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(54) **A self-locking descender and a method for descending a load on a rope**

Abseilgerät mit Selbstverriegelung und Verfahren zum Abseilen einer Last an einem Seil

Descendeur autobloquant et procédé pour faire descendre une charge avec une corde

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(73) Proprietor: **Sordyl, Jacek**
44-300 Wodzislaw Slaski (PL)

(72) Inventors:
- **Sordyl, Jacek**
  44-300, Wodzislaw Slaski (PL)
- **Polanek, Marek**
  44-230, Czerwionka-Leszczyny (PL)

(74) Representative: **Pawlowski, Adam**
Eupatent.PL
Al. Kosciuszki 23/25
90-418 Lodz (PL)

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Description

[0001] The invention relates to a self-locking descender for controlling the movement of a load on a rope and a method for descending a load on a rope.

[0002] Descender devices for controlling movement of a load on a rope are widely used for mountaineering, alpinism, life-saving and other applications. Various attempts have been made to improve the descenders in order to obtain a device which is simple, yet safe to use. The commonly used descenders have a self-locking mechanism which can be released by a lever, which is to be operated by one hand of the user which has to grip the descender, while the other hand of the user guides the free end of the rope.

[0003] For example, a US patent US5850893 describes a self-locking descender for a rope having a head clamping the rope to a resistive element, which can be released via a lever operable directly by the user's hand which does not guide the free end of the rope.

[0004] In turn, a European patent application EP2018894 describes a self-locking descender for a rope, also comprising a head clamping the rope to a resistive element, which can be released via a lever operable by user's hand, wherein the user may further move the lever to a position which additionally blocks the passage of the rope.

[0005] A German patent application DE2602092A1 describes a self-locking descender for controlling the movement of a load on a rope, comprising rope guiding means comprising a rotatable head with a clamping element for clamping the rope to a resistive element and a pulley, around which the rope is to be guided. The pulley is movable between a first position and a second position and coupled with the rotatable head by a coupling mechanism, such that when the descender is loaded, when the pulley is in the first position, the clamping element of the rotatable head clamps the rope towards the resistive element so that the rope movement is blocked, and when the pulley is in the second position, the clamping element of the rotatable head is distanced from the resistive element so that the rope movement is enabled. The pulley is movable from the first position to the second position by pulling the free end of the rope. When the free end of the rope is not pulled, the pulley is automatically movable from the second position to the first position due to the action of a spring.

[0006] The aim of the present invention is to provide a self-locking descender which is simpler and safer to use, as well as a simpler and safer method for descending a load on a rope.

[0007] The object of the invention is a self-locking descender for controlling the movement of a load on a rope, comprising rope guiding means comprising a rotatable head with a clamping element for clamping the rope to a resistive element, wherein the rope guiding means further comprise a pulley, around which the rope is to be guided, the pulley movable between a first position and a second position, wherein the pulley is coupled with the rotatable head by a coupling mechanism, such that when the descender is loaded, when the pulley is in the first position, the clamping element of the rotatable head clamps the rope towards the resistive element so that the rope movement is blocked, and when the pulley is in the second position, the clamping element of the rotatable head is distanced from the resistive element so that the rope movement is enabled, wherein the pulley is movable from the first position to the second position by pulling the free end of the rope. The coupling mechanism comprises a pivotable arm coupled with the pulley at its movable end and having a first element of a transmission fixed at its pivot point, the first element of the transmission being coupled with a second element of the transmission fixed to a rotatable shaft on which the rotatable head is mounted and when the free end of the rope is not pulled, the pulley is automatically movable from the second position to the first position by the pivotable arm due to the friction force between the rotatable head and the rope.

[0008] Preferably, the coupling mechanism further comprises a stabilizing mechanism for stabilizing the coupling mechanism when the pulley is in the second position.

[0009] Preferably, the pivotable arm is coupled with the pulley via a pivotable portion of the pivotable arm, the pivotable portion being coupled with a first pivotable hook of the stabilizing mechanism, the first pivotable hook being engagable with a second pivotable hook fixed apart from the pivotable arm.

[0010] Preferably, the first pivotable hook and the second pivotable hook have sliding surfaces which are configured to engage when the pulley moves from the first position to the second position and to disengage when the pulley moves from the second position to the first position.

[0011] Preferably, the self-locking descender comprises an internal plate, wherein the rope guiding means are located on one side of the internal plate and the coupling mechanism is located on the opposite side of the internal plate. Preferably, the pulley is movable along an opening in the internal plate. Preferably, the internal plate comprises a load attachment opening.

[0012] Preferably, the self-locking descender further comprises a base plate, on which the coupling mechanism is mounted, wherein the base plate is fixed to the internal plate.

[0013] Preferably, the self-locking descender further comprises a cover plate pivotally mounted on the internal plate, for covering the rope guiding means. Preferably, the cover plate comprises a load attachment opening limited by a pivotable flap.

