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(54) **FALL-PREVENTION DEVICE**

FALLSCHUTZVORRICHTUNG

DISPOSITIF ANTI-CHUTE

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Description

[0001] The present invention concerns an individual safety device against falls during working at height. More in detail, the present invention concerns a movable fall-prevention device for a securing support and, in particular, flexible and vertical securing supports, such as cables and ropes.

[0002] In the art it is known that the personnel having to intervene on high installations and, for this purpose, to climb or descend on pylons or posts, must be secured against dangerous falls. For example, it is the case of installers or system repairers such as, for example, cableway or chair lift systems and similar. It is therefore necessary to secure these operators so that they can climb and descend freely, with no fall risks. Devices constituted by a vertically arranged securing rope or cable are already known, named "lifeline", to which the user is connected so that to move upwardly and downwardly. For this purpose, he/she is provided with individual protecting equipment connecting him/her to the "lifeline" and comprising a harness fastened to a movable fall-prevention device.

[0003] However, known devices are not completely satisfactory about their use comfort and reliability. In particular, it is possible for the user to inadvertently release the movable fall-prevention device from the "lifeline" during its use.

[0004] Such possibility constitutes a high risk for the user's safety, in particular if the user is inexperienced. Fall-prevention devices are known in the art, to which the user can connect by a harness. Such fall-prevention devices comprise a restraining groove in which a securing support is held, such as a cable or rope. In case of fall, the device is prevented from sliding by a lever that, through a locking cam, engages the rope thus locking the sliding thereof inside the device.

[0005] In particular, the lever rotates between an open position, in which the cable can be inserted/removed in/to from the device, and a closed position in which the lever, and in particular the locking cam thereof, is engaged with the cable to prevent the sliding thereof as a consequence of the user's fall.

[0006] Known fall-prevention devices, such as that described in EP1359980, further comprise a stop limiting the rotation of the lever in an intermediate position, when moving from the closed position to the open position, thus guaranteeing the device movement along the securing support and, at the same time, preventing the securing support from coming out from the device. However, also if this kind of fall-prevention devices has a stop for the lever contact and allows the stopping thereof in the intermediate position, the user might inadvertently release the fall-prevention device from the securing support constituting the "lifeline".

[0007] Indeed, in the intermediate position of the lever, i.e. when the lever is contacting the stop in its intermediate position, there is the condition of possible removal of the fall-prevention device by forcing the stop rotation.

[0008] This is possible because, by acting on the stop, the user can transmit rotation on the lever in contact with the stop itself. In fact, the contact between the stop and the lever happens at a lever surface tilted with respect to the stop and therefore not preventing effectively the stop rotation.

[0009] In other words, in the intermediate position the stop is in contact with a lever surface not allowing to effectively prevent the stop movement and, therefore, the user can inadvertently move the stop from its operative position, in which the lever rotation is limited. The movement of the stop from its operative position allows the lever to move to its open position and then allows the fall-prevention device to be removed from the securing cable or rope.

[0010] Also the device described in US5265696 is provided with a stop and, in particular, with a locking lever (sleeve lock). However, also in this device, when the lever is in contact with the stop, the rotation of the stop is not prevented. In fact, also in the device according to US5265696, the lever does not allow to prevent effectively the stop from moving and, therefore, the user can inadvertently move the stop from its operative position in which it limits the lever rotation. Object of the present invention is to increase the safety level given by known fall-prevention devices. In particular, object of the present invention to provide a movable fall-prevention device which is particularly safe, reliable and simple to use and implement.

[0011] Moreover, object of the present invention is to provide a movable fall-prevention device able to be used very safely without possibility for the user, in case of distraction, to inadvertently handle the device so that the latter is unintentionally opened and therefore comes out from the lifeline (securing supporting).

[0012] These and other objects are achieved by a fall-prevention device according to claim 1. Further aspects and features of the device are set forth in the dependent claims.

[0013] The movable fall-prevention device for a securing support (such as cable or ropes) according to the invention comprises a main body having a passage for the insertion/removal of the securing support in/from a restraining groove, wherein the securing support is restrained through a lever rotating between an open position and a closed position. One of the lever ends comprises a locking cam and the other free end comprises a hole intended to receive a karabiner, or similar connecting elements. The device further comprises a stop movable between an operative position, in which it limits the rotation of the lever in an intermediate position, when the lever is moved from the closed position to the open position, and a release position in which it allows the rotation of the lever in the open position. In other words, according to an aspect of the invention, the limit can be retracted, i.e. moved from the operative position and therefore not interfere with the lever movement towards its own open

position.

[0014] According to an aspect of the invention, the lever comprises at least one abutment surface cooperating, in the intermediate position, with at least one corresponding engaging surface of the stop to lock the stop to its own operative position (that is to prevent its movement to the release position).

[0015] The abutment surface is tilted by an angle substantially comprised between 90° and 135° with respect to the movement path of the stop (and in particular of its engaging surface) from the operative position towards the release position. The angle is measured from the path to the lever anticlockwise.

[0016] It has to be noticed that the expression "tilted by an angle substantially comprised between 90° and 135°" is herein and in the following used to denote the abutment surface being substantially perpendicular to the stop path (and therefore directed substantially perpendicular to the path), otherwise it is tilted with respect to the perpendicular of an angle up to about 45°. In other words, the abutment surface is substantially perpendicular to the path or is tilted by an angle substantially up to 45° with respect to the path perpendicular.

