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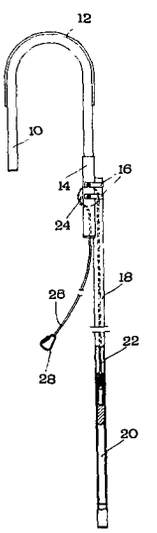
(71) Applicant: **A + A MONFERRATO FOREVER s.n.c., via Gonin 37, I-10137 Turin (IT)**

(72) Inventor: **Monferrato, Enzo, Corso Orbassano 256, I-10100 Turin (IT)**

(74) Representative: **Robba, Eugenio, Studio "INTERPATENT" via Caboto 35, I-10129 Turin (IT)**

(54) Fall arrest safety device.

(57) In a fall arrest safety device, particularly for personnel operating on power line pylons, a hollow rod (18) carries at its upper end a pulley (24) and an attachment hook (10). A rope (22) leads around the pulley (24) and with one end into the hollow rod (18) where it is secured to a counterweight (20) slidably mounted within the hollow rod (18). The other end of the rope (22) extends through locking means in the rod (18) and is provided with means (28) for attachment to a safety-belt of a user. Under normal operating conditions the rope (22) runs freely through said locking means but is locked therein when the rope runs at a speed exceeding a pretermined level in the direction of lifting the counterweight (20).



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Fall arrest safety device

This invention relates to a fall arrest safety device of the so-called "first man" type, particularly for personnel operating on power line pylons and the like, but also for application in other situations where safety against falling is required.

For maintenance operations on suspended structure such as power lines the operators must climb up pylons having a height of several tens of meters to reach the insulators on which the electric cables are suspended. Various safety devices for protecting the life of the personnel having to work on pylons are known. Generally such safety devices comprise a rope which is attached to the waist-belt of the user and suspended from a safety rewinder anchored to the highest point that the user can reach. This safety rewinder locks the rope when the latter is accelerated downwardly beyond a predetermined speed which corresponds to the speed of a falling man. However, such safety devices can only be used when the first man has reached the highest point, but do not protect the first man on climbing up.

Therefore, it was hitherto necessary to provide pylons with fixed permanently installed ladders and fall arrest guards which made such installations expensive and also easily accessible to unauthorized persons.

Also safety locking rewinders have been proposed which can be worn by the user, but in this case as the user is climbing up a pylon he has

to hook the free end of the rope to a higher point on each step of climbing by stretching out a hand upwardly as far as he can reach. Therefore, this solution is also inconvenient and even dangerous because the user has to carry the weight of the rewinder and may easily lose his balance as the rewinder is usually carried on the back and also the distance that the user can reach above his head obviously cannot be greater than the length of his arm.

It is therefore an object of the present invention to provide a fall arrest safety device, of the so-called "first man" type, particularly for personnel operating on power line pylons and the like, which does not require the user to wear heavy equipment and permits him to climb up a pylon more rapidly.

To achieve this object the invention provides a fall arrest safety device which comprises an attachment hook firmly connected to a hollow rod, a pulley rotatably mounted near an upper end of the hollow rod, a rope having one end secured to a counterweight slidably mounted within said hollow rod, said rope extending from an upper end of said hollow rod and passing around said pulley and through locking means anchored to said hollow rod, the other end of said rope being provided with means for attachment to a safety-belt of the user, said locking means being arranged to permit free passage of the rope in both directions when said rope is running slowly and to lock said rope when it is running in the direction of lifting of the counterweight at a speed exceeding a predetermined value.

A preferred embodiment of the invention will now be described by way of example and with reference to the accompanying drawings, in which:

Fig. 1 is a side view of a fall arrest safety device according to the invention;

Fig. 2 is a longitudinal section, on a larger scale, of a detail of the device of Fig. 1, and

Fig. 3 is a front view of the pulley forming part of the device.

Referring to Fig. 1, a fall arrest safety device according to the

invention comprises an attachment hook 10 made preferably of a steel tube formed in U-shape and reinforced by an iron strap 12 welded along the outside of the curved portion. One end of the hook 10 terminates in a tubular member 14 which in turn is rigidly connected by means of welded brackets 16 to hollow rod 18 which extends for a length of a few metres from the end of the hook 10.

