drawings is attached as an integral part of said description, wherein the following is shown as way of illustration but not limited to:

Figure 1.- Shows a perspective view of the vertical

lifeline for elevated work of the present invention, installed over a vertical ladder.

Figures 2 to 5.- Show a sectioned detailed view of the upper anchoring system in different positions of the energy absorption system.

PREFERRED EMBODIMENT OF THE INVENTION

[0017] In light of the figures, described below is a preferred embodiment of the lifeline of the present invention which comprises an upper anchoring system (1) arranged on the upper part of the installation (17) and a lower anchoring system (3) arranged on the lower part of the installation (17), these anchoring systems (1, 3) enabling to anchor a cable (4) to which a fall prevention device (5) is attached which is movable along the cable (4) and to which, in turn, some attachment means (6) are fixed, which in this preferred embodiment is a hook going through an opening of the fall prevention device (5), where the user is fastened.

[0018] The cable's upper anchoring system (1) comprises, in turn, an energy absorption system (2) which enables the gradual stop of the user in the event of a fall, where said energy absorption system (2) comprises a movable body (7) which is movable with respect to the upper anchoring system (1) and which is attached to the cable (4), the movable body (7) comprising at least one breakable section (8) which enables the user's gradually stop in the event of a fall.

[0019] In this preferred embodiment, the movable body (7) has a the shape of a plate which is articulated at the upper anchoring system (1), so that in the event of a fall, the movable body (7) rotates around an articulation (9) that is present in the upper anchoring system (1), a surface (18) rigidly coupled to the upper anchoring system (1) thereby actuating at least a breakable section (8) in the movable body (7).

[0020] Preferably, the movable body (7) comprises three breakable sections (8) which gradually break during the fall depending on the user's weight.

[0021] The cable's upper anchoring system (1) further comprises a secondary anchor point (10) for attaching the user during the lock and unlock operations of the fall prevention device (5), this secondary anchoring point (10) being fixed to a lateral of the upper anchoring system (1).

[0022] The lifeline further comprises some fall detection means (11) which comprise a safety electronic sensor which is placed in contact with the movable body (7) when said movable body (7) is in a stand-by position, Figure 2, and is separated from said movable body (7) when said movable body moves with respect to the upper anchoring system (1) or rotates around the articulation (9) featured in said upper anchoring system (1), Figures 3 to 5, so that it sends an alarm signal which may be integrated into the security protocol of the PLC monitoring the installation. This way, the PLC may send the alarm to the communications center and/or the rescue teams

in order to implement a safety plan.

[0023] In a preferred embodiment, the installation (17) is a ladder, where the upper anchoring system (1) is attached to the three upper steps (12) of said ladder, which prevents any risk of said upper anchoring system (1) moving with respect to the ladder.

[0024] The cable (4) is connected to the upper anchoring system (1) with a bezel and a thimble, without the possibility of using with single pieces.

[0025] The lower anchoring system (3) comprises a tensioner (13), a pretension indicator (14) and a fixing device (15) for fixing the cable (4) by using screws, where said lower anchoring system (3) is attached to the two lower steps (16) of the ladder.

Claims

1. Vertical lifeline for elevated work which comprises:

- an upper anchoring system (1) arranged in the upper part of the installation (17);
- a lower anchoring system (3) arranged on the lower part of the installation (17); and
- a cable (4) anchored to the anchoring systems, said cable (4) being configured both so as to be fastened to the user and so as to be attached to a fall prevention device (5),

characterized in that the upper anchoring system (1) further comprises an energy absorption system (2) enabling the gradual stop of the user in the event of a fall.

2. Vertical lifeline for elevated work according to claim 1, **characterized in that** the energy absorption system (2) comprises:

- a movable body (7) which is movable with respect to the upper anchoring system (1), where-in said movable body (7) is attached to the cable (4), and
- at least a breakable section (8) comprised in the movable body (7).

3. Vertical lifeline for elevated work according to claim 2, **characterized in that** the movable body (7) has the shape of a plate and is rotatable around an articulation (9) that is present in the upper anchoring system (1), where the lifeline further comprises a surface (18) adjacent to the upper anchoring system (1), for actuating the breakable section(s) (8).

4. Vertical lifeline for elevated work according to any of claims 2 or 3, **characterized in that** the movable body (7) comprises three breakable sections (8).

5. Vertical lifeline for elevated work according to any of

the above claims, **characterized in that** it further comprises a fall detection means (11).