[0017] What described above applies both to flat abutment surfaces and/or to flat engaging surfaces and also to curved surfaces. In this case, angular relations discussed above can be defined in relation to the path, by referring to a plane or line lying on the surface, or tangent to the surface.

[0018] Advantageously, the presence of an abutment surface having the afore said arrangement with respect to the limit movement and in the intermediate position being intended to cooperate, i.e. to intercept a corresponding engaging position of the stop, allows to effectively hamper the stop movement from its operative position to the release position, thus allowing the safety level given by the fall-prevention device to be considerably increased. In fact, contrary to what happens in devices known in the art in which the stop movement is not intercepted and thus not hampered (prevented) by the lever, in the device according to the present invention, in the intermediate position the at least one abutment surface interferes with the stop and hampers the movement thereof to the release position. In other words, the stop movement is hampered due to the presence of the abutment surface interfering with the stop (by intercepting the path of its movement towards the release position), which constitutes a surface blocking the stop movement to the release position. According to an aspect of the present invention, the stop is rotationally movable. In this case, it has to be noticed that the arrangement of the abutment surface of the lever with respect to the circular path, and therefore the angular values mentioned before, can be referred to the tangent to the stop movement path.

[0019] Advantageously, the rotation movement of the stop allows its simple activation between the operative position and the release position and the arrangement of the abutment surface substantially perpendicular to the tangent to the path in the intermediate position (or tilted by an angle up to about 45° with respect to the perpendicularity condition) allows to obtain an efficient and safe locking of the stop in its operative position.

[0020] In fact, in the intermediate position, the user cannot inadvertently move the stop from its operative position, just because of the obstacle the abutment surface of the lever provides.

[0021] According to an aspect of the present invention, the abutment surface is designed substantially complementary to the engaging surface of the stop. With the expression "substantially complementary" is meant that the abutment and engaging surfaces intended to cooperate one with another, have such shape to determine an effective reciprocal engagement and thus avoid undesired sliding effects one to another. According to an aspect of the present invention, the lever comprises at least one second abutment surface. In other words, the lever comprises at least two abutment surfaces, and in particular a first and a second abutment surfaces cooperating with at least two engaging surfaces of the stop.

[0022] Advantageously, the presence of two or more abutment surfaces allows to improve the effectiveness in locking the stop in the operative position and thus to prevent it from moving towards the release position.

[0023] According to different possible embodiments, a first abutment surface can be intended to limit the lever rotation in the intermediate position and a second abutment surface is intended to limit the stop rotation towards the release position. According to an aspect of the present invention, the at least two abutment surfaces are tilted one to another. More in detail, according to an aspect of the present invention, at least one first abutment surface is arranged in accordance with the afore discussed angular arrangement with respect to the path, and at least one second abutment surface is tilted with respect to the first abutment surface. Advantageously, the presence of two or more reciprocally tilted abutment surfaces, for example the presence of a first abutment surface and a second abutment surface tilted one to another, allows to effectively prevent the stop from moving from its operative position to the release position, thus allowing to considerably increase the safety level the fall-prevention device provides.

[0024] According to a possible embodiment, the lever comprises at least two abutment surfaces, for example a first abutment surface and a second abutment surface, which are perpendicular to one another, so that to take a substantially stepped shape.

[0025] Advantageously, the perpendicularity between the two abutment surfaces and in particular the substantially stepped shape, allows both to stop the lever rotation towards its open position (by an abutment surface) and to prevent effectively any movement of the stop when the lever is in the intermediate position (by another abutment surface).

[0026] According to an aspect of the present invention, the at least two abutment surfaces are substantially

wedge-shaped. For example, the two or more surfaces can be tilted by an inner acute angle, and thus to form a wedge intended to cooperate with two or more engaging surfaces of the stop, for example which are arranged to form a seat substantially complementary to the wedge. Obviously, other relative tilts of the first and second abutment surfaces are not excluded from being used, provided that at least one abutment surface is arranged with respect to the stop movement path discussed above.

[0027] Obviously, the shape of the two or more surfaces herein described referring to the lever can be applied to the two or more engaging surfaces of the stop, and vice versa. For example, the engaging surfaces of the stop can be wedge-shaped and the abutment surfaces of the lever can be seat-shaped to accommodate at least part of the wedge.

[0028] In general, it has to be noticed that the two or more abutment surfaces and/or the two or more engaging surfaces can be blent to one another, for example by a curvature radius or one or more straight line segments.

[0029] According to an aspect of the present invention, the stop comprises an activating arm to drive the movement of the stop from the operative position towards the release position. The activating arm is preferably activated manually by the user.

[0030] According to an aspect of the present invention, the activating arm is arranged outside of the device body when the stop is in the operative position thus allowing it to be manually driven, and the body of the device is shaped to house the activating arm for at least part of the movement between the operative position and the release position. By doing so, the activating arm can be activated by the user only for a portion of its movement from the operative position to the release position. It follows that the complete movement of the stop in its release position can be completed by the contact with another device element and preferably by the lever.

[0031] According to an aspect of the present invention, the profile of the activating arm is at the edge of the device body before the release position is reached.

[0032] In other words, after a portion of the movement driven by the user from the outside of the device body, the activating arm is still housed inside the device body.