[0014] A further object of the invention is a method for descending a load on a rope, comprising the steps of providing the self-locking descender according to the invention, mounting the descender on a rope, attaching a load to the descender, pulling the free end of the rope in order to enable movement of the loaded descender on

the rope.

[0015] The self-locking descender according to the invention is simpler to use than the prior art descenders, as it requires only one hand of the user to guide the rope and control the movement of the rope. Therefore, it is also safer to use, as the user has one hand free to perform additional actions during descending on the rope. Furthermore, the rope is guided via the descender in a straight fashion, i.e. it does not rotate along its longitudinal axis, therefore the rope does not twist during operation. Accordingly, the method for descending a load using a descender according to the invention is also simpler and safer than the prior art methods.

[0016] The invention will be described by way of example and with reference to the accompanying drawings in which:

Fig. 1 shows a perspective view of a top portion of the descender, showing rope guiding means;
Fig. 2 shows a perspective view of a bottom portion of the descender, showing coupling mechanism;
Fig. 3 and Fig. 4 show a plan view of a top and bottom portion of the descender in a movement-enabled configuration;
Fig. 5 and Fig. 6 show a plan view of a top and bottom portion of the descender in a movement-blocked configuration.

[0017] The embodiments presented in the drawings are intended only for illustrative purpose and do not limit the scope of the invention, as defined by the accompanying claims.

[0018] The self-locking descender according to the invention comprises rope guiding means 200 for guiding and controlling the movement of a rope 100 when the descender is in use. The rope guiding means 200 comprise a rotatable head 201 with a clamping element 202 for clamping the rope to a resistive element 203. The rope guiding means 200 further comprise a pulley 204, around which the rope is to be guided. The pulley 204 is movable between a first position and a second position. The pulley 204 is coupled with the rotatable head 201 by a coupling mechanism 300. When the descender is loaded, the friction between the rope 100 and the rotatable head 201 forces rotation of the head in a direction such that the clamping element 202 clamps the rope 100 towards the resistive element 203 and therefore the movement along the rope is blocked. This is a movement-blocked configuration shown in Figs. 5 and 6. In this configuration the pulley 204 is in a first position and the clamping element 202 of the rotatable head 201 clamps the rope 100 towards the resistive element 203 so that the rope movement is blocked. In turn, when the descender is loaded and when the pulley 204 is in the second position, as shown in Figs. 3 and 4, the clamping element 202 of the rotatable head 201 is distanced from the resistive element 203 so that the rope 100 movement is enabled and the descender is in movement-enabled configuration.

[0019] In use, the rope 100 is installed by placing the rope within the rope guiding means 200. The load, such as the body of the user or a separate load, is attached to a load-attachment opening 412 directly or via attachment means such as a karabiner. One end of the rope constitutes is loaded end 101, i.e. the end which is tensed between a rope fixing point and the loaded descender, while the other end of the rope is the free end 102, i.e. the end towards which the load descends.

[0020] When the descender is loaded, the pulley 204 is movable from the first position to the second position by pulling the free end 102 of the rope 100. In turn, when the free end 102 of the rope 100 is not pulled, the pulley 204 is automatically movable from the second position to the first position due to the friction force between the rotatable head 201 and the rope 100.

[0021] Such configuration allows controlling the movement of the load on the rope by pulling the free end of the rope. Therefore, the user may use only one hand for both guiding the free end of the rope and controlling the rate of descending, while the other hand is free to perform additional actions.

[0022] The coupling mechanism 300 comprises a pivotable arm 301 coupled with the pulley 204 at its movable end and having a first element 321 of a transmission 320 fixed at its pivot point. The first element 321 of the transmission 320 is coupled with a second element 322 of the transmission 320 fixed to a rotatable shaft 323 on which the rotatable head 201 is mounted. The rotatable shaft 323 may be rotatable in a ball bearing 324 with rings 325, 326. The transmission 320 may be a toothed gear transmission. The coupling mechanism 300 further comprises a stabilizing mechanism 310 for stabilizing the coupling mechanism 300 when the pulley 204 is in the second position.

[0023] Therefore, when the user pulls the free end 102 of the rope 100, causing the pulley 204 to move from the first position shown in Fig. 6 to a second position shown in Fig. 4, the transmission 320 causes rotation of the rotatable head 201 such that the clamping element 202 is distanced from the resistive element 203 and thus the descender is in movement-enabled configuration.

