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(54) Safety screw for climbing on ice

(57) The invention relates to an ice screw having the function of supporting a carabiner in which the safety rope of a climber slides. The screw is equipped, on the head portion, with a grip that enables ease of screwing of the screw with the aid also of a tuck-away lever, which minimizes the effort required to the climber. The screw is moreover provided with a supporting ring to which it

is possible to anchor a carabiner. The ring is free to rotate about the cylindrical portion of the screw and thus enables the climber to operate the lever even when the safety rope is engaged in the carabiner. This eliminates the risks that the screw may drop and be lost following upon incomplete insertion into the ice, because in any case it remains anchored to the safety rope (also during recovery of the screw).

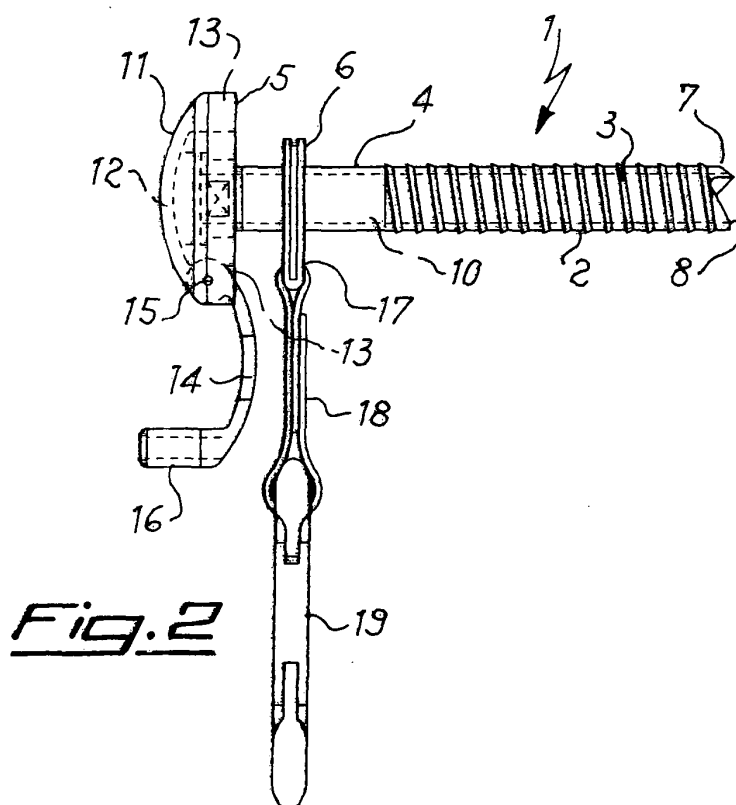


Fig. 2

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Description

[0001] The present invention relates to a screw for mountain-climbing on ice faces.

[0002] Climbers that climb up ice faces use a plurality of safety devices in order to provide protection against falls. Amongst such devices are safety ropes, which have the purpose of keeping the climber hanging in the case where he loses his grip on the ice face, thus preventing him from falling. One end of said rope is secured to the harness worn by the climber whilst the other end is secured to bodies that are fixed to the base of the ice face or else is held manually in tension by other climbers by means of elements of friction. During the ascent and at regular intervals, the climber uses particular screws, which are to be engaged in the ice and to which carabineres are anchored. The climber runs the safety rope through each ring or carabiner. In this way, in the event of a fall, the last ring or carabiner fixed to the ice face constitutes the ring for return of the rope, and the climber will undergo a loss of height approximately equal to twice the length of the rope comprised between his harness and the ring for return of the rope. This system thus enables the fall of the climber to be arrested, so guaranteeing his safety.

[0003] Traditional embodiments of ice screws are formed by a hollow cylindrical body, externally threaded, provided with a head portion that has means for anchoring the carabineres and means the function of which is to facilitate engagement of the threaded portion in the ice.

