Title: LIFTING, LOWERING OR TENSIONING DEVICE FOR FLEXIBLE ROPE, CABLE OR THE LIKE

Abstract: The Invention provides a novel lifting, lowering or tensioning device which comprises a winching element. The winching element comprises a lever rod provided with spaced apart rope- or cable-jamming members; a rope or cable guide device for receiving a rope or cable therearound; and a return member extending between the lever rod and the cable guide device.
LIFTING, LOWERING OR TENSIONING DEVICE FOR FLEXIBLE ROPE, CABLE OR THE LIKE

The present invention relates to lifting, lowering, or tensioning devices for use with flexible ropes, cables or the like, and more particularly, though not exclusively, to a lifting, lowering, or tensioning device for use with flexible ropes, cables or the like comprising a novel winching element, and a rescue system embodying such a device.

In known rescue systems, for example, as described in GB 2376009 and US 5911410, a mechanical advantage in the system, to facilitate ease of lifting and lowering, is provided by the use of a pulley system. The disadvantage in using a pulley system is that the greater the mechanical advantage of the system becomes, the greater the amount of rope that is required within the system. For example, a pulley system providing a 5:1 mechanical advantage will require five metres of rope to be pulled through the system to raise a load by one metre. Likewise, to lower a load on a 5:1 pulley will require a length of rope five times the distance that the load is required to be lowered. Considering that rescue systems, for example, in mountain rescue, may need to be carried considerable distances, this is a profound disadvantage.

In one aspect, the invention provides a novel lifting, lowering or tensioning device for use with flexible ropes, cables or the like.

In another aspect, the invention provides a rescue system embodying the novel lifting, lowering or tensioning device which obviates many of the difficulties of known systems.
In a still further aspect, the invention provides a lifting, lowering or tensioning device comprising a novel lever-operated winching element.

In a first aspect, the present invention provides a winching element comprising:

a lever rod provided with spaced apart rope- or cable-jamming members; a rope or cable guide device for receiving a rope or cable therearound; and a return member extending between the lever rod and the cable guide device.

In a second aspect, the present invention provides a lifting, lowering or tensioning device for use with flexible ropes, cables or the like, which comprises a lever rod provided with spaced apart rope- or cable-jamming members; a rope or cable guide device for receiving a rope or cable therearound; means for attaching the guide device to a support; and a return member extending between the lever rod and the cable guide device.

In a third aspect, the present invention provides a rescue system comprising a rope, cable or the like having at its distal end attachment means for attaching the rope, cable or the like to an attachment point on a load, a lever rod provided with spaced apart rope- or cable-jamming members; a rope or cable guide device for receiving the rope, cable or the like therearound; means for attaching the guide device to a support; and a return member extending between the lever rod and the cable guide device.

In a fourth aspect, the present invention provides a
lever rod, for use in a winching element, or a lifting, lowering or tensioning device, or a rescue system, provided with a first rope- or cable-jamming member mounted at the distal end of the lever rod and a second rope- or cable-jamming member mounted part way along the lever rod, leaving a section of the lever rod as a manually operable handle.

The invention is particularly applicable to rescue systems, for example, where it is required to lift and/or lower a person situated in an inaccessible position to place of safety, but it is to be understood that the invention is not limited thereto. Thus, the example, the winching element of the invention can be used in many situations where it is required to raise, pull, or otherwise move heavy loads with a mechanical advantage. Furthermore, the winching element of the invention can also be used to tension a rope or cable between two anchor points. The lifting, lowering or tensioning device of the invention can be used, for example, for raising water in a receptacle from one level to a higher level, for pulling a stuck vehicle free from bad ground conditions, for tensioning wire fencing, or for tensioning a rope to provide a horizontal safety line.

In the winching element of the invention, the lever rod is preferably a box section alloy rod, or any other lightweight bar or tube with the appropriate stiffness and strength. The lever rod is preferably provided with two spaced apart rope- or cable-jamming members mounted thereon. Preferably one of the rope- or cable-jamming members is mounted at the distal end of the lever rod, and the other is mounted part way along, leaving a section of the lever rod, preferably more than half of its axial length, as a manually-operable handle.
In this specification the term "jamming-member" or "jammer" is used with its ordinary meaning in the art of climbing of a device that will clamp or grip a rope or cable when under load in one direction but through which a rope or cable can pass freely in the opposite direction when not under load. Preferably each jammer is an ascender (mechanical sliding and braking device used to move up a rope, more preferably an ascender that meets the requirements of EN 567. Alternatively, the jammer consists of the jamming element of an ascender.