[0024] In the movement-enabled configuration, the stabilizing mechanism 310 stabilizes the coupling mechanism so that slight variations in the pulling force do not affect the movement of the rope 100. The user, by slightly releasing the tightened rope, may effect movement of the rope in order to descend along the rope. The stabilizing mechanism 310 may be formed by two pivotable hooks 311, 312. The pivotable arm 301 may by coupled with the pulley 204 via a pivotable portion 302 of the pivotable arm 301, the pivotable portion 302 being coupled with a first pivotable hook 311 of the stabilizing mechanism 310. The first pivotable hook 311 may be engagable with a second pivotable hook 312 fixed apart from the pivotable arm 301. The first pivotable hook 311 and the second pivotable hook 312 may have sliding surfaces

313, 314 configured to engage when the pulley 204 moves from the first position to the second position and to disengage when the pulley 204 moves from the second position to the first position.

[0025] The sliding surfaces 313, 314 remain engaged when the hook 311 is pressed by the pivotable portion 302 of the arm 301, which is effected by acting via the rope on the movable pulley 204 attached on one end of the pivotable portion 302. When the pulling force acting on the pulley 204 is released, and therefore the pressing of the pivotable portion 302 of the arm 301 on the hook 311, after the rope is released from user's hand, the sliding surfaces 313, 314 of the hooks, having appropriate slope, disengage.

[0026] When the user stops pulling the free end 102 of the rope 100, the friction force between the rotatable head 201 and the rope 100 causes the rotation of the clamping element 202 of the rotatable head 201 towards the resistive element 203. Due to lack of pulling force at the free end 102 of the rope 100 and thus due to no additional force (additional to the weight of the free part of the rope) acting on the pulley 204, the pivotable portion 302 of the pivotable arm 301 is free to move and the pivotable hooks 311, 312 of the stabilizing mechanism 310 disengage. At the same time, the coupling mechanism 300, via the transmission 320 and the pivotable arm 301, causes the pulley 204 to move from the second position shown in Fig. 4 to the first position shown in Fig. 6. The friction force between the rotatable head 201 and the rope 100 causes the clamping element 202 to clamp the rope 100 towards the resistive element 203, thereby blocking the movement of the rope and setting the descender in a movement-blocked configuration.

[0027] The descender preferably comprises an internal plate 410, wherein the rope guiding means 200 are located on one side of the internal plate 410 and the coupling mechanism 300 is located on the opposite side of the internal plate 410.

[0028] The internal plate may have an opening 411 along which the pulley 204 may be movable, thus further stabilizing the movement path of the pivotable arm 301.

[0029] The descender may comprise a base plate 420 fixed to the internal plate 410 and the coupling mechanism 300 can be mounted on the base plate 420.

[0030] The descender may further comprise a cover plate 430 pivotally mounted on the internal plate 410, for covering the rope guiding means 200, so as to prevent the rope guiding means 200 from clogging or from accidental falling out of the rope. The cover plate 430 may comprise a load attachment opening 431 limited by a pivotable flap 432. This allows the user to pivot the cover plate 430 even when a karabiner is attached to the descender, by moving aside the pivotable flap 432. The pivotable flap 432 may comprise a spring which causes automatic return of the pivotable flap 432 to the closed position.

[0031] The rotatable head 201, the resistive element 203 and/or the pulley 204 may comprise circumferential concave edges, so as to increase the area of contact with the rope 100.

[0032] The rotatable head 201 may comprise a spring for keeping the head 201 in a movement-enabled position when the descender is not in use, thereby making it easier for the user to install the rope before using the descender.

[0033] The descender may be produced in a variety of sizes, adapted to specific diameters of ropes. One type of descender may be designed to be suitable for a particular rope diameter or a range of rope diameters, depending on the dimension of the rope guiding means, especially their circumferential concave edges and the distance between the clamping element 202 and the resistive element 203.

[0034] The elements of the rope guiding means 200, such as the rotatable head 201, the resistive element 203 and the pulley 204 may be made of aluminum alloy or stainless steel. The elements of the coupling mechanism 300 may be made of tool steel, such as NC11, WCL, WNL steel. The internal plate 410, the base plate 420 and the covering plate 430 may be made of aluminum alloys.

[0035] In order to descend a load on a rope using the method according to the invention, the self-locking descender according to the invention is used. The descender is mounted on the rope 100 by guiding the rope 100 via the rope guiding means 200 and a load is attached to the descender, for example via a karabiner to the load attachment opening 412. The load may be the body of the user or any other load. The user then pulls the free end 102 of the rope 100 in order to move the pulley 204 to the second position and thus set the descender in a movement-enabled configuration, thereby enabling movement of the loaded descender on the rope 100. When the user releases the free end 102 of the rope 100 from the hand, intentionally or unintentionally, for example due to an accident, the descender automatically blocks the rope by rotation of the head 201 and clamping the rope 100 towards the resistive element 203 by the clamping element 202 of the head 201.

[0036] The self-locking descender according to the invention is particularly usable for controlling the movement of a load on a rope, in particular a synthetic climbing rope. It may be used in various mountaineering, alpinism, life-saving, special forces and other applications.