6. Vertical lifeline for elevated work according to claim 5 and any of claims 2 to 4, **characterized in that** the fall detection means (11) comprise a safety electronic sensor configured so as to be in contact with the movable body (7) when said movable body (7) is in a stand-by position and to be separated from said movable body (7) when said movable body (7) moves with respect to the upper anchoring system (1). 5 10
7. Vertical lifeline for elevated work according to any of the above claims, **characterized in that** the upper anchoring system (1) of the cable further comprises a secondary anchoring point (10) for attaching the user lock and unlock operations of the fall prevention device (5). 15 20
8. Vertical lifeline for elevated work according to claim 7, **characterized in that** the secondary anchoring point (10) is fixed to a lateral of the upper anchoring system (1). 25
9. Vertical lifeline for elevated work according to any of the above claims, **characterized in that** the cable (4) is connected to the upper anchoring system (1) with a bethel and a thimble. 30
10. Vertical lifeline for elevated work according to any of the above claims, **characterized in that** the lower anchoring system (3) comprises a tensioner (13). 35
11. Vertical lifeline for elevated work according to any of the above claims, **characterized in that** the lower anchoring system (3) comprises a pretension indicator (14). 40
12. Vertical lifeline for elevated work according to any of the above claims, **characterized in that** the lower anchoring system (3) comprises a fixing device (15) for fixing the cable (4) by means of screws. 45
13. Vertical lifeline for elevated work according to any of the above claims, **characterized in that** the installation (17) is a ladder. 50
14. Vertical lifeline for elevated work according to claim 13, **characterized in that** the upper anchoring system (1) is attached to the three upper steps (12) of the ladder. 55
15. Vertical lifeline for elevated work according to claim 13, **characterized in that** the lower anchoring system (3) is attached to the two lower steps (16) of the ladder.