[0004] For example, the U.S. patent No. 5,782,442 relates to an ice screw made up of two metal parts which can be fitted together: an externally threaded hollow cylinder and a lever. In particular, the lever can be fitted to the head portion of the cylinder through a slotting element having a shape obtained by means of a restriction of the section of the cylinder itself. The lever has a generally elongated shape and has a hole for insertion of a carabiner and a tuck-away lever. By acting on the lever, the climber impresses a rotation on the lever, which pivots on the head of the cylinder. Said rotation is transmitted to the cylinder itself through the fit described above. The lever thus has the dual purpose of facilitating engagement of the screw in the ice and of constituting the support for the carabineres.

[0005] The document No. *US 5,118,061* relates to an ice screw having characteristics similar to those of the screw previously described in *US 5,782,442*, but provided with a third element that can be fitted to the head of the screw. Said element has the purpose of protecting the head of the screw and of transmitting the force impressed by the climber through a hammer during the step of insertion of the screw into the ice.

[0006] The ice screws described above and those according to the known art present various drawbacks. In particular, the head of the screw has a through hole in communication with the internal hole of the cylindrical

portion of the screw for the purpose of enabling extraction, through the head itself, of the core of ice that is created within the cylindrical portion when it is engaged in the ice. The need to have said discharge hole on the head of the screw causes the head itself not to offer a surface of adequate extent and shape for being struck by a hammer.

[0007] In addition, ice screws according to the known art have a head that is in general not ergonomic being difficult to manipulate. This aspect results in a further difficulty for the climber, who in the step of insertion of the screw in the ice, before its thread engages, must exert a discrete pressure on the head of the screw with his hand. Consequently, traditional screws prove difficult to insert into the ice, and frequently an ineffective initial insertion causes momentary loss of the screw, which slides out of the ice and drops, forcing the climber to recover it by means of the rope that secures the screw itself to the climber, with obvious expenditure of energy.

[0008] Another defect that can be encountered in screws according to traditional embodiments is given by the fact that in order to be able to get the screw to make a complete turn, by acting on the lever, the climber is forced to abandon his grip on the lever and then resume it. This involves further risks of loss of the screw, which, if it has not yet been engaged in the ice, at the moment when the climber detaches his hand from the lever, may drop and even be lost altogether. In addition, the climber finds himself having to expend a lot of energy given that he finds himself having to operate on the lever while his balance is precarious.

[0009] The ice screw forming the subject of the invention solves the problems mentioned above, since it is easy to insert manually into the ice with a single continuous, i.e., non-interrupted, movement.

[0010] In addition, the ice screw according to the invention eliminates the possibility of loss of the screw since it is possible to keep it anchored to a carabiner and a rope for the entire duration of the step of positioning, inserting and screwing into the ice, without any further hindrance.

[0011] The subject of the invention is an ice screw comprising: a hollow cylindrical shaft in part externally threaded; a flange fitted to the non-threaded end of the shaft, provided with a central through hole communicating with the internal channel of the shaft; and a supporting ring, said flange being provided with extractable means designed for turning the screw, said means being operable manually by means of just one hand, and said ring being free to slide and rotate on the non-threaded portion of the hollow cylindrical shaft, between the flange and the threaded portion of the shaft, said ring being provided with means for anchorage of a carabiner.

[0012] In particular, the shaft is formed by a hollow metal cylinder having a first free end, designed to be inserted into the ice, and a second end, which can be fitted to the flange. The free end of the shaft has, along its edge, a toothed profile having the purpose of faci-

tating engagement of the screw in the ice.

[0013] The teeth in fact are shaped in such a way as to penetrate into the ice during the step of screwing of the screw, removing material (ice), which is guided towards the internal cavity of the shaft.

[0014] According to the preferred embodiment, the toothing of the screw is obtained by making appropriate flared portions along the edge of the free end of the shaft.

[0015] A portion of the outer surface of the shaft, in a position corresponding to the free end, is threaded, whilst the remaining part, corresponding to the other end, is generally smooth.

[0016] At its second end, the shaft is fixedly fitted to a flange, which is to constitute the head of the screw. The fit can be chosen from among the different types of fit traditionally used. For example, the flange can be fixed to the shaft by means of a force fit that envisages the use of keys or metal catches. In general, said fit envisages that the shaft will engage in the flange so as to project just from one side of the flange itself.