Claims

1. A self-locking descender for controlling the movement of a load on a rope, comprising rope guiding means (200) comprising a rotatable head (201) with a clamping element (202) for camping the rope (100) to a resistive element (203),
and a pulley (204), around which the rope (100) is to be guided, the pulley (204) movable between a first position and a second position,
wherein the pulley (204) is coupled with the rotatable

head (201) by a coupling mechanism (300), such that when the descender is loaded,
when the pulley (204) is in the first position, the clamping element (202) of the rotatable head (201) clamps the rope (100) towards the resistive element (203) so that the rope movement is blocked,
and when the pulley (204) is in the second position, the clamping element (202) of the rotatable head (201) is distanced from the resistive element (203) so that the rope (100) movement is enabled,wherein the pulley (204) is movable from the first position to the second position by pulling the free end (102) of the rope (100),
characterized in that
the coupling mechanism (300) comprises a pivotable arm (301) coupled with the pulley (204) at its movable end and having a first element (321) of a transmission (320) fixed at its pivot point, the first element (321) of the transmission (320) being coupled with a second element (322) of the transmission (320) fixed to a rotatable shaft (323) on which the rotatable head (201) is mounted,
such that when the free end (102) of the rope (100) is not pulled, the pulley (204) is automatically movable by the pivotable arm (301) from the second position to the first position due to the friction force between the rotatable head (201) and the rope (100).

2. The self-locking descender according to claim 1, **characterized in that** the coupling mechanism (300) comprises a stabilizing mechanism (310) for stabilizing the coupling mechanism (300) when the pulley (204) is in the second position.

3. The self-locking descender according to claim 2, **characterized in that** the pivotable arm (301) is coupled with the pulley (204) via a pivotable portion (302) of the pivotable arm (301), the pivotable portion (302) being coupled with a first pivotable hook (311) of the stabilizing mechanism (310), the first pivotable hook (311) being engagable with a second pivotable hook (312) fixed apart from the pivotable arm (301).

4. The self-locking descender according to claim 3, **characterized in that** the first pivotable hook (311) and the second pivotable hook (312) have sliding surfaces (313), (314) which are configured to engage when the pulley (204) moves from the first position to the second position and to disengage when the pulley (204) moves from the second position to the first position.

5. The self-locking descender according to any of the preceding claims, **characterized in that** it comprises an internal plate (410), wherein the rope guiding means (200) are located on one side of the internal plate (410) and the coupling mechanism (300) is located on the opposite side of the internal plate (410).

6. The self-locking descender according to claim 5, **characterized in that** the pulley (204) is movable along an opening (411) in the internal plate (410).

7. The self-locking descender according to claims 5 or 6, **characterized in that** the internal plate (410) comprises a load attachment opening (412).

8. The self-locking descender according to any of claims 5-7, **characterized in that** it comprises a base plate (420), on which the coupling mechanism (300) is mounted, wherein the base plate (420) is fixed to the internal plate (410).

9. The self-locking descender according to any of claims 5-8, **characterized in that** it comprises a cover plate (430) pivotally mounted on the internal plate (410), for covering the rope guiding means (200).

10. The self-locking descender according to any of claims 5-9, **characterized in that** the cover plate (430) comprises a load attachment opening (431) limited by a pivotable flap (432).

11. A method for descending a load on a rope, comprising the steps of:

providing the self-locking descender according to any of claims 1-10;
mounting the descender on a rope;
attaching a load to the descender;
pulling the free end of the rope in order to enable movement of the loaded descender on the rope.

Patentansprüche

1. Selbstverriegelnde Abseilvorrichtung zum Steuern der Bewegung einer Last an einem Seil, umfassend Seilführmittel (200), welche einen drehbaren Kopf (201) mit einem Klemmelement (202) zum Klemmen des Seils (100) an ein Widerstandselement (203) umfassen,
und eine Rolle (204), um welche das Seil (100) geführt wird, wobei die Rolle (204) bewegbar zwischen einer ersten Position und einer zweiten Position ist, wobei die Rolle (204) mit dem drehbaren Kopf (201) durch einen Koppelmechanismus (300) derart gekoppelt ist, dass wenn die Abseilvorrichtung beladen ist,
wenn die Rolle (204) sich in der ersten Position befindet, das Klemmelement (202) des drehbaren Kopfs (201) das Seil (100) in Richtung des Widerstandselements (203) klemmt, so dass die Seilbewegung blockiert wird,
und wenn die Rolle (204) sich in der zweiten Position befindet, das Klemmelement (202) des drehbaren Kopfs (201) von dem Widerstandselement (203) be-

