(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 047 232**
B1

(12) # EUROPEAN PATENT SPECIFICATION

(45) Date of publication of patent specification: **09.07.86**

(51) Int. Cl.⁴: **A 63 B 29/02**

(21) Application number: **81850145.4**

(22) Date of filing: **02.09.81**

(54) **Anchoring device for mountain climbers.**

(30) Priority: **03.09.80 SE 8006154**
16.03.81 SE 8101653

(43) Date of publication of application:
10.03.82 Bulletin 82/10

(45) Publication of the grant of the patent:
09.07.86 Bulletin 86/28

(84) Designated Contracting States:
AT CH DE FR GB IT LI SE

(56) References cited:
DE-A-2 352 048
FR-A-2 396 562
FR-A-2 440 206
US-A-3 877 679
US-A-3 903 785

(73) Proprietor: **SALEWA Sportgeräte GmbH**
Thalkirchner Strasse 47
D-8000 München 2 (DE)

(72) Inventor: **Mellgard, Ingemar**
Sandavägen 39
S-140 32 Grödinge (SE)

(74) Representative: **Fincke, Karl Theodor, Dipl.-Phys.Dr. et al**
Patentanwälte Dipl.-Ing. H.Weickmann Dipl.-Phys.Dr. K.Fincke Dipl.-Ing. F.A.Weickmann Dipl.-Chem. B. Huber Dr. Ing. H. Liska Dipl.-Phys.Dr. J. Prechtel Postfach 860820
D-8000 München 86 (DE)

EP 0 047 232 B1

Courier Press, Leamington Spa, England.

Description

The present invention relates to a device for releasable anchoring in slots having opposite walls, in particular slots having essentially parallel walls. The device can be attached or released with one hand in a simple and rapid way. It is primarily intended for use in mountain climbing to obtain an anchor in rock cracks.

When two or more climbers move over steep and difficult rock it is common practice to utilize a rope to secure the climbers together and to anchor the rope in slidable manner to the rock being climbed.

US Patent No. 4 184 657 discloses an anchoring device for mountain climbers which can be used also in parallel-sided slots and can be attached or released with one hand. The device is based on camming action and has become extremely popular although it is mechanically complicated, heavy and very expensive to produce. An additional disadvantage is that it can not be made for use in cracks being more narrow than about 2 cm.

In "Mountain" Magazine, Vol 53, p 48, 1977, it is suggested to arrange an anchor for mountain climbers by placing two conventional mountaineering wedges ("chocks") side by side in a crack but turned in opposite directions, in order to obtain an anchor in a slot being too wide for a single wedge. The wedges are tied together with a flexible rope sling which is thread through the longitudinal holes in each wedge in such a manner that the wedges are pressed in opposite directions and give a firm anchor when the sling is loaded. The disadvantage with this system is that it is safe only when constant pressure is maintained on the sling, and it does not normally work in parallel-sided slots. Further it can not be handled with one hand, can not be inserted deeply into slots and can not be used in slots being less wide than about 3 cm.

In FR—A—2 440 206 there is suggested a device which is also based on the idea of opposite wedges, preferably three wedges having different shape and size. The device is said to be useful for anchoring in open slots which are wider at the surface, that is non-parallel slots. There is a load-bearing cord or cable mounted at the narrow end of one wedge, and at the lower end of said cord or cable there is an eye for the attachment of a load. The wedge carrying the load-bearing cord or cable can be readily separated from the wedge or wedges that co-operate with it in a manner permitting loss of one from the other, and the device is presumably difficult or impossible to handle with one hand.

Many other types of simple anchoring devices for mountain climbers are known, but the simple devices are in the main only suitable for anchoring in slots which have a constriction in the direction of the load.

The object of the present invention is to bring forward a device which does not possess the disadvantages and limitations mentioned in the foregoing. This object has been attained by a device which has the characterizing features given in the appended claims. According to the invention there is thus obtained a device which can be handled with one hand and stays safely in place, and which can be made so that a single device suits a very wide range of different slot-sizes including parallel-sided slots and slots being less wide than 2 cm. The device comprises only a few parts and is inexpensive to produce. The invention will in the following be explained in detail with reference to some embodiments shown in the annexed drawings wherein fig. 1 illustrates one particular embodiment of the invention, and fig. 2—5 illustrate various types of wedges which can be used in the device according to the invention.

The wedge-shaped member 1 to the left in fig. 1 is in the following denoted "loading wedge", because it is intended to support an outer load (e.g. a climber) which is attached to the attachment eye 3. The wedge-shaped member 2 to the right is denoted "locking wedge", because it is intended to lock the loading wedge in the desired fixed position by friction against the slot wall.