[0017] The head of the screw (flange) has a generically cylindrical shape with an external diameter greater than the length of its generatrix. The internal hole of the head and the internal cavity of the shaft constitute a single passage open at the two ends of the screw. The surface of the head that is on the opposite side of the shaft has a convex profile. Provided on said surface is a groove of length equal to the external diameter of the head of the screw, which at the external edge of the head is joined to two diametrically opposite flared portions present on the lateral surface of the head itself, said flared portions being parallel to the generatrix of the head.

[0018] The groove and the flared portions define a space designed to receive a lever having an arched profile, characterized by the same radius of curvature as that of the convex surface of the head of the screw. In particular, one end of the lever is hinged to the head of the screw in a position corresponding to one of the two flared portions in such a way that the lever itself may assume two configurations, corresponding to two different positions thereof. In a first, closing, configuration, the lever is received within the groove in such a way as to mate with the bottom and side surfaces that define the groove itself. In this configuration, the top surface of the lever and that of the head of the screw define a continuous surface, without any sharp edges, and the lever intercepts the discharge hole of the screw. The lever can be rotated manually about its hinge by an angle of approximately 180°, corresponding to its second configuration, referred to as "opening" configuration. When it is in this position, the lever projects in a radial direction from the head of the screw and does not intercept the discharge hole. The free end of the lever can be fitted, for example by means of a pin, to a bushing that is free to rotate about its own axis, which, when the lever is in its closing position, is received in the corresponding

flared portion present on the head of the screw and can also project from the head towards the cylindrical portion of the screw in a direction parallel thereto.

[0019] According to a further embodiment of the invention, the lever can be fitted to the head of the screw along its outer circumference. According to this embodiment, the lever has an arched profile and is extractable from the lateral surface of the head of the screw.

[0020] According to a preferential embodiment of the invention, the head of the screw is provided with a series of through holes set along a circumference and having the dual purpose of lightening the head of the screw and of enabling insertion of a cord used for performing the manoeuvre of recovery of the screw.

[0021] The openable lever thus constitutes a useful support for manual turning of the screw. A climber, in fact, thanks to the convex profile of the head of the screw and with the lever in the closing position, can push and rotate the screw in the ice without ever detaching his hand from the grip, so preventing any accidental losses, and he can then open the lever and, with a continuous movement of his hand, rotate the lever by pivoting on the bushing present on the lever itself. This enables the climber to engage the screw in the ice at a considerably greater speed as compared to the speed made possible by traditional screws. This advantage results also in a saving of energy for the climber, who is not forced to make slow and irregular movements whilst he is in a precarious state of balance.

[0022] Provided between the head of the screw and the thread of the cylindrical surface is a supporting ring of such a diameter as to enable its free sliding and its free rotation on the cylindrical portion referred to above. The ring is provided with means for anchorage of a carabiner, within which the safety rope passes. In particular, the ring is provided with an eyelet, about which a tape is wound. The tape provides a support for a carabiner and is made of a material designed to resist the tensile stress caused by the weight of the climber, which, in the event of a fall, is loaded on the screw and hence on the tape itself.

[0023] The ring offers the advantage of enabling free rotation of the screw and ease of insertion thereof in the ice even when the safety rope is already inserted in the carabiner. This considerably reduces the risks of dropping and loss of the screw, which even in the event of detachment from the ice face (in the case where it has not been sufficiently inserted into the ice prior to engagement therein), remains hanging on to the safety rope through the carabiner.

[0024] Further details will emerge more clearly evident from the detailed description of preferred but non-exclusive embodiments of an ice screw according to the invention, illustrated by way of indicative but non-limiting example in the attached drawings, in which:

- Figure 1 is a side view of the ice screw, with the lever in the closing position;

- Figure 2 is a side view of the ice screw, with the lever in the opening position;
- Figure 3 is a front view of the screw, with the lever in the closing position;
- Figure 4 is a front view of the ice screw, with the lever in the opening position; and
- Figure 5 is a side view of the toothing of the screw.