[0033] According to an aspect of the present invention, at least part of the lever is contacting the stop, preferably a back surface of the stop, to guide at least part of the movement thereof towards the release position. By doing so, when the activating arm is housed inside the device and cannot be driven directly by the user, the rotation of the lever to its own open position allows the stop to contemporaneously move to the release position thanks to the contact of the lever (and preferably of the end of one of the lateral arm thereof) with the stop and, preferably, the back of the stop.

[0034] According to an aspect, the stop comprises a lower arm, said at least one engaging surface being arranged on said lower arm, preferably at an end thereof.

[0035] According to an aspect, the stop comprises a safety arm preventing the insertion/removal of the securing support in/from the passage when said stop is in the operative position and allowing the insertion/removal of the securing support in/from the passage when said stop is in said release position.

[0036] Another aspect of the present invention further relates to a use method of the fall-prevention device and, in particular, to a method for installing/removing the fall-prevention device to the securing support.

[0037] It has to be noticed that what herein described and/or claimed, with reference to the fall-prevention device, can be applied to the method according to the present invention.

[0038] The method according to the invention, and in particular the installing/removing steps on/from the securing supporting according to the invention, can be applied to a fall-prevention device comprising a main body having a passage for the insertion/removal of the securing support in/from a restraining groove, wherein the securing support is restrained through a lever rotating between an open position and a closed position. One of the lever ends comprises a locking cam and the other free end comprises a hole intended to receive a karabiner, or similar connecting elements. The device further comprises a stop movable between an operative position, in which it limits the rotation of the lever in an intermediate position, when the lever is moved from the closed position to the open position, and a release position in which it allows the rotation of the lever in the open position.

[0039] Therefore, the method provides the step of moving the stop from its operative position towards the release position in order to rotate the lever from the closed position to the open position, thus allowing the insertion/removal of the securing support in/from the groove of the device.

[0040] According to an aspect of the present invention, the user carries out the step of moving (preferably by rotating) the stop towards the release position only partially by directly activating the stop, and particularly an activating arm of the stop.

[0041] In fact, according to an aspect of the present invention, the step of moving the stop towards the release position provides for guiding the stop at least for part of the travel by the device lever.

[0042] According to an aspect of the present invention, the activating arm of the stop can be activated by the user only for a portion of its movement from the operative position to the release position. It follows that the complete movement of the stop in its release position can be completed by the contact with another device element and preferably by the lever.

[0043] In fact, after the user manually carried out a first step of moving directly the stop from the operative position towards the release position by acting directly on the activating arm of the stop arranged outside of the device body, a step follows wherein the movement of the stop towards the release position is guided by at least part of the lever rotated towards its own open position.

[0044] In detail, as discussed before, according to an aspect of the present invention, the lever is contacting the stop, preferably a back surface of the stop, and is rotated to the open position to guide at least part of the movement of the stop towards the release position.

[0045] According to an aspect, the step of moving the stop from its operative position towards the release position is carried out before rotating the lever from the closed position to the open position.

[0046] According to an aspect, in the step of moving the stop from its operative position towards the release position, said stop is clockwise rotated from the operative position towards said release position.

[0047] According to an aspect, in the step of rotating the lever from the closed position towards the open position, said lever is anticlockwise rotated from said closed position towards said open position.

[0048] According to an aspect, the user carries out the step of moving, preferably by rotating, the stop towards the release position only partially by directly activating the stop, preferably by acting on an activating arm of the stop.

[0049] According to an aspect, the step of moving the stop towards the release position provides for guiding the stop at least for part of the travel by the device lever.

[0050] According to an aspect, after the user manually carried out a first step of moving directly the stop from the operative position towards the release position, a step follows wherein the movement of the stop towards the release position is guided by at least part of the lever rotated towards its own open position. Advantageously, the method thus allows to increase the safety the device provides, by preventing the user from moving it to the release position only through the stop activation. In fact, as described before and better explained in the following, the method needs also the subsequent activation of the lever that guides the stop to the release position.

[0051] Other characteristics and advantages of the invention will emerge from the following description, in relation to the accompanying drawings provided for illustration purposes only and without limitation, in which:

- Figure 1 is an overall view depicting the use of the fall-prevention device according to the invention;
- Figures 2, 3 and 4 are some views of a possible embodiment of the fall-prevention device according to the invention, in which figure 2 is a plant view, figure 3 is a side view from the top of the lever, whereas figure 4 is a top view;
- Figure 5 is another plant view depicting the fall-prevention device in the open position of the lever and in the release position of the stop, in which the secondary plate has been omitted for a better visualization;
- Figures 6a-e depict the various steps of connecting the fall-prevention device according to the invention to the securing cable;
- Figure 7 shows the fall-prevention device before its connection to the cable in an intermediate position;
- Figure 7a is an enlarged view of the lever and stop in the intermediate position, in which the part of the spring has been omitted for ease of illustration;
- Figures 8a-e depict the various steps of removing the fall-prevention device according to the invention from the securing cable;
- Figure 9 shows the fall-prevention device connected to the cable in an intermediate position;
- Figure 10 shows another possible embodiment of the fall-prevention device according to the present invention;
- Figure 10a is an enlarged view of the lever and stop in the intermediate position, in which the part of the spring has been omitted for ease of illustration.

[0052] Referring to the attached figures 1 - 9, a possible embodiment of the fall-prevention device 1 according to the present invention will be described hereinafter. What described referring to these figures applies also to an embodiment depicted in figure 10, different from the embodiment of figures 1-9 only for the different shape of the abutment surfaces 80a, 80b of the lever 16 and for the respective engaging surfaces 53a, 53b of the stop.