The jammer mounted at the distal end of the lever rod, (hereinafter "the front jammer") is engaged on the "live" side of the rope or cable in an arrangement that allows the jammer to pull against the load in one direction (toward the guide device and away from the distal end of the rope or cable). Preferably the front jammer is adapted such that the rope or cable can pass freely there through in the direction of the distal end of the rope or cable, but is frictionally engaged by the front jammer and prevented from travelling in the reverse direction.

The jammer mounted part way along the lever rod, (hereinafter "the rear jammer") is engaged on the "dead" side of the rope in an arrangement that allows the jammer to pull against the load (via the guide device) in one direction (away from the guide member and away from the distal end of the rope or cable). Preferably the rear jammer is adapted such that the rope or cable can pass freely through the rear jammer in the direction of its proximal end, but is frictionally engaged by the rear jammer and prevented from travelling in the reverse direction (toward its distal end).
The guide device is preferably a so-called descending device or "descender". In this specification the term "descending device" or "descender" is used with its ordinary meaning in the art of climbing of a rope support device which allows the rope at travel in one direction but not in the other and provides a means of controlling the speed of travel. Typical descenders include, for example, pulleys with a friction braking mechanism, generally operated with a handle, capstan winching devices and ascenders. Descenders are commercially available, for example, from Petzl. Preferred descenders are those that conform to EN341 part A.

The return member extending between the lever rod and the guide device is preferably an elongate retractable member attached at one end to the rear jammer and at the other to the guide device. In an alternative construction, the return member could be mounted at one end directly on the lever rod. Any suitable resilient and retractable member may be used as the return member, and for example the return member can comprise an elastic material that will stretch under load and return to its original size and length when the load is removed, or a retractable and extendable spring-loaded device.

When the winching element is used in a lifting, lowering or tensioning device of the invention, the rope- or cable-guide device is provided with means for attachment to a support or anchor point. Thus the guide device can be provided with a connector, for example, a karabiner, preferably a double action karabiner, which can in turn be attached to a sling or strop. Preferably the sling or strop is one that will withstand the loads applied during the dynamic and static tests of EN1496, assuming a safe working load of 150 kg. Preferably the sling or strop is
one that conforms to EN795 type B and/or EN566.

In the rescue system of the invention, any suitable rope or cable that is strong enough for its purpose can be used. For example, ropes formed from nylon, polyester, metal wire, Kevlar or natural fibres may all be used as appropriate. The rope or cable, and the rescue system, should however meet the dynamic and static test requirements of EN1496. The rope or cable is provided at its distal end with attachment means for attaching the rope or cable to an attachment point on the load. The attachment means can be any suitable connector. The attachment means is preferably a karabiner, and more preferably a double action karabiner. The term "karabiner" in this specification is used in its ordinary meaning in the art of climbing of a connector having a spring-loaded gate which is self-closing. A double action karabiner is one that requires two separate actions to be opened. The attachment means is preferably one that meets the test requirements of EN362.

In a preferred rescue system in accordance with the invention there is also provided an elongate locating member adapted to maintain the attachment means at the distal end of the rope or cable in an open position and to locate the attachment means in position to be attached to the load. Preferably the elongate locating member comprises a pole, preferably a telescopic pole, provided with a connector gate retaining bracket. The connector gate retaining bracket is preferably frictionally retained on the connector and preferably holds open the connector spring-loaded gate. The retaining bracket preferably keeps the connector in tension within the bracket until the connector is engaged with an anchor point on the load, whereupon the bracket can be pulled
away, thereby leaving the connector engaged with the anchor point and allowing the spring-loaded gate to close.

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

Figure 1 shows a schematic representation of a winching element in accordance with a first aspect of the invention;

Figure 2 shows a schematic representation of the a lifting, lowering or tensioning device in accordance with a second aspect of the invention;

Figure 3 shows a schematic representation of a rescue system in accordance with a third aspect of the invention;

Figure 4 shows a schematic representation of the rescue system of figure 3 being attached to a casualty;

Figure 5 shows a schematic representation of the return mechanism of the rescue system attached to the cable guide device thereof; and

Figure 6 shows a schematic representation of the cable guide device of the rescue system in a lowering position.

Figure 1 shows a winching element, illustrated generally at 10, in accordance with a first aspect of the invention comprising a lever rod 1. The rod 1 is provided with two spaced apart jammers 2, 3. The front jammer 2 is
mounted on the distal end of the rod 1, and the rear jammer 3 is mounted part way along the length of the rod. The rod 1 is provided with a handle 4 at the proximal end thereof.