[0025] With reference to Figures 1-4, an ice screw 1 is illustrated, which comprises a hollow cylindrical shaft 2, the outer surface of which has a threaded portion 3 and a smooth portion 4, a flange 5, and a supporting ring 6.

[0026] The flange 5, which constitutes the head of the screw 1, is fixedly fitted to the end of the shaft 2 on the side of the smooth portion 4. The outer surface 11 of the flange 5 has a convex profile characterized by a radius of curvature that enables the climber to insert the screw easily into the ice through the pressure and simultaneous rotation of the flange 5 using the palm of his hand. The flange 5 has, in a position corresponding to its axis, a through hole 9 having the same diameter as the internal hole 10 of the cylindrical shaft 2 with which it is in communication. Present on the surface 11 of the flange 5 is a transverse groove 12, the ends of which communicate with two longitudinal flared portions 13 made in an area corresponding to the periphery of the flange 5. The volume defined by the transverse groove 12 and by the longitudinal flared portions 13 constitutes the housing for a tuck-away lever 14, fitted to the flange 5 by means of a hinge 15 in a position corresponding to one of the flared portions 13. The lever 14 is provided with a bushing 16 pivoted thereto and which can turn about its own axis. In addition, the lever 14 has a curved profile, characterized by having the same radius of curvature as the outer surface 11 of the flange 5, so that when the lever is in the closing position its outer surface is contiguous with the surface 11 of the flange, without any generation of sharp edges. Once the climber has inserted the screw 1 with a few turns into the ice face, he can open the lever 14 with a simple movement of just one hand, and, still using the same hand, he can rotate the lever 14 in a circumferential direction by acting on the bushing 16, so transmitting the rotation to the screw that engages in the ice.

[0027] In the embodiment illustrated, the flange 5 is provided with a series of through holes 20 for insertion of a cord normally used by climbers for recovery of the screw.

[0028] The cylindrical shaft 2 of the screw 1 is equipped, at its free end 7, with a series of teeth 8 that have the function of triturating and conveying the ice in the hole 10 of the shaft 2 when the screw is engaged. The core of ice that is thus being formed, is expelled through the discharge channel formed by the hole of the flange 9 and by the hole 10 of the shaft 2.

[0029] Figure 5 shows the preferred embodiment of the teeth 8, the profile of which is obtained by making

appropriate flared portions 21 along the edge of the shaft 2. The flared portions 21 are inclined with respect to the axis of the shaft 2.

[0030] A supporting ring 6 is fitted to the smooth portion 4 of the screw 1. The internal diameter of the ring 6 is slightly greater than the external diameter of the portion 4, so that the ring can slide freely between the flange 5 and the start of the threaded portion 3. The ring 6 is provided with an eyelet 17, to which there is fixed a tape 18 that can be associated to a carabiner 19, in which the climber causes the safety rope (not illustrated) to slide. The play existing between the supporting ring 6 and the screw 1 enables the climber to turn the screw 1 even when the carabiner 19 is in use, i.e., when it is engaged to the safety rope, thus eliminating the possibility of the screw falling and getting lost. The tape 18 must be made of a material that is able to resist the stresses that are loaded thereon, through the safety rope, in the event of the climber falling.

Claims

1. An ice screw comprising: a hollow cylindrical shaft, which is in part externally threaded; a flange fitted at the non-threaded end of the shaft, provided with a central through hole communicating with the internal channel of the shaft; and a supporting ring; said ice screw being **characterized in that**:
 - said flange is provided with extractable means designed to rotate the screw, said means being operable manually by means of just one hand; and
 - said ring is free to slide and rotate on the non-threaded portion of the hollow cylindrical shaft, between the flange and the threaded portion of the shaft, and is provided with means for anchorage of a carabiner.
2. An ice screw according to Claim 1, **characterized in that** said extractable means designed to rotate the screw consist of a tuck-away lever fitted to the flange by means of a hinge, said lever being houseable in a suitable compartment obtained in the flange and being actuatable by means of a bushing which can turn about its own axis, fitted thereto through a pin present on the free end of the lever.
3. An ice screw according to Claims 1 and 2, **characterized in that** said tuck-away lever may be opened in a direction orthogonal to the axis of the flange.
4. An ice screw according to Claims 1 and 2, **characterized in that** said tuck-away lever may be opened laterally from the perimetral surface of the flange.
5. An ice screw according to Claim 1, **characterized**

in that said means for the anchorage of a carabiner consist of a tape made of fabric.