[0053] For example, as visible in figure 1, the movable fall-prevention device 1 is generally part of individual equipment protecting against high falls and denoted with numeral reference 2 which comprises, in addition to said fall-prevention device 1, a harness 3 comprising at least one anchoring ring 4 with a hooking karabiner 5, or similar connecting elements. The fall-prevention device 1 is then intended to be removably connected to a vertical securing support 6 fastened, for example, to a service post 7. The movable fall-prevention device 1, hereinafter also referred only as fall-prevention device, in its use position, i.e. connected to the harness 3, can be voluntarily moved upwards HA or downwards BA by normally sliding (i.e. at the user's climb or descent speed) along a cable or rope 6 (preferably substantially vertical), which constitutes the securing support.

[0054] In case of fall, corresponding to an accelerated descent speed, the movable fall-prevention device blocks on the cable 6. It will be understood that the user 8 will be therefore able to climb or descend along a post 7 by leaving the fall-prevention device to slide upwards HA or downwards BA along the safety cable 6, while he/she will be assured against falls since the fall-prevention device 1 is blocked on the cable 6 constituting the securing support.

[0055] The fall-prevention device 1 comprises a main body 1a comprising a passage 40 for the insertion/removal of the securing support 6 in/from a groove or hollow profile 9, preferably straight having axis YY' and intended to receive the securing cable 6. In the following it will be referred particularly to a securing cable 6, however the possibility of using the fall-prevention device 1 on different securing support is not excluded.

[0056] As better detailed in the following, the securing

cable 6 is restrained in the groove 9 by a lever 16 provided with a locking cam 10 designed to engage the cable 6 and prevent the sliding thereof inside the groove, de facto determining the blocking of the fall-prevention device on the cable 6, in case of fall.

[0057] According to an aspect of the present invention, the body 1a of the device comprises a main plate 12a and a secondary plate 12b facing to one another. The two plates 12a, 12b can be constrained to one another as known, or be made in one piece. According to a possible embodiment, the hollow profile 9 is constituted by the wall 11a of the main plate 12a, whose first side edge 13a is bent parallel to said wall, so that to form a preferably semicircular groove 9, whereas the second side edge 14a is in the wall plane and curved. It has to be noticed that the groove preferably has semicircular profile with vertical axis (YY') and substantially has the size of the cable or rope 6 both intended to be housed in its inside.

[0058] The lever 16 comprising the locking cam 10 is constrained to the device 1 so that to be rotationally movable with respect to a transversal axis XX'. The lever 16 is preferably rotatable around a pivot constrained to the body 1a of the device.

[0059] It has to be noticed that the second side edge 14a of the main wall 12a can be shape to be a substantially circular lower ramp having radius R1 centered on the axis XX'.

[0060] As mentioned, the body of the movable fall-prevention device comprises, in addition to the main plate 12a described before and forming the groove 9, a secondary plate 12b. The latter is integral with the main body to be parallel thereto and is spaced out of a distance (d) in order to constitute a space (e) between the two plates intended to move the lever 16, in addition to the longitudinal passage 40 for the insertion/removal of the cable 6.

[0061] According to a possible embodiment, the secondary plate is configured substantially identical to the wall 11a of the main plate 12a. In this way, it is constituted by a wall 11b and comprises a first straight side wedge 13b, whereas the second side edge 14b is in the wall plane and curved to constitute a lower ramp.

[0062] The passage 40 is limited laterally by the first edge 13b of the main plate 12a and the first edge 13a of the secondary plate 12b. Obviously, the passage width is larger than the diameter of the cable or rope 6, both intended to be engaged therein. According to a possible embodiment, it has to be noticed that the passage 40 extends parallel to the axis YY' of the groove 9.

[0063] The above mentioned lever 16 is arranged so as to be rotationally movable around the transversal axis XX', preferably at a pivot allowing such rotation. It is arranged so that to move inside the body 1a between the two plates 12a, 12b in the space (e) formed between the main plate 12a and the secondary plate 12b.

[0064] The lever 16 is rotatably assembled around an axis or pivot 21 extending between the two plates so that its hooking end 16" protrudes outside of the ramps 14a, 14b of the two plates 12a, 12b.

[0065] In fact, the lever 16 substantially comprises the locking cam 10 substantially at one of the ends (locking end 16') and a hooking hole 23, substantially at the other free end (hooking end 16"), intended to receive a karabiner 5 or similar means connecting to the user and, in particular, to the user's harness.

[0066] The hooking hole 23 is cylindrical and its axis QQ' is arranged at a distance L1 from the axis XX' greater than the value of the radius R1 of the ramp summed to radius of the hole 23, so that its peripheral wall 24 is at a distance L2 from the axis XX' greater than the radius R1.

[0067] As mentioned, at the side opposite to the hooking hole 23, the lever 16 comprises a cam 10, for example comprising a locking ramp 25, to guarantee the locking of the fall-prevention device 1 on the securing device 6.

[0068] The lever 16 can then take, by rotation around the XX' axis, two limit positions: an open position as depicted in figures 5, 6d, 8d, and a closed position as depicted in figures 2, 6a, 8e.

[0069] In the closed position, the locking cam 10 is in contact with the securing cable 10 thus determining the locking thereof due to the friction generated thereon.