The winching element further comprises a cable guide device 5 for receiving a rope or cable (not shown) therearound. A return member 6 extends between the rear jammer 3 and the cable guide device 5.

Figure 2 shows a lifting, lowering or tensioning device in accordance with the second aspect of the invention, embodying the winching element 10 of figure 1. The lifting, lowering or tensioning device comprises the winching element 10. An attachment means 17 is provided for attaching the guide device 5 to a suitable anchor point. The attachment means 17 comprises a sling 18 connected to the cable guide device 5, by a double action karabiner 19.

In use the sling 18 is detached from the karabiner 19 and passed around an anchor point S. The sling 18 is then reattached to the karabiner 19, which is itself attached to the cable guide device 5.

A rope 20 is placed around the cable guide device 5. Once positioned around the guide device the distal end 21 of the rope 20 is attached to an object to be lifted or lowered (not shown).

The front jammer 2 is engaged on the "live" side of the rope. The front jammer is adapted such that the rope can pass freely there through in the direction of the distal end of the rope, but is frictionally engaged by the jamming member and preventing from travelling in the
reverse direction.

The second rear jammer 3 is engaged on the "dead" side of the rope in an orientation that will allow the device to pull against the load to be lifted or lowered (via the guide device) in one direction (away from the descending device), yet run freely along the rope in the other direction.

Movement of the handle 4 in a direction downwards with respect to the cable guide device 5 causes the front jammer 2 to pull the "live" rope towards the cable guide device 5 and the rear jammer 3 to pull the dead rope away from the cable guide device 5. The combined effect of these two actions is that the rope 2 is moved through the cable guide device 5.

The cable guide device 5 allows the rope 2 to travel in one direction, but not in the opposite direction ie against the direction on movement of the handle. Thus once the rope has been moved through the cable guide device 5, it is unable to return to its original position.

Once the handle 4 of rod 1 has been moved to its maximum downwards position, the return member, which has been stretched under the load of the downward movement, will return to its original size and length when the load is removed, thereby returning the rod back to its original starting position. Due to their configuration, the front and rear jammers are able to move along the rope back to their original starting position.

The downward movement of the rod 1 and consequent pulling of the rope through the cable guide device 5 can be
repeated until the desired lifting or tensioning is achieved.

The system can be used for the tensioning of rope or wire between two anchor points provided that the rope is secured at its distal end to a second immovable anchor point.

Figure 3 illustrates a rescue system in accordance with a third aspect of the invention, the system embodying the lifting device of figure 2. In addition to the lifting device, the rescue system comprises a rope 30 having at one end thereof a double action karabiner 31 for attaching the rope to an attachment point 32 on a casualty.

In use, the sling 18 is attached to a suitable attachment point 5 and then attached to the cable guide device 5 by the karabiner 19. The rope 31 is passed through the cable guide device 5 until there is sufficient length on the “live” side to reach the attachment point 32 on the casualty.

The double action karabiner 31 attached to the rope 30 is then attached to the attachment point 32 on the casualty. As shown in figure 4, an elongate locating member 40 is provided to maintain the karabiner 31 in an open position and to locate the karabiner 31 in a position capable of engaging the attachment point 32. The locating member 40 comprises a telescopic pole 41 and a connector gate retaining bracket 42. The connector gate retaining bracket is frictionally retained on the karabiner 31 and holds the karabiner spring loaded gate in an open position. The locating member is used to manoeuvre the karabiner to a position where it engages the attachment
point 32, whereupon the retaining bracket 42 is pulled away from the karabiner 31, leaving the karabiner attached to the casualty and allowing the spring loaded gate 43 to close.

The lever rod 1 is then introduced to the system, by the engagement if the front and rear jammers 2 and 3 on the “live” and “dead” side of the rope 30 respectively. The return member 6 is then introduced between the rear jammer 3 and the cable guide device 5 by way of a carbine hook 50, as illustrated in figure 5.

Repeated downward force is then applied to the handle 4, resulting in movement of the rope 30 through the cable guide device 5 as described previously, thereby lifting the casualty.

If the casualty is suspended from a fall arrest lanyard at the time a rescue is implemented, the system can be operated so that the casualty is lifted just enough for the weight of the casualty to be transferred from the fall arrest lanyard to the system. The fall arrest lanyard can then be detached from the point at which it is anchored. The casualty can then be lifted to safety or lowered to safety.

To lower the casualty, the first and second jamming members 2, 3 are disengaged from the rope 31. The return member 6 is then detached from the carbine hook 50 and the lever discarded. The dead end of the rope 31 is then placed within the carbine hook 50 and held to provide additional friction during the lowering process as illustrated in figure 6. The handle 51 on the descending device is then operated which unlocks the rope jamming function of the device and allows the rescuer to lower
the casualty in a controlled manner.