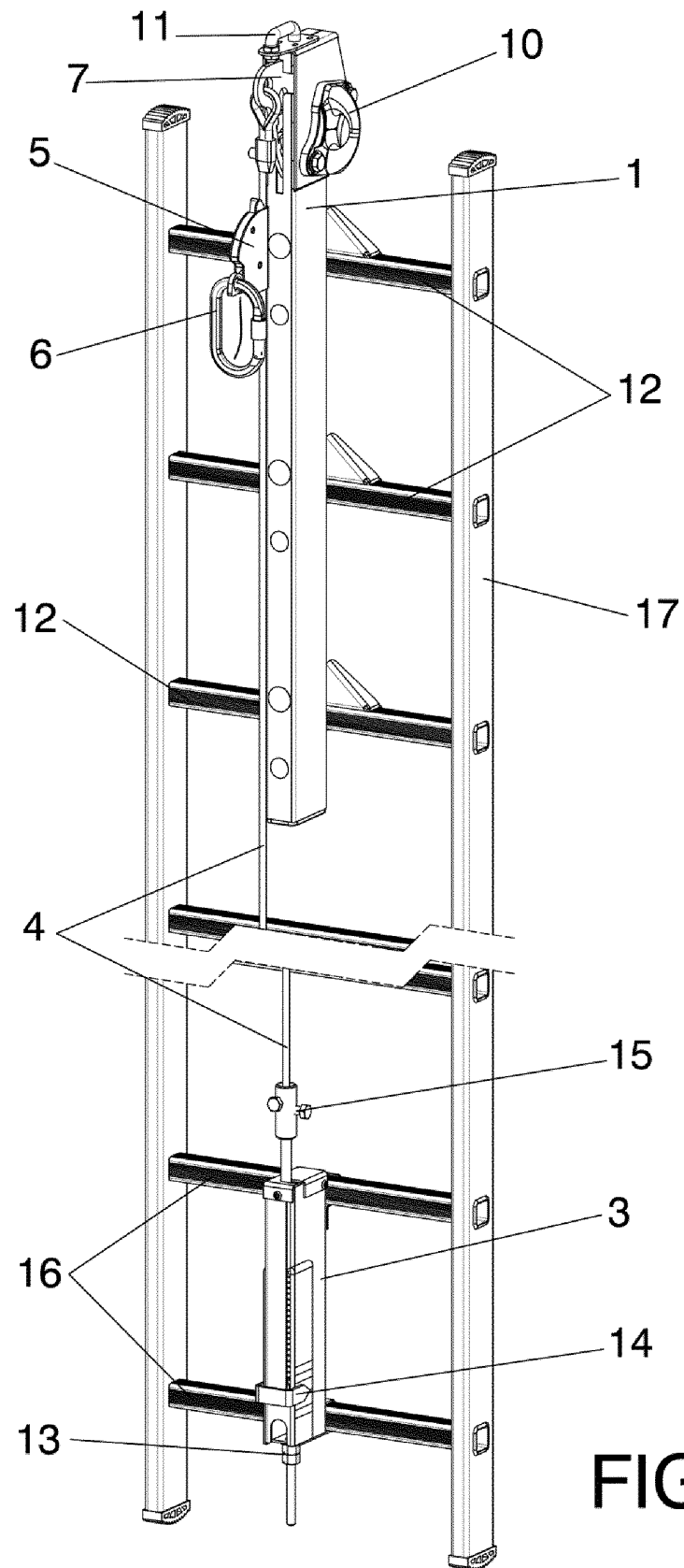


FIG. 1

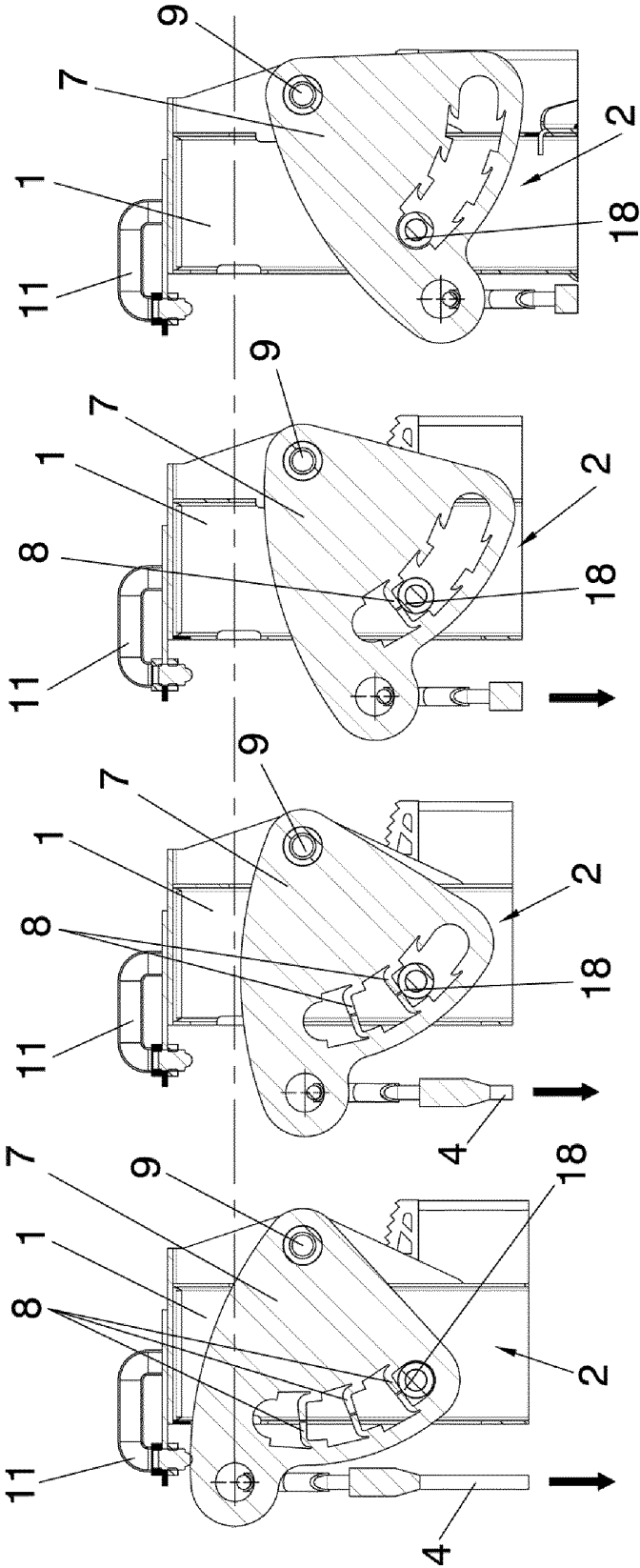


FIG. 2

FIG. 3

FIG. 4

FIG. 5

INTERNATIONAL SEARCH REPORT

International application No

PCT/ES2013/070152

A. CLASSIFICATION OF SUBJECT MATTER

INV. E06C7/00 E06C7/18 A62B35/00 A62B35/04
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

E06C A62B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CA 2 181 858 A1 (WILLIAMSON RICHARD [CA]) 24 January 1998 (1998-01-24)	1,7-13, 15
Y	figures 1-6	2-6,14
Y	DE 10 2010 015572 A1 (HASENBACH LORENZ GMBH CO KG [DE]) 11 November 2010 (2010-11-11) figures 4, 5	2-4
Y	FR 2 755 236 A1 (BRUNET HENRI JOACHIM VICTOR [FR]) 30 April 1998 (1998-04-30) figures 1-3	5,6
Y	US 3 598 200 A (THOMPSON HARVEY L) 10 August 1971 (1971-08-10) figures 1-3	14
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☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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Date of the actual completion of the international search

31 July 2013

Date of mailing of the international search report

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Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Bauer, Josef

INTERNATIONAL SEARCH REPORT

International application No
PCT/ES2013/070152

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 433 290 A (ELLIS J N [US] ET AL) 18 July 1995 (1995-07-18) figure 5	2-4
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Form PCT/ISA/210 (continuation of second sheet) (April 2005)

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Information on patent family members

International application No

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REFERENCES CITED IN THE DESCRIPTION

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