A calculation of the forces which work on the wedges shows that a prerequisite for the desired locking to take place when a downward force is applied to the attachment eye 3 is that tang v, where v is the angle in fig. 1 which is formed between the left angle-cut side of the locking wedge and the right wall of the slot, is less than the coefficient of friction n between the locking wedge and the right wall of the slot, provided that the coefficient of friction n_o between the locking wedge and the loading wedge can be neglected. If this last-mentioned friction can not be neglected then the criterion is that tang $(v+v_o)$, where v_o is the angle whose tang is n_o, has to be less than n.

It is apparent from the last-mentioned formula that the coefficient of friction n_o should be as low as possible and the coefficient of friction n should be as high as possible, in order to obtain a safe lock. In practice the coefficient of friction n may be about 0.5 or more, which means that the angle v has to be less than c:a 25°. The angle v should preferably be between 8—14°. The friction between the loading wedge and the wall of the slot surprisingly has no influence on the lock in parallel-sided slots. However, it has been found that if this friction is low then the wedges will be subjected to strong transverse compressive forces which can cause deformation of the wedges or dangerously expand a crack in bad rock.

The loading wedge in fig. 1 is connected with an attachment eye 3 via a first load-bearing member 4. This load bearing member should be rather long, and preferably between 15—30 cm (including the length of the attachment eye), so that the wedges if desired can be guided deeply into a slot. The load-bearing member 4 should be flexible but sufficiently stiff that one without difficulty can guide the wedges to the desired

position even when the device is only held closely to the attachment eye. The load bearing member 4 may suitably consist of a stiff steel cable, the one end of which has ben formed to an attachment eye 3 to which the load can be applied with the aid of a carabiner or similar connecting means.

The load-bearing member 4 is surrounded by a spring means 5, illustrated by a coil-spring in fig. 1. The one end of the spring is mounted close to the attachment eye and the other end is mounted to a second member 6. The other end of this second member is mounted to the locking wedge. The member 6 runs through a guide eye 7 which is mounted to the load-bearing member 4. The member 6 is flexible and resilient so that the resilience and the guide eye holds the locking wedge in direct contact with the loading wedge side by side.

The purpose of the spring means 5 is to push the locking wedge upwards relative to the loading wedge, so that the wedges expand and stay in the place where they have been positioned even when no outer load is attached to the attachment eye 3. When the device is to be released from the slot, the load must first be removed whereupon the spring means 5 is compressed with hand power, preferably by inserting one's thumb in the attachment eye 3 and then gripping with the fingers on the member 6 between the spring and the locking wedge. This operation is facilitated if a special finger hold, shown as a circular hollow plate 8 in fig. 1, is mounted on the member 6. A similar compression of the spring is usually necessary also when the device is inserted in a slot. A stop lug 9 is mounted on the load-bearing member 4 to prevent the finger grip and thus, indirectly, the locking wedge from being displaced beyond a pre-selected end position. This end position is selected so that the locking wedge does not slide off the loading wedge or ceases to cooperate effectively with same.

The member 6 will only be subjected to a minor compressive strain from the spring, and may thus be made thinner than the load-bearing member 4 and may be made of elastic materials such as plastics or rubber with low tensile strength. The fastening of the member 6 in the locking wedge may for example be made by simple gluing in a hole which has been drilled in the locking wedge. The fastening of the load-bearing member 4 to the loading wedge must however be performed according to such known methods which give a more strong connection. The load-bearing member 4 and the attachment eye 3 should in fact be able to withstand forces of between 4000—40 000 Newton when the device is used in mountain climbing.

The loading wedge and the locking wedge must also withstand compressive forces of the order of 10^4 Newton, and are preferably made of metals such as steel, titanium, plain bearing metal, or aluminium alloys. In order to obtain a low coefficient of friction n_o between the common contact surface of the loading wedge and the locking wedge, these surfaces may be treated by for example honing, polishing, teflon coating or other permanent or temporary lubricant coating.

In the embodiment shown in fig. 1 that side of the locking wedge which bears on the slot is shaped slightly convex. This gives a more centered fit-up in slots which are either narrowing or widening in the direction of the load. In such slots the upper or lower edge of the locking wedge would otherwise carry the whole strain which might cause deformation of this. The side of the loading wedge which bears on the slot is shown plane in fig. 1, but can also be designed concave or even somewhat convex. The sides of the wedges which bear on the wall of the slot may if desired be provided with transverse furrows, slices of rubber or other means for increasing the friction.