A cylindrical counterweight 20 is slidably mounted within the hollow rod 18 and a rope 22, preferably made of three twisted strands of nylon, has one end firmly secured to the counterweight 20 and extends upwardly therefrom through the hollow rod 18, passed around a pulley 24 mounted for free rotation in the tubular member 14 and comes out of the lower end of this tubular member 14 after passing through locking means which will be described in greater detail hereinafter, to terminate with a free end 26 provided with a spring catch 28 for attachment to a safety-belt (not shown) of a user.

Referring now to Figs. 2 and 3, the means for locking the rope accommodated in the tubular member 14 and cooperating with the pulley 24 will be described. The locking means is located in the tubular member 14 between a pair of plugs 30, 32. The first plug 30 supports a guide shoe 34 for retaining the rope on the pulley and preventing it from derailing whereas the second plug 32 is provided with a bore permitting the rope to pass therethrough.

The locking means then comprises a sleeve 36 located above the plug 32 and having a frustoconical inner seat for receiving a floating piston 38 the end of which has a frustoconical shape complementary to that of the inner seat in the sleeve 36. A helical spring 40 normally pushes the piston 38 upwardly away from the sleeve 36. The piston 38 is provided with a central bore permitting the rope 22 to pass therethrough. The rope 22 is guided toward the piston 38 by a fixed guide member 42. The conical portion of the piston 38 has three radial apertures 44 (only one of which is seen in the drawings) each receiving a steel ball 46.

The upper end of the floating piston 38 supports a slidable strut

48 having an inclined surface 50 at its upper end. As will be explained in greater detail hereinafter, a rotatable plate 52 having at least one projecting pin 54 is mounted for rotation in the pulley 24 so that during rotation of the plate 52 the pin 54 will engage the inclined surface 50 on the strut 48 to move the piston 38 downwardly against the action of the spring 40.

Mounted within the pulley 24 is a centrifugally operated device for coupling the rotatable plate 52 to the pulley 24 when the latter rotates at a speed exceeding a predetermined value. Various devices capable of achieving this are known, but a preferred embodiment will now de described with reference to Fig. 3.

A crescent-shaped weight 56 is accommodated in a central cylindrical recess in the pulley 24 and mounted for pivotal movement around a pivot 58 connecting the crescent-shaped weight 56 to the body of the pulley. A calibrated helical spring 60 normally holds the crescent-shaped weight 56 in a position close to the axis of the pulley.

The rotatable plate 52 has a projection 62 extending inwardly from and over part the periphery of the plate 52. When the pulley 24 is rotating slowly, the force of the spring 60 is sufficient to hold the weight 56 in the position shown in solid lines in Fig. 3, but when the predetermined speed limit is exceeded, the centrifugal force of the weight 56 exceeds the force of the spring 60 and the weight 56 moves to the position indicated in dash-and-dot lines. In this position the weight 56 is in the path of movement of the projection 62 on the rotating plate 52 and provides a firm connection between the latter and the pulley.

The safety device is used and operates as follows:
The user attaches the spring catch 28 to this safety-belt, grips the rod 18 near its lower end and lifts the entire device for attaching it by the hook 10 to a point as high as possible on the pylon, i.e. as far he can reach from his starting positions. During this operation the rope 22 will be withdrawn from the device by passing around the pulley 24 and lifting the counterweight 20. This movement of the rope will not be

obstructed by the device as the speed of rotation of the pulley 24 is lower than that required for coupling the rotatable plate 52 to the pulley.

After having thus attached the hook 10 to a fixed position on the pylon or other structure, the user will climb up the latter without further bothering about the safety device while the counterweight 20 will gradually recover the rope 22 as the user approaches the hook 10. When the user comes up to a position about at the same height as that of the hook 10, the user will repeat the operation of attaching the hook 10 to a position above him a distance corresponding at least to the length of the rod 18 and by repeating this operation a number of times he will reach the desired position up on the pylon.

Should the user lose his grip and fall while moving from one point of attachment of the safety device to another, the rope 26 would be suddenly pulled rapidly by the falling body and cause rapid rotations of the pulley 24. This is turn would cause a radially outward movement of the weight 56 and coupling of the rotatable plate 52 to the pulley. Then the pin 54 would engage the inclined surface 50 on the slidable strut 48, as shown in Fig. 2, and the strut would push the floating piston 38 downwardly and the piston would be wedged into the frustoconical seat in the sleeve 36. Thereby the three balls would be pushed radially outwardly and would penetrate between the strands on the rope, thus locking the latter in position. After initial engagement of the rope, the traction exerted by the rope will be sufficient to keep the piston 38 wedged into the sleeve 36 and thus the balls 46 urged firmly against the rope.