abstandet ist, so dass die Bewegung des Seils (100) ermöglicht wird, wobei die Rolle (204) von der ersten Position zu der zweiten Position durch Ziehen des freien Endes (102) des Seils (100) bewegbar ist,
dadurch gekennzeichnet, dass
der Koppelmechanismus (300) einen schwenkbaren Arm (301) umfasst, welcher mit der Rolle (204) an seinem bewegbaren Ende gekoppelt ist und ein erstes Element (321) eines Getriebes aufweist, welches an seinem Schwenkpunkt fixiert ist, wobei des erste Element (321) des Getriebes (320) mit einem zweiten Element (322) des Getriebes (320) gekoppelt ist, welches an einer drehbaren Welle (323) fixiert ist, an welcher der drehbare Kopf (201) befestigt ist, derart, dass wenn das freie Ende (102) des Seils (100) nicht gezogen wird, die Rolle (204) automatisch von dem schwenkbaren Arm (301) von der zweiten Position zu der ersten Position aufgrund der Reibungskraft zwischen dem drehbaren Kopf (201) und dem Seil (100) bewegbar ist.

2. Selbstverriegelnde Abseilvorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** der Koppelmechanismus (300) einen stabilisierenden Mechanismus (310) zum Stabilisieren des Koppelmechanismus (300) umfasst, wenn sich die Rolle (204) in der zweiten Position befindet.

3. Selbstverriegelnde Abseilvorrichtung nach Anspruch 2, **dadurch gekennzeichnet, dass** der schwenkbare Arm (301) mit der Rolle (204) über einen schwenkbaren Abschnitt (302) des schwenkbaren Arms (301) gekoppelt ist, wobei der schwenkbare Abschnitt (302) mit einem ersten schwenkbaren Haken (311) des stabilisierenden Mechanismus (310) gekoppelt ist, wobei der erste schwenkbare Haken (311) mit einem zweiten schwenkbaren Haken (312) in Eingriff bringbar ist, welcher von dem schwenkbaren Arm (301) getrennt fixiert ist.

4. Selbstverriegelnde Abseilvorrichtung nach Anspruch 3, **dadurch gekennzeichnet, dass** der erste schwenkbare Haken (311) und der zweite schwenkbare Haken (312) Gleitflächen (313), (314) aufweisen, welche dazu eingerichtet sind, miteinander einzugreifen, wenn die Rolle (204) sich von der ersten Position in die zweite Position bewegt, und sich voneinander zu lösen, wenn die Rolle (204) sich von der zweiten Position in die erste Position bewegt.

5. Selbstverriegelnde Abseilvorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** sie eine interne Platte (410) umfasst, wobei die Seilführmittel (200) an einer Seite der internen Platte (410) angeordnet sind, und der Koppelmechanismus (300) an der entgegengesetzten Seite der internen Platte (410) angeordnet ist.

6. Selbstverriegelnde Abseilvorrichtung nach Anspruch 5, **dadurch gekennzeichnet, dass** die Rolle (204) entlang einer Öffnung (411) der internen Platte (410) bewegbar ist.

7. Selbstverriegelnde Abseilvorrichtung nach Anspruch 5 oder 6, **dadurch gekennzeichnet, dass** die interne Platte (410) eine Lastanbringungs-Öffnung (412) umfasst.

8. Selbstverriegelnde Abseilvorrichtung nach einem der Ansprüche 5 - 7, **dadurch gekennzeichnet, dass** sie eine Grundplatte (420) umfasst, an welcher der Koppelmechanismus (330) angebracht ist, wobei die Grundplatte (420) an der internen Platte (410) fixiert ist.

9. Selbstverriegelnde Abseilvorrichtung nach einem der Ansprüche 5 - 8, **dadurch gekennzeichnet, dass** sie eine Abdeckplatte (430) umfasst, welche schwenkbar zum Abdecken der Seilführmittel (200) an der internen Platte (410) angebracht ist.

10. Selbstverriegelnde Abseilvorrichtung nach einem der Ansprüche 5 - 9, **dadurch gekennzeichnet, dass** die Abdeckplatte (430) eine Lastanbringungs-Öffnung (431) umfasst, welche von einer schwenkbaren Klappe (432) begrenzt wird.

11. Verfahren zum Abseilen einer Last an einem Seil, umfassend die Schritte:

Bereitstellen der selbstverriegelnden Abseilvorrichtung nach einem der Ansprüche 1 - 10;
Anbringen der Abseilvorrichtung an einem Seil;
Befestigen einer Last an der Abseilvorrichtung;
Ziehen des freien Endes des Seils, um eine Bewegung der beladenen Abseilvorrichtung an dem Seil zu erreichen.