[0070] It should also be noted that in the closed position, part of the lever 16 extends at the passage 40 and prevents the securing cable 6 from being inserted/removed in/from the restraining groove 9 through the passage 40. On the contrary, in the open position the lever 16 does not extend at the passage 40, and then the securing cable 6 can be inserted/removed in/from the groove 9.

[0071] It has to be further noticed that the fall-prevention device 1 comprises two stops 28, 29 to limit the angular displacement of the lever 16, downwards by a lower stop 28, and upwards by an upper stop 29.

[0072] The lower stop 28 can be made through a cylindrical spacer extending between the two plates 12a, 12b in the lower area, whereas the upper stop 29 can be made through another upper cylindrical spacer connecting the upper portion of the two plates 12a, 12b.

[0073] According to an aspect of the present invention, the lever 16 is continuously biased towards its closed position by a spring, preferably a torsion spring 27 (visible in figures 3 and 4). The latter is useful, on the one hand, to keep the fall-prevention device 1 in position on the securing cable 6 when the karabiner 5 is positioned and removed and, on the other hand, it is useful to guarantee the locking of the device 1 in case of fall even before the karabiner 5 secures in turn the lever rotation downwards, i.e. towards its closed position.

[0074] According to an aspect of the present invention, the fall-prevention device 1 comprises a stop 50, preferably a rotationally movable stop, movable between an operative position, in which it limits the rotation of the lever 16 in an intermediate position, when the lever 16 is moved from the closed position to the open position, and a release position in which it allows the rotation of the lever 16 in the open position.

[0075] In other words, the device 1 comprises a movable and retractable stop 50 for the lever 16, which is intended to limit the rotation of the latter upwards in an intermediate position.

[0076] More in detail, in the intermediate position part of the lever 16, and in particular of its locking end 16', is placed at the passage 40 de facto preventing the securing support 6 from being removed from the fall-prevention device.

[0077] According to a possible embodiment, the stop 50 is constituted by a rotating by a rotating pawl 50.

[0078] It has to be noticed that the stop 50 is biased in its operative position by the spring 27. It has to be noticed that, although only one spring 27 acting on the limit 50 and the lever 16 is provided for biasing these components respectively in their operative position and closed position, distinct elastic elements can be used to bias the two components independently.

[0079] The stop 50 is intended both to limit the rotation of the lever 16 in an intermediate position and to prevent, due to its shape, the securing support 6 from disengaging inconveniently through the passage 40.

[0080] In fact, the stop 50 (or pawl) further comprises a safety arm 51 preventing the insertion/removal of the securing support 6 in/from the passage 40 when the stop 50 is in the operative position and allowing the insertion/removal of the securing support 6 in/from the passage 40 when the stop 50 is in the release position.

[0081] More in detail the pawl, thanks to its lateral safety arm 51, constitutes an obstacle locking the undesirable disengagement of the securing support 6 through the passage 40.

[0082] Advantageously, it follows that the operative position of the stop 50 corresponds to a closed position of the passage 40, whereas the release position of the stop allows the insertion/removal of the securing support 6 in/from the passage 40.

[0083] Advantageously, as mentioned, the pawl constituting a further safety system of the device, is biased in its operative and closed stop position by a spring 27, which can advantageously be the same spring biasing the lever 16 in the closed position. According to an aspect of the present invention, the stop 50 further comprises an activating arm 55. The arm 55 is designed so that to protrude outside of the body 1a of the device when the stop 50 is in the operative position.

[0084] Moreover, the stop 50 comprises an engaging portion 53 comprising at least one engaging surface 53a, 53b that, as better detailed in the following, is intended to engage the lever 16 and, in particular, an abutment portion 80 of the lever 16 in the intermediate position. The abutment portion 80 of the lever 16 comprises at least one abutment surface 80a intended to cooperate, in the intermediate position, with at least one corresponding engaging surface 53a of the stop 50 to lock the stop 50 in its operative position.

[0085] The engaging surface 53, and in particular the at least one engaging surface 53a, is preferably arranged on a lower arm 52 of the stop 50, preferably at one end of the lower arm.

[0086] According to a possible embodiment, the pawl (stop) is constituted by three arms, i.e. a lateral safety arm 51 intended to lock the undesirable disengagement of the securing support 6 through the passage 40, a lower arm 52 comprising the engaging portion 53 that engages the lever 16 and is intended to limit the lever rotation in an intermediate position (when the lever is rotated from the operative position towards the closed position), as well as an activating arm 55.

[0087] According to a possible embodiment, the pawl (stop) is assembled as rotationally movable around a transversal axis (pivot) 58 arranged between the main plate and the secondary plate in the upper part of the fall-prevention device, substantially in the extension of the first edge 13b of the secondary plate. By doing so, the lateral safety arm 51 goes beyond the edge 13b until it reaches the edge 13a, thereby blocking the passage 40 when the pawl is in the operative position and acting as stop for the lever 16. On the contrary, when the stop is rotated to the release position, the safety arm 51 clears the passage 40.

[0088] In other words, the stop 50 is movable and retractable between an operative position named "safety position", which blocks the passage 40 and limits the lever rotation in its intermediate position, and an idle release position. The user, by simply acting on the stop and in particular on the activating arm 55 to move it from its operative position to the release position and allow the lever 16 to pass from its intermediate position to its open position.