Thus the body of the falling person would be immediately arrested.

Although a preferred embodiment of the invention has thus been described in detail and illustrated in the accompanying drawings, it is to be understood that the invention is not limited to this precise embodiment and that numerous changes and modifications obvious to one skilled in the art may be made therein without departing from the scope of the invention as defined by the appended Claim. Particularly the rope locking means may be different from the illustrated and described embodiment.

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Claim:

A fall arrest safety device comprising an attachment hook (10) firmly connected to a hollow rod (18), a pulley (24) rotatably mounted near an upper end of the hollow rod (18), a rope (22) having one end secured to a counterweight (20) slidably mounted within said hollow rod (18), said rope (22) extending from an upper end of said hollow rod (18) and passing around said pulley (24) and through locking means (36, 38, 46) anchored to said hollow shaft (18), the other end of said rope (22) being provided with means (28) for attachment to a safety-belt of the user, said locking means (36, 38, 46) being arranged to permit free passage of the rope in both directions when said rope is running slowly and to lock said rope when it is running in the direction of lifting of the counterweight at a speed exceeding a predetermined value.

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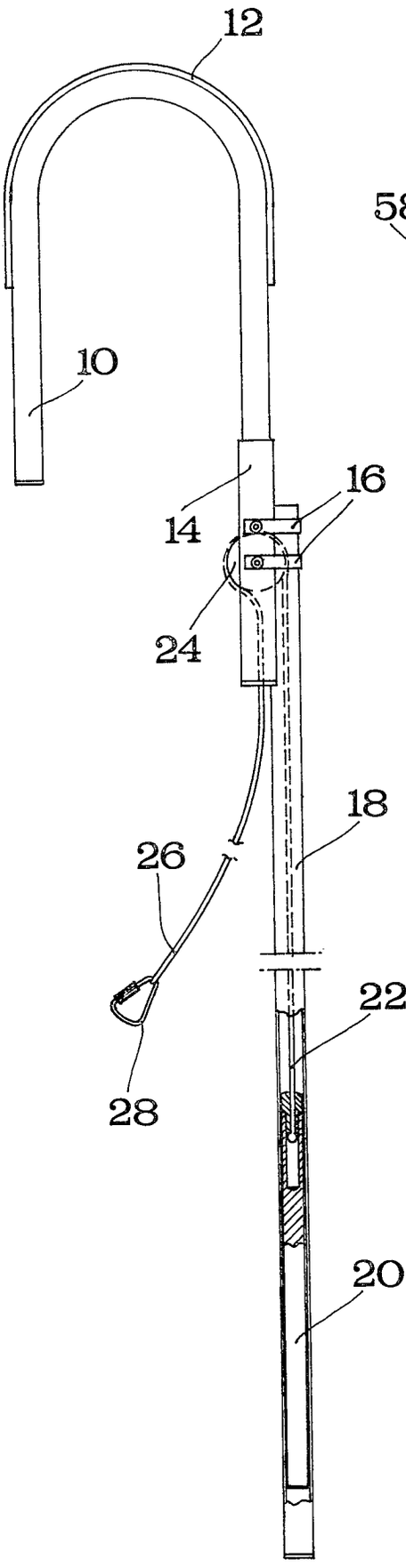