The system can be used in a vertical plane where it is anchored directly above the casualty or a horizontal plane where it is anchored adjacent to a casualty, and the casualty can be pulled to safety. The system can also be used in a combination of both horizontal and vertical planes e.g. where the system is anchored on a flat roof with the rope of the system running horizontally to the edge of a building, then over the edge and down vertically to a casualty.

The reader's attention is directed to all papers and documents which are filed concurrently with or previous to this specification in connection with this application and which are open to public inspection with this specification, and the contents of all such papers and documents are incorporated herein by reference.

All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive.

Each feature disclosed in this specification (including any accompanying claims, abstract and drawings), may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series of equivalent or similar features.
The invention is not restricted to the details of any foregoing embodiments. The invention extends to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.
CLAIMS

1. A winching element comprising a lever rod provided with spaced apart rope- or cable-jamming members; a rope or cable guide device for receiving a rope or cable therearound; and a return member extending between the lever rod and the cable guide device.

2. A lifting, lowering or tensioning device for use with flexible ropes, cables or the like, which comprises a lever rod provided with spaced apart rope- or cable-jamming members; a rope or cable guide device for receiving a rope or cable therearound; means for attaching the guide device to a support; and a return member extending between the lever rod and the cable guide device.

3. A rescue system comprising a rope, cable or the like having at its distal end attachment means for attaching the rope, cable or the like to an attachment point on a load, a lever rod provided with spaced apart rope- or cable-jamming members; a rope or cable guide device for receiving the rope, cable or the like therearound; means for attaching the guide device to a support; and a return member extending between the lever rod and the cable guide device.

4. A rescue system according to claim 3, wherein the distal end attachment means is a connector.

5. A rescue system according to claim 4, wherein the connector comprises a karabiner.
6. A rescue system according to claim 5, wherein the karabiner is a double action karabiner.

7. A lifting, lowering or tensioning device according to claim 2, or a rescue system according to any of claims 3 to 6, wherein the means for attaching the guide device to a support comprises a sling or strop.

8. A lifting, lowering or tensioning device, or a rescue system, according to claim 7, wherein the sling or strop is attached to the cable guide device by a connector.

9. A lifting, lowering or tensioning device, or a rescue system, according to claim 8, wherein the connector is a karabiner.

10. A rescue system according to any of claims 3 to 9, wherein the rescue system further comprises an elongate locating member adapted to maintain the attachment means at the distal end of the rope or cable in an open position and to locate the attachment means in position to be attached to the load.

11. A rescue system according to claim 10, wherein the elongate locating member comprises a telescopic pole provided with a connector gate retaining bracket.

12. A winching element, or a lifting, lowering or tensioning device, or rescue system according to any preceding claim, wherein the lever rod is provided with two spaced apart rope- or cable-
jamming members mounted thereon.

13. A winching element, or a lifting, lowering or tensioning device, or a rescue system, according to claim 12, wherein one of the rope- or cable-jamming members is mounted at the distal end of the lever rod, and the other is mounted part way along, leaving a section of the lever rod, as a manually-operable handle.

14. A winching element, or a lifting, lowering or tensioning device, or a rescue system, according to any preceding claim, wherein the cable guide device is a descender.

15. A winching element, or a lifting, lowering or tensioning device, or a rescue system, according to any preceding claim, wherein the return member is an elongate retractable member.

16. A winching element, or a lifting, lowering or tensioning device, or rescue system, according to any preceding claim, wherein each jamming member is an ascender.

17. A lever rod, for use in a winching element, or a lifting, lowering or tensioning device, or a rescue system, provided with a first rope- or cable-jamming member mounted at the distal end of the lever rod and a second rope- or cable-jamming member mounted part way along the lever rod, leaving a section of the lever rod as a manually operable handle.

18. A winching element as hereinbefore described with
reference to and as illustrated in the accompanying drawings.

19. A lifting, lowering or tensioning device as hereinbefore described with reference to and as illustrated in the accompanying drawings.

20. A rescue system as hereinbefore described with reference to and as illustrated in the accompanying drawings.

21. A lever rod as hereinbefore described with reference to and as illustrated in the accompanying drawings.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER
B66D3/00

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)
A62B  B66D  A63B

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 practical, search terms used):
EPD-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Further documents are listed in the continuation of Box C.

Date of the actual completion of the international search
15 March 2006

Date of mailing of the international search report
28/03/2006

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