Revendications

1. Descendeur autobloquant pour commander le mouvement d'une charge sur une corde comprenant des moyens de guidage de corde (200) comprenant une tête rotative (201) avec un élément de serrage (202) pour le serrage de la corde (100) sur un élément résistant (203), et une poulie (204) autour de laquelle la corde (100) doit être guidée, la poulie (204) étant mobile entre une première position et une seconde position,
dans lequel la poulie (204) est couplée à la tête rotative (201) par un mécanisme de couplage (300) de sorte que lorsque le descendeur est chargé,
lorsque la poulie (204) est dans la première position, l'élément de serrage (202) de la tête rotative (201) serre la corde (100) vers l'élément résistant (203) de

sorte que le mouvement de corde soit bloqué,
et lorsque la poulie (204) est dans la seconde position, l'élément de serrage (202) de la tête rotative (201) est espacé de l'élément résistant (203) de sorte que le mouvement de la corde (100) soit permis, dans lequel la poulie (204) est mobile de la première à la seconde position en tirant l'extrémité libre (102) de la corde (100), **caractérisé en ce que**
le mécanisme de couplage (300) comprend un bras pivotant (301) couplé à la poulie (204) sur son extrémité mobile et présentant un premier élément (321) d'une transmission (320) fixée sur son point de pivotement, le premier élément (321) de la transmission (320) étant couplé à un second élément (322) de la transmission (320) fixée à un arbre rotatif (323), sur lequel la tête rotative (201) est montée
de sorte que lorsque l'extrémité libre (102) de la corde (100) n'est pas tirée, la poulie (204) soit automatiquement mobile par le bras pivotant (301) de la seconde à la première position en raison de la force de friction entre la tête rotative (201) et la corde (100).

2. Descendeur autobloquant selon la revendication 1, **caractérisé en ce que** le mécanisme de couplage (300) comprend un mécanisme de stabilisation (310) pour stabiliser le mécanisme de couplage (300) lorsque la poulie (204) est dans la seconde position.

3. Descendeur autobloquant selon la revendication 2, **caractérisé en ce que** le bras pivotant (301) est couplé avec la poulie (204) via une partie pivotante (302) du bras pivotant (301), la partie pivotante (302) étant couplée à un premier crochet pivotant (311) du mécanisme de stabilisation (310), le premier crochet pivotant (311) pouvant être engagé avec un second crochet pivotant (312) fixé loin du bras pivotant (301).

4. Descendeur autobloquant selon la revendication 3, **caractérisé en ce que** le premier crochet pivotant (311) et le second crochet pivotant (312) présentent des surfaces coulissantes (313), (314) qui sont configurées pour s'engager lorsque la poulie (204) se déplace de la première à la seconde position et pour se désengager lorsque la poulie (204) se déplace de la seconde à la première position.

5. Descendeur autobloquant selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'**il comprend une plaque interne (410), dans lequel les moyens de guidage de corde (200) sont situés sur un côté de la plaque interne (410) et le mécanisme de couplage (300) est situé sur le côté opposé de la plaque interne (410).

6. Descendeur autobloquant selon la revendication 5, **caractérisé en ce que** la poulie (204) est mobile le long d'une ouverture (411) de la plaque interne (410).

7. Descendeur autobloquant selon la revendication 5 ou 6, **caractérisé en ce que** la plaque interne (410) comprend une ouverture d'attache de charge (412).

8. Descendeur autobloquant selon l'une quelconque des revendications 5 à 7, **caractérisé en ce qu'**il comprend une plaque de base (420), sur laquelle le mécanisme de couplage (300) est monté, dans lequel la plaque de base (420) est fixée sur la plaque interne (410).

9. Descendeur autobloquant selon l'une quelconque des revendications 5 à 8, **caractérisé en ce qu'**il comprend une plaque de recouvrement (430) montée de manière à pouvoir pivoter sur la plaque interne (410) pour le recouvrement des moyens de guidage de corde (200).

10. Descendeur autobloquant selon l'une quelconque des revendications 5 à 9, **caractérisé en ce que** la plaque de recouvrement (430) comprend une ouverture d'attache de charge (431) limitée par un volet pivotant (432).

11. Procédé pour faire descendre une charge sur une corde, comprenant les étapes suivantes .
fournir le descendeur autobloquant selon l'une quelconque des revendications 1 à 10 ;
monter le descendeur sur une corde ;
attacher une charge sur le descendeur ;
tirer l'extrémité libre de la corde dans le but de permettre le mouvement du descendeur chargé sur la corde.