FIG. 1

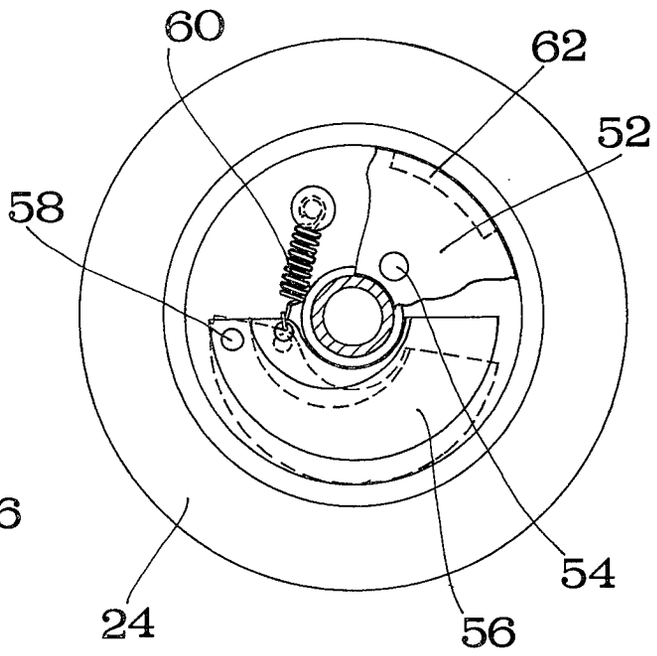

FIG. 3

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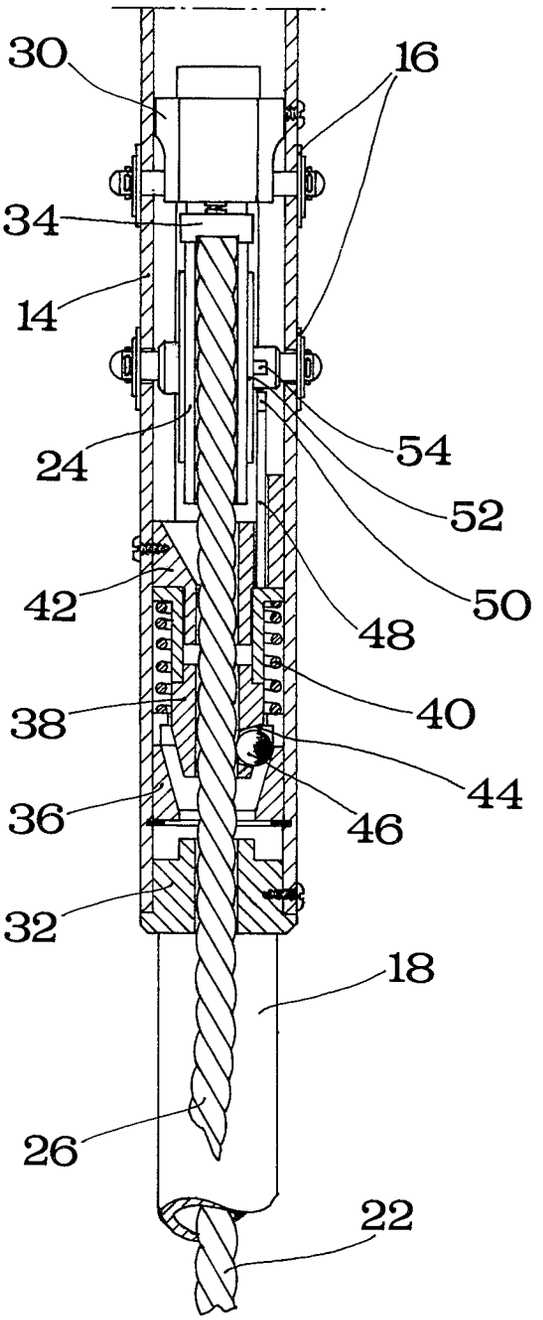
FIG. 2



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EUROPEAN SEARCH REPORT

0028041
Application number
EP 80 20 0940.7

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
	DE - U1 - 7 919 515 (MITTELMANN & CO.) * entire document *	1
	US - A - 2 538 904 (R.H. HEROD) * fig. 1 *	1
A	DE - C - 239 573 (J. KOLESZA) * fig. 5 *	1
A	DE - U - 7 337 770 (W. RADÜGE) * claim 1 *	1
A	GB - A - 1 061 903 (IRVING AIR CHUTE) * claim 1; fig. 1 to 6 *	1
A	US - A - 3 442 529 (G.F. LEWIS et al.) * fig. 2 *	1
A	US - A - 3 418 021 (G.F. LEWIS) * fig. 2 to 5 *	1
A	US - A - 2 886 227 (C.W. ROSE et al.) * claim 1; fig. 2 *	1

CLASSIFICATION OF THE APPLICATION (Int. Cl.³)

A 62 B 35/02
A 62 B 1/16

TECHNICAL FIELDS SEARCHED (Int. Cl.³)

A 62 B 1/00
A 62 B 35/00
A 63 B 27/00
E 04 G 21/00
E 06 C 7/00
H 02 G 1/00

CATEGORY OF CITED DOCUMENTS

X: particularly relevant
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: conflicting application
D: document cited in the application
L: citation for other reasons

&: member of the same patent family, corresponding document

X The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Berlin	04-02-1981	KANAL

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