6. An ice screw according to any one of the preceding claims, **characterized in that** the end of the shaft opposite to the flange has a toothed profile. 5
7. An ice screw according to Claim 6, in which said toothed profile is obtained by means of a series of oblique flared portions made along the edge of said end. 10

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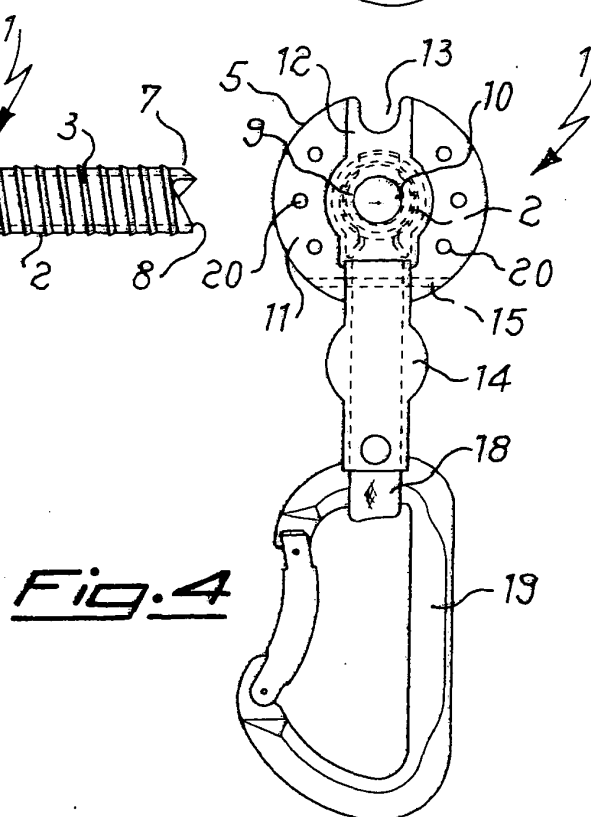
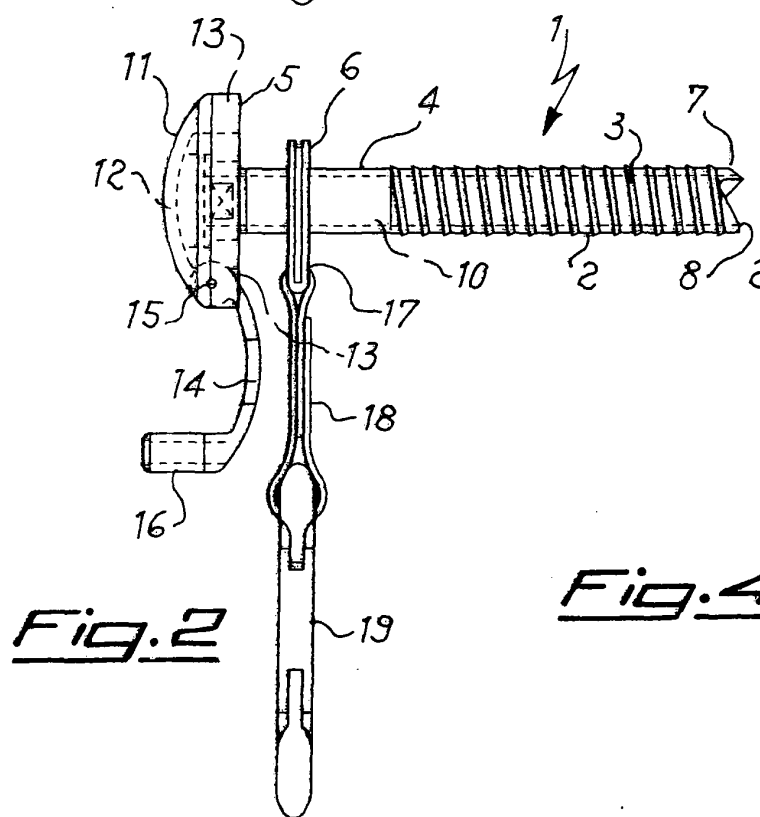
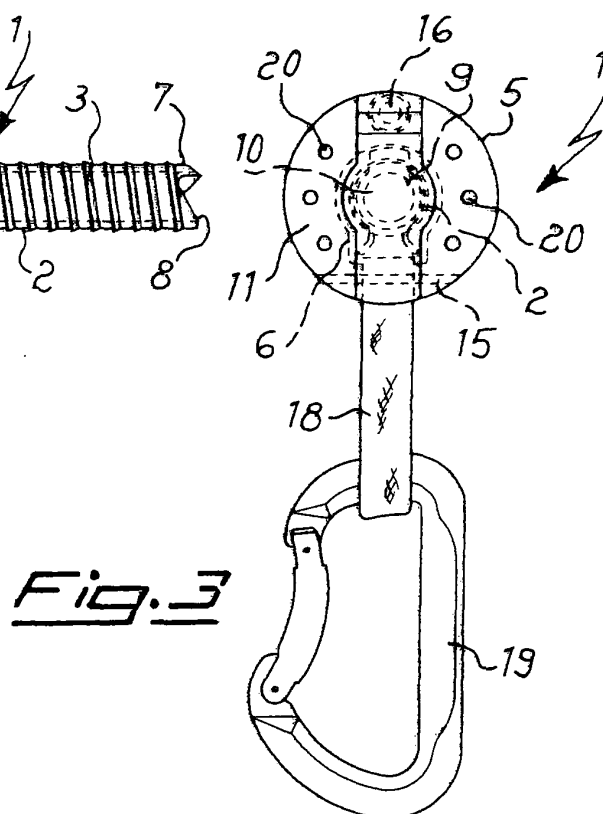
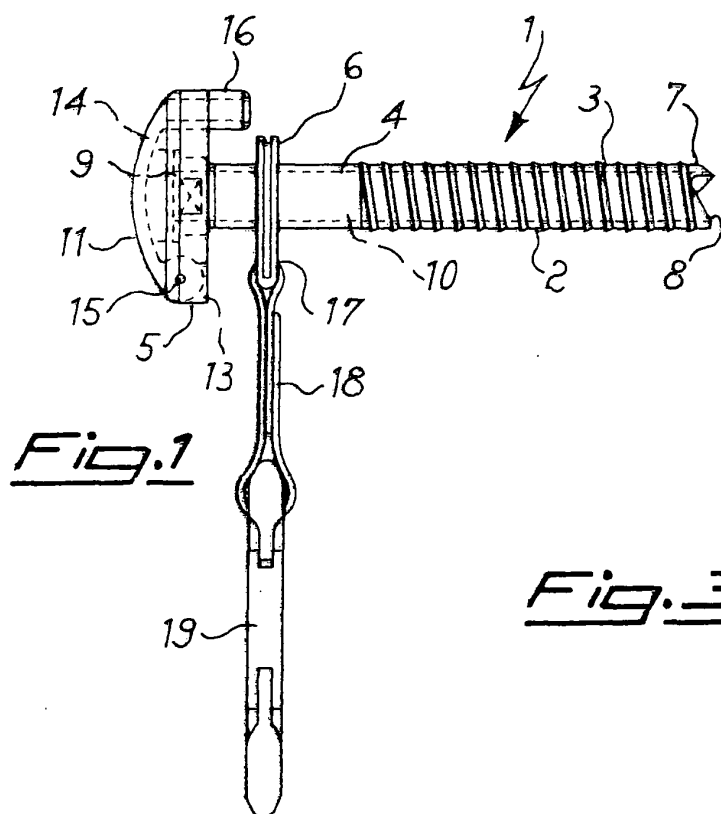


Fig. 5