[0089] As afore said, the body of the device 1a is shaped to house the activating arm for at least part of the movement between the operative position and the release position. In fact, the activating arm can be activated by the user only for a portion of its movement from the operative position to the release position. It follows that the complete movement of the stop in its release position can be completed only by the contact with the lever 16 at its own back surface 52b.

[0090] In fact, the movement driven by the user on the outside of the device of the activating arm can be carried out only until the profile P of the arm 55 is at the side walls 15a, 15b of the device (see figures 6b, 6c and figures 8b, 8c). For the remaining part of the movement towards the release position, the activating arm 55 is housed inside the body 1a of the device.

[0091] The contact of the abutment portion 80 of the lever 16 with the back surface 52b of the stop will cause the displacement of the latter to the release position (see the movement from figure 6c to figure 6d and from figure 8c to figure 8d). It has to be further noticed that the stop can be advantageously provided with a roll 56, or similar element to aid the sliding, at its safety arm 51 to guarantee a better guide of the securing support 6 at the upper end of the groove 9.

[0092] Returning to the intermediate position of the le-

ver 16, the stop 50 limits the rotation of the lever 16 in such position by an abutment portion 80 of the lever cooperating with the engaging portion 53 of the stop 50 that, as mentioned, is preferably arranged at a lower arm 52 of the stop.

[0093] More in detail, according to an aspect of the present invention, the lever 16 comprises at least one abutment surface 80a for an engaging surface 53a of the stop 50. In particular, the abutment surface 80a limits the rotation of the stop 50 away from its own operative position towards the release position.

[0094] Advantageously, the presence of the abutment surface 80a allows to prevent the rotation movement of the stop towards the release portion when the intermediate position of the lever 16 has been reached.

[0095] In fact, if in the intermediate position (visible for example in figures 7, 7a, 9, 10 and 10a) the user acts on the activating arm 55 of the stop, the rotation is effectively countered by the presence of the abutment surface 80a.

[0096] According to an aspect of the present invention, for example visible in the figures, the lever 16 and in particular its abutment portion 80 comprises a first abutment surface 80a and a second abutment surface 80b.

[0097] As mentioned, the first abutment surface 80a is adapted to limit the rotation of the stop 50 away from its own operative position towards the release position. According to a possible embodiment, such as for example visible in figures 1 - 9, the first abutment surface 80a and a second abutment surface 80b are substantially perpendicular to one another.

[0098] In particular, the first abutment surface 80a is adapted to limit the rotation of the stop 50 towards the release position, whereas the second abutment surface 80b is adapted to limit the rotation of the lever 16 in the intermediate position when the latter is rotated from the open position to the closed position. By doing so, the abutment portion 80 of the lever 16 takes a substantially stepped form allowing to effectively avoid any movement of the stop 50 when the lever 16 is in the intermediate position in engagement with the engaging portion 53 of the stop 50.

[0099] According to a further possible embodiment visible in figure 10, the two abutment surfaces 80a, 80b substantially are wedge-shaped and are intended to cooperate with the engaging surfaces 53a, 53b of the stop 50.

[0100] In general, it has to be noticed that the at least two abutment surfaces 80a, 80b are tilted one to another.

[0101] It has to be further noticed that, according to a possible embodiment (such as for example in figures 1 - 9) in the intermediate position of the lever 16, the abutment surface 80a is arranged substantially perpendicular to the movement path T of the stop 50 from the operative position to the release position. In other words, according to this embodiment, the abutment surface 80a is tilted by an angle α substantially equal to 90° with respect to the movement path T of the stop 50.

[0102] Advantageously, the abutment surface 80a provides an effective obstacle for the undesirable movement of the stop 50, for example as a consequence of an unintentional activation of the activating arm 55 by the user.

[0103] It has to be noticed that the expression "substantially perpendicular to the path" herein means that the abutment surface 80a is arranged substantially perpendicular to the movement direction, and in particular substantially perpendicular to the tangent T' to the path, or perpendicular to the direction of the velocity vector, the engaging portion 53 of the stop and in particular the engaging portion 53a intended to cooperate with the abutment surface 80a.

[0104] Since the stop is preferably rotationally movable, in this case (such as for example visible in the figure), the movement path will be circular. The expression "substantially perpendicular to the circular path" means that the abutment surface 80a is substantially perpendicular to the tangent T' to the path, or to the direction of the velocity vector (tangential velocity) of the engaging surface 53a of the stop.

[0105] As previously mentioned, the abutment surface 80a can be arranged as tilted by an angle substantially comprised between 90° and 135° with respect to the movement path T of the stop (and in particular of its engaging surface) from the operative position towards the release position.

[0106] In other words, the abutment surface 80a can be arranged substantially perpendicular to the path T of the stop (and therefore substantially directed along the perpendicular to the path), as in the embodiment of figures 1-9, or it is tilted with respect to the perpendicular to the path by an angle up to about 45° (as in the embodiment of figure 10). In other words, the abutment surface 80a is substantially perpendicular to the path or is tilted by an angle up to 45° with respect to the path perpendicular.

[0107] In the embodiment depicted in figure 10, in the intermediate position of the lever 16, the abutment surface 80a is arranged as tilted by an angle α substantially equal to 135° with respect to the movement path T of the stop 50 from the operative position to the release position. In particular, in the intermediate position of the lever 16, the abutment surface 80a is arranged as tilted by an angle equal to 135° with respect to the tangent of the movement path T of the stop 50 from the operative position to the release position.