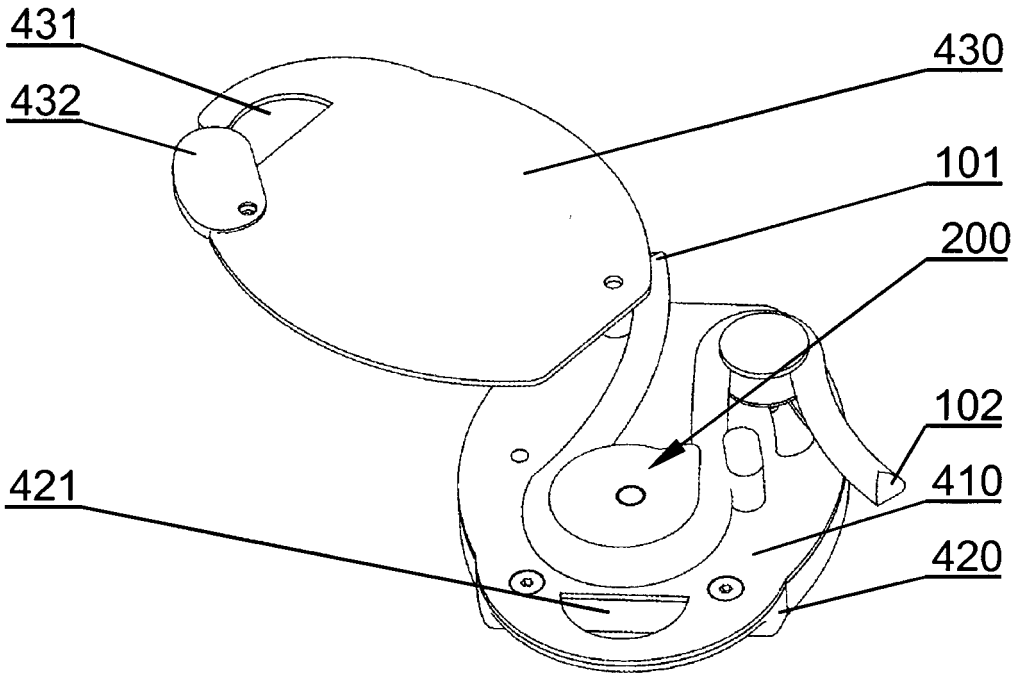


Fig. 1

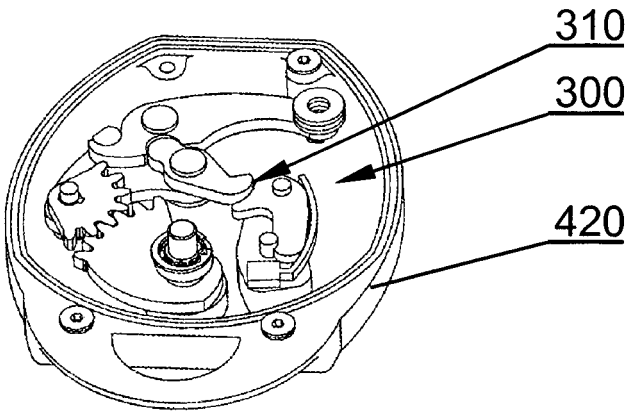


Fig. 2

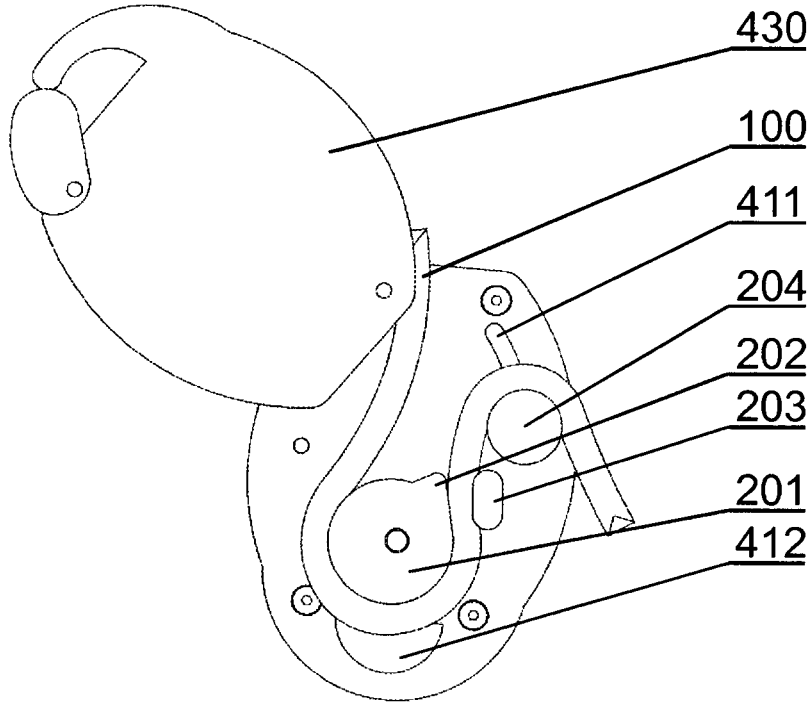

430
100
411
204
202
203
201
412

Fig. 3

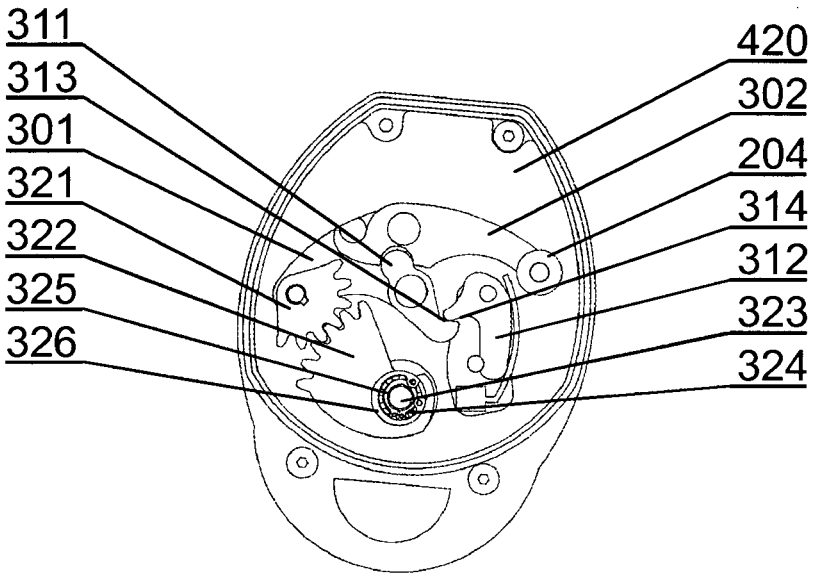

311
313
301
321
322
325
326
420
302
204
314
312
323
324

Fig. 4