The anchoring device according to the invention should preferably be designed so that one single device can be made to fasten in the widest possible range of different slot-widths. In order to attain this it is suitable to have two load-bearing members mounted on the loading wedge on each side of the same, instead of having a single centrally mounted load-bearing member. It is then possible to displace the lower edge of the locking wedge close to the opposite wall of the slot, without interfering with the members mounted on the loading wedge, which means that the device can be used in more narrow slots than would otherwise be possible. Fig. 2 illustrates a suitable configuration of a loading wedge and a locking wedge to achieve this. An additional advantage with this configuration is that the locking wedge slides in a groove in the loading wedge and is thus stabilized sideways.

In fig. 3 there is illustrated another suitable configuration of a loading wedge and a locking wedge, wherein the common contact surface of the wedges have the shape of a section of a circular cylinder surface. Such an embodiment is advantageous because the locking wedge and the loading wedge will be allowed to turn relative each other, which gives a more stable fit-up in slots having walls which are not exactly parallel in a cross-section being transverse to the general direction of the load, that is so-called flared slots. In the embodiment shown in fig. 3 the convex side of the cylindrical surface is a part of the loading wedge and the concave side of the surface is a part of the locking wedge. It is of course possible to make it quite the reverse.

In fig. 4 there is illustrated a loading wedge and locking wedge having a common contact surface which consists of two planes forming a small angle between them. Furthermore, the outer surfaces of the wedges are convex and somewhat unsymmetrical, which is advantageous when using the device in non-parallel slots.

In fig. 5 there is illustrated an embodiment of a loading wedge and locking wedge which is especially suitable when making a device according to the invention which is to be used in

very narrow (e.g. 0.3—1.0 cm) vertical slots, in particular parallel slots or slots which slightly open up sideways. The loading wedge has a single load-bearing rod which is rigidly mounted on one side of the loading wedge, the rod and the wedge in fact being made in a single piece of metal. Also the locking wedge and corresponding rod is made in one piece. The wedges are further distinguished by the fact that their width, height and thickness narrow away in a direction normal to the attachment points of the rods in the wedges. This is advantageous because the device can then be used in slots of very different widths. Only the outer narrow section of the wedges is inserted in slots being correspondingly narrow.

The invention is not limited to the specific embodiments disclosed above. Several variations are possible within the scope of the claims. The coil-spring 5 which exerts pressure may for example be substituted with a coil-spring which resists expansion and is fixedly mounted on the rod 4 closer to the loading wedge. The rod 6 and the finger grip is then mounted at the lower end of the coil-spring, and the rod 6 may run inside the coil-spring so that the spring acts as a guide member for the rods. A further variation comprises joining the guide member 7 with the stop-lug 9 to one single unit.

Claims

1. Anchoring device for mountain climbers for detachable anchoring in slots having essentially parallel walls, which device comprises a loading wedge (1) and a load-bearing member (4) mounted on the narrow end of said wedge, the other end of the load-bearing member being provided with an attachment eye (3) intended for attachment of an outer load, a locking wedge (2) and a second member (6) mounted on the wide end of this wedge, whereby the wedges are slidably arranged side by said with low friction against each other and having their narrow ends oriented in opposite directions to each other, the device being characterized in that said members (4, 6) are rods or stiff cables and that said members are provided with one or more guide means (7) which keep said members and the wedges mounted thereon joined as a single unit in such a way that said members and the wedges are longitudinally displaceable relative to each other, members having associated therewith a spring means (5) which pushes the narrow ends of the wedges in opposite directions so that the effective joint thickness of the wedges is expanded and held in place against the walls of the slot, and a finger grip (8) is mounted on one of said members for exerting a force on the spring means in order to achieve a reduction of the combined width of the wedges when the device is being placed into the slot.

2. Anchoring device according to claim 1 characterized in that the locking wedge slides in a groove in the loading wedge and that the loading wedge is provided with two load-bearing rods or stiff cables which are placed on each side of the groove.

3. Anchoring device according to claim 1 characterized in that the common contact surface of the wedges has the shape of a section of a circular cylinder surface.

4. Anchoring device according to claim 1 characterized in that the common contact surface of the wedges comprises two planes forming a small angle between them.

5. Anchoring device according to claim 1 characterized in that the sides of the wedges which are to be oriented against the walls of the slot are shaped convex.

6. Anchoring device according to claim 1 characterized in that it is provided with means (9) which prevent the locking wedge from sliding off the loading wedge so that the wedges would cease to cooperate with each other.