[0108] According to the embodiment depicted in figure 10, the lever comprises a second abutment surface 80b intended to cooperate with a second engaging surface 53b of the stop 50.

[0109] The first and the second abutment surfaces 80a, 80b are tilted to one another to form an inner acute angle and thus to form a wedge intended to cooperate with two engaging surfaces 53a, 53b of the stop.

[0110] According to an aspect of the present invention, the abutment portion 80 is designed substantially complementary to the engaging surface 53 of the stop 50. For example, the abutment portion 80 and the engaging

portion 53 both intended to contact one another in the intermediate position can be, for example, both step-shaped and complementary to one another, or can be wedge-shaped and intended to cooperate with a corresponding seat, in order to achieve the effect of efficiently prevent the undesirable movement of the stop towards the release position.

[0111] For example, as visible in the attached figures 1-9, the engaging portion 53 arranged at the end of the lower arm 52 has a substantially stepped-shape able to couple with the abutment portion 80 also substantially stepped, through the two abutment surfaces 80a,80b substantially perpendicular to one another.

[0112] It has to be further noticed that, according to an aspect of the present invention, the abutment portion 80 is arranged on a lateral arm 16a of the lever 16.

[0113] Preferably, the abutment portion 80 and in particular the at least one abutment surface 80a, is arranged at the end of the arm 16a.

[0114] The arm 16a extends laterally from the lever 16, preferably in a portion comprised between the rotation axis of the lever and the hooking hole 23.

[0115] According to a possible embodiment, the lateral arm 16a of the lever 16 has a substantially curved shape, preferably substantially circular, that follows the profile of the body 1a of the device at the edges 14a, 14b of the plates.

[0116] It has to be further noticed that, according to an aspect of the present invention, the lever 16 comprises a seat 16b designed to accommodate at least part of the stop 50 (as visible in figures 6c and 8c) and, in particular, the lower arm 52 when the latter is rotated towards the release position.

[0117] Preferably, the seat 16b is arranged under the lateral arm 16a of the lever 16 and, in particular, between the rotation axis of the lever and the point from which the lateral arm 16a extends from the profile of the lever 16.

[0118] The device 1, during the use, can be in three different possible positions, which will be better detailed in the following. In particular, the figures 6a, 8a show the open position in which the cable 6 can be inserted/removed in/from the device. In such a position, the lever 16 is in its open position and the stop 50 is in the release position. The intermediate position of the lever 16 is, for example, visible in figures 7, 9 and 10 in which the stop 50 is in its own operative position. In such a position, as described above, the abutment portion 80 provided with the at least one abutment surface 80a, allows to effectively prevent the undesirable movement of the stop away from its own operative position.

[0119] The locking position is, for example, visible in figure 6e in which the lever 16 is in its own closed position with the locking cam 10 in contact with the cable, and the stop 50 is in its own operative position. It has to be noticed that the fall-prevention device 1 is in the open position while the cable is inserted and removed. The fall-prevention device, when used as connected to the cable, can be used during climb or descent. During the climb, the user rotates the lever 16 upwards (HA) in accordance with R1b (anticlockwise rotation). By doing so, the lever 16 reaches the intermediate position, i.e. the portion 80 abuts on the end 53 of the arm 52. As mentioned, in this position the lever 16 prevents the cable from releasing the groove 9 and, when the lever 16 is released, the latter rotates again downwards in accordance with (R2), thus causing the fall-prevention device to lock on the cable.

[0120] During the descent, the weight of the fall-prevention device 1 and the spring 27 allow the lever 16 to stay in the intermediate position.

[0121] In this way, the user can descend without intervening on the fall-prevention device 1. In case of fall or sudden descent, the lever 16 turns downwards (BA) in accordance with (R2), whereas the locking cam 25 tightens the cable (6).

[0122] In the intermediate position, between the cable and the cam 10 there is some play allowing the free sliding upwards (HA) and downwards (BA) at the same time. However, as soon as a fall happens, the fall-prevention device 1 returns immediately in its locking position, as depicted in figure 8a.

[0123] Figures 6a-e depict the various steps of connecting (assembling) the fall-prevention device according to the present invention to the securing cable.

[0124] It has to be noticed that, according to a preferred use mode, during insertion and removal operations of the cable 6 in the device, a karabiner 5 is advantageously connected to the hole 23 and connects the device to the user's harness, so that the tool is constrained to the user and cannot be lost.

[0125] Returning back to the steps of connecting the device 1 to the cable 6, the user operates, for example by leaning the first plate 12a of the fall-prevention device 1 in the palm of the right hand, the activating arm 55 of the stop downwards according to R1a (clockwise) to disengage the passage 40 for the cable.

[0126] It has to be noticed that, according to an aspect of the present invention, the body 1a of the device 1 is shaped so that the upper surface of the activating arm 55 (and in particular the upper profile (edge) P of the activating arm) is arranged at the upper profile (edge) 15a, 15b of the device body before reaching the release position.

[0127] In other words when the user activates the activating arm 55 from the operative position of the stop towards the release position, at one point it will encounter the profile (edge 15a, 15b) of the device body and, in such position, the stop 50 has not reached yet its release position.