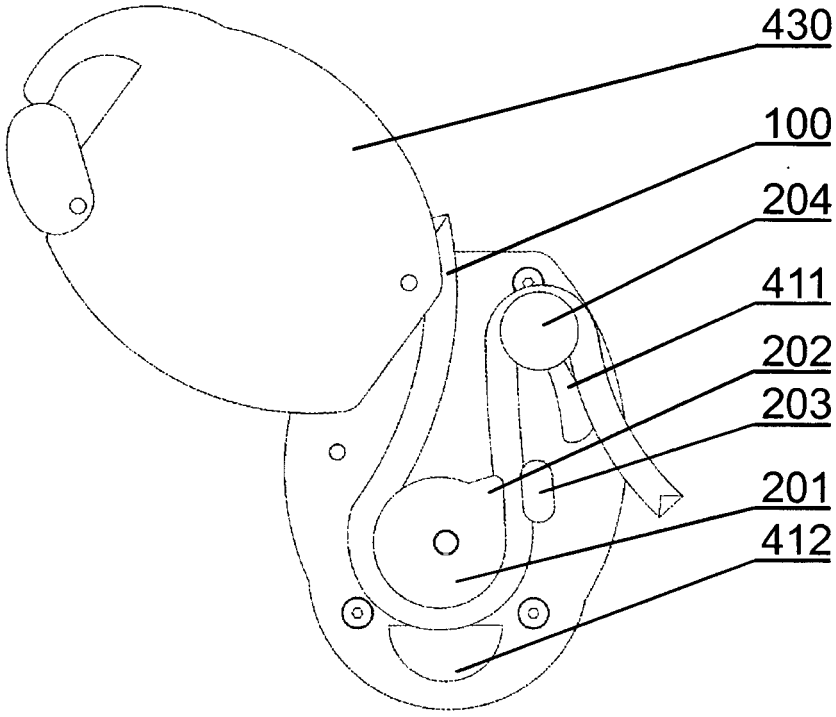

430
100
204
411
202
203
201
412

Fig. 5

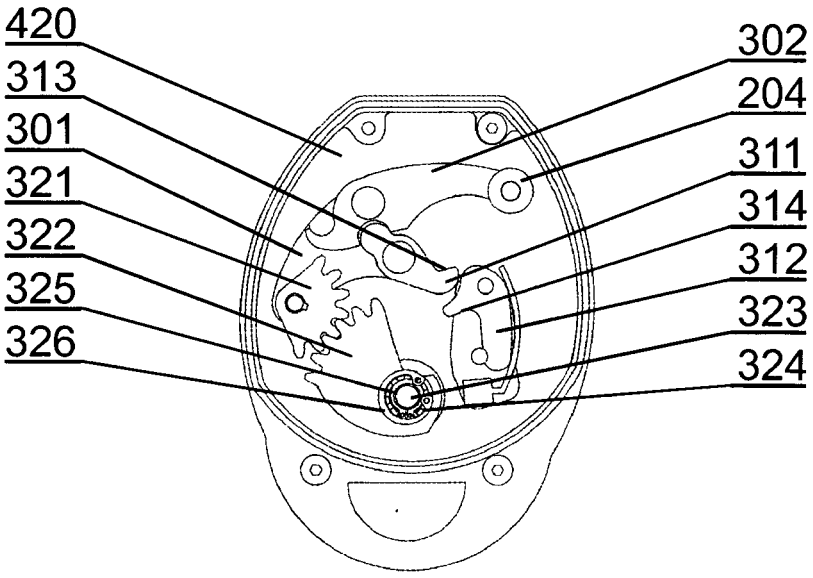

420
313
301
321
322
325
326
302
204
311
314
312
323
324

Fig. 6

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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