Patentansprüche

1. Klemmvorrichtung für Bergsteiger zur lösbaren Verankerung in Rissen mit im wesentlichen parallelen Wänden mit einem Belastungskeil (1) und einem an einer Schmalseite des Keils montierten lasttragenden Element (4), dessen anderes Ende mit einer der Befestigung einer äußeren Last dienenden Befestigungsöse (3), mit einem Verklemmkeil (2) und einem zweiten an einer Breitseite dieses Keils montierten Element (6), wobei die Keile Seite an Seite mit geringer Reibung gegeneinander gleitend und ihre Schmalseiten gegensinnig zueinander angeordnet sind, dadurch gekennzeichnet, daß die Elemente (4, 6) Stäbe oder steife Kabel sind und mit einem oder mehreren Führungsmitteln (7) versehen sind, welche die Elemente und die daran montierten Keile derart als eine einzige Einheit zusammenhalten, daß die Elemente und die Keile in Längsrichtung relativ zueinander verschiebbar sind, daß den Elementen Federmittel (5) zugeordnet sind, welche die Schmalseiten der Keile so in gegensinnigen Richtungen drücken, daß die effektive Dicke der verbundenen Keile aufgeweitet und diese an den Risswänden in ihrer Lage gehalten werden, und daß an einem der Elemente ein Standgriff (8) montiert ist, mit dem auf die Federmittel eine Kraft ausübbar ist, um eine Reduzierung der Gesamtbreite der Keile zu erreichen, wenn die Vorrichtung in den Riss eingesetzt wird.

2. Klemmvorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß der Verklemmkeil in einer Nut im Belastungskeil gleitet und daß der Belastungskeil mit lasttragenden Stäben oder steifen Kabeln versehen ist, welche in den Seiten der Nut angeordnet sind.

3. Klemmvorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die gemeinsame Kontaktfläche der Keile die Form eines Teils der kreisförmigen Zylinderfläche besitzt.

4. Klemmvorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die gemeinsame

Kontaktfläche der Keile zwei einen kleinen Winkel zwischen sich bildenden Ebenen aufweist.

5. Klemmvorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Seiten der Keile, die gegen die Risswände orientiert sind, konvex geformt sind.

6. Klemmvorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß Mittel (9) vorgesehen sind, welche ein Abgleiten des Verklemmteils vom Belastungskeil verhindern, so daß die Keile aufhören zusammenzuwirken.

Revendications

1. Dispositif d'ancrage pour l'escalade pour un ancrage démontable en fissures aux murs essentiellement parallèles, ledit dispositif comprenant un coin de charge (1) et un élément porteur (4) attaché au bout étroit du dit coin, l'autre bout de cet élément porteur étant pourvu d'un oe illet de fixation (3) pour y attacher une charge extérieure, un coin de blocage (2) et un second élément (6) attaché au bout large de ce coin, les coins étant disposés côte à côte de manière glissante sous peu de frottement l'un contre l'autre et ayant leurs bouts étroits orientés en directions opposées l'un à l'autre, le dispositif étant caractérise en ce que lesdits éléments (4, 6) sont des bâtons ou des câbles rigides, et en ce que lesdits éléments sont pourvus d'un ou plusieurs moyens de guidage (7) qui tiennent y attachés lesdits éléments et les coins, joints en une seule unité de sorte que lesdits éléments et les coins peuvent être déplacés au sens longitudinal l'un relatif à l'autre, les éléments ayant un moyen de ressort (5) correspondant poussant les bouts étroits des coins en directions opposées de sorte que l'épaisseur effective des coins liés est évasée et tenue en place contre les murs de la fissure, et une poignée est attachée à l'un des deux éléments pour exercer une force sur le moyen de ressort afin d'obtenir une réduction de l'épaisseur totale des coins quand le dispositif est placé dans la fissure.

2. Dispositif d'ancrage selon la revendication 1 caractérisé en ce que le coin de blocage glisse dans une rainure de coin de charge et en ce que le coin de charge est pourvu de deux bâtons porteur ou câbles rigides placés de chaque côté de la rainure.

3. Dispositif d'ancrage selon la revendication 1 caractérisé en ce que la surface de contact commune des coins a la forme d'une section d'une surface cylindrique circulaire.

4. Dispositif d'ancrage selon la revendication 1 caractérisé en ce que la surface de contact commune des coins comprend deux plaines formant un petit angle entre eux.

5. Dispositif d'ancrage selon la revendication 1 caractérisé en ce que les côtés des coins orientés vers les murs de la fissure sont convexes.

6. Dispositif d'ancrage selon la revendication 1 caractérisé en ce que ledit dispositif est pourvu de moyens (9) qui empêchent le coin de blocage de glisser du coin de charge de sorte que les coins finiraient de coopérer l'un avec l'autre.