[0128] In fact, in such position (intermediate position of the stop), the stop 50 and in particular the safety arm 51 does not disengage the passage 40 completely, as shown in figure 6b. At this point, the user rotates the lever 16 to the open position in accordance with (R1b), as shown in figure 6c. The movement of the lever 16 towards the open position determines the contact of the abutment portion 80 with the back surface 52b of the stop and

moves it to its release position.

[0129] In particular, the lateral arm 16a of the lever 16 is designed so that, in the open position of the lever 16, it contacts the stop and, in particular, the lower arm 52 to move it to the release position, as shown in figure 6d. In such a position, the stop 50 and in particular the safety arm 51 disengages the passage 40 completely, the coupling of the fall-prevention device with the cable 6 is thus possible. The user then engages the cable 6 in the groove 9 and releases the lever 16 and the stop 50 that, due to the spring 27, will move to the close position and the operative position, respectively, as depicted in figure 6e.

[0130] The method of connecting the fall-prevention device 1 to the cable therefore comprises the user's action both onto the stop 50 and the lever 16. As shown in figure 6b, before raising the lever 16 it is necessary to rotate the activating arm 55 of the stop 50 in accordance with (R1a) to move the stop away from its operative position, otherwise the lever, during the movement towards the open position, would reach the intermediate contact position of the abutment portion 80 with the engaging portion 53 of the stop (for example as shown in figure 7).

[0131] Once the process of connecting the fall-prevention device to the cable is ended, the lever 16 is biased by the spring 27 and turns downwards in accordance with (R2) until the locking cam 25 tightens the cable 6 by restraining it in the groove 9, while the stop blocks the passage 40 by means of its safety arm 51.

[0132] In the position depicted in figures 6e, 8a, the fall-prevention device 1 is locked so that to avoid any undesirable descent downwards (BA) and prevent the user's fall, but it might be moved upwards (HA) up to its intermediate position of engagement with the stop, by the rotation of the lever 16 upwards in accordance with (R1b). Figures 8a-e depict the various steps of removing the fall-prevention device according to the present invention from the cable.

[0133] Starting from a position in which the lever 16 is not in the intermediate position of engagement with the stop (figure 8a), the user rotates the stop 50 in accordance with (R1a) towards the release position, as shown in figure 1b. At this point, the lever 16 can be rotated in accordance with (R1b), as shown for example in figure 8c, until the abutment portion 80 of the lever 16 engages the back surface 52b (or back) of the arm 52 of the stop 50 and the stop 50 is involved in completing its rotation and then the open position of the lever is reached. As mentioned above referring to the assembling, the movement of the lever 16 to its own open position terminates the movement of the stop to its own release position, as shown in figure 8d. At this point, the fall-prevention device can be disengaged from the cable 6 and the stop and the lever 16 can be both released, as shown in figure 8e.

[0134] The process of removing the fall-prevention device from the cable according to the present invention is particularly safe thanks to a necessary sequential and consecutive action on the arm 55 of the stop 50 and on the lever 16, to cause the removal of the fall-prevention device. As shown in figure 9, as a matter of fact, the only rotation of the lever 16 is not sufficient to unlock the fall-prevention device. Once the fall-prevention device is in the intermediate position engaging the lever 16 with the stop, such as for example visible in figure 9, even an action onto the arm 55 of the stop 50 cannot cause the rotation of the stop towards the release position, just thanks to the engagement with the abutting portion 80. In fact, thanks particularly to the presence of the abutment surface 80a, the rotation of the stop from its operative position to the release position can be effectively hampered. This arrangement according to the present invention guarantees high safety allowing involuntary removals of the fall-prevention device from the cable during use.

Claims

1. Movable fall-prevention device (1) for a securing support (6), comprising a main body (1a) having a passage (40) for the insertion/removal of the securing support in/from a restraining groove (9), wherein said securing support (6) is restrained through a lever (16) rotating between an open position and a closed position, and wherein one of the lever ends comprises a locking cam (10, 25) and the other free end comprises a hole (23) intended to receive a karabiner (5), the device further comprising a stop (50) movable between an operative position, in which it limits the rotation of the lever (16) in an intermediate position when the lever is moved from the closed position to the open position, and a release position in which it allows the rotation of the lever (16) in the open position, **characterized in that** said lever (16) comprises at least one abutment surface (80a) cooperating, in said intermediate position, with at least one corresponding engaging surface (53a) of the stop (50) to lock the stop (50) to the operative position, wherein said abutment surface (80a) is tilted by an angle (α) substantially comprised between 90° and 135° with respect to the movement path (T) of the stop (50) from the operative position towards the release position.

2. Fall-prevention device according to claim 1, wherein said at least one abutment surface (80a) in said intermediate position intercepts said at least one corresponding engaging surface (53a) of the stop (50) to hamper the movement of the stop (50) from its operative position towards the release position.

3. Fall-prevention device according to claim 1 or 2, wherein said stop (50) is rotationally movable and the abutment surface (80a) is tilted by an angle (α) substantially comprised between 90° and 135° with respect to the tangent (T1) to the movement path (T) of the stop (50).

4. Fall-prevention device (1) according to any one of the preceding claims, wherein said abutment surface (80a) is configured substantially complementary to said engaging surface (53a).

5. Fall-prevention device (1) according to any one of the preceding claims, wherein said at least one abutment surface (80a) is arranged on a lateral arm (16a) of said lever (16).

6. Fall-prevention device (1) according to any one of the preceding claims, **characterized in that** said lever (16) comprises a seat (16b) to receive at least part of said stop (50) when the latter is