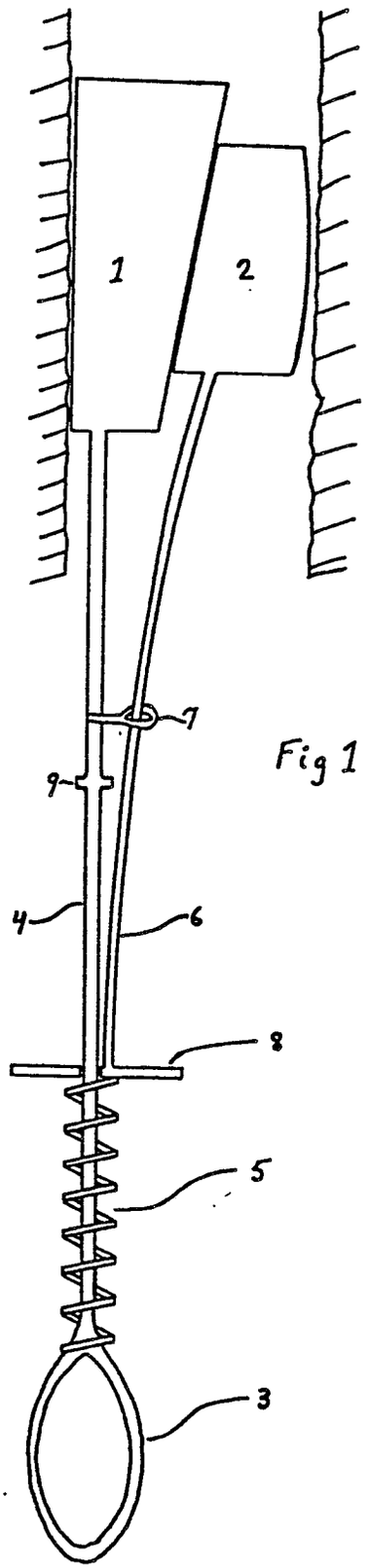

Fig 1

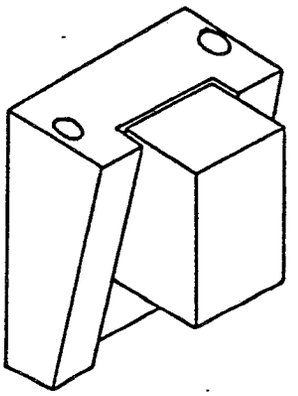

Fig 2

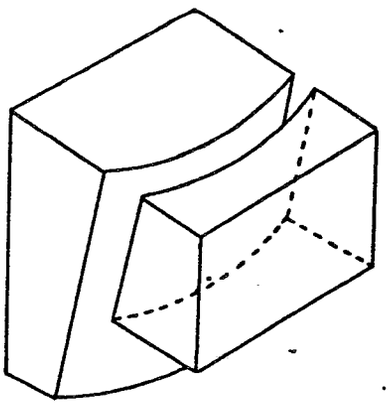

Fig 3

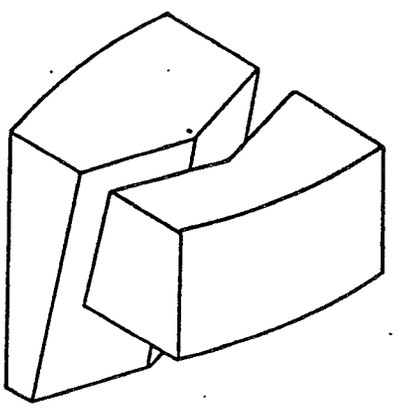

Fig 4

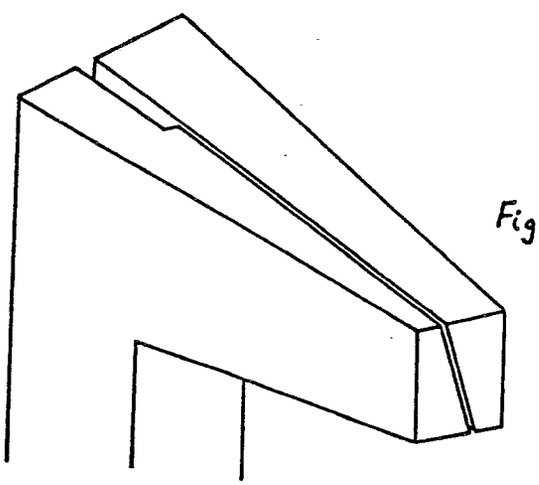

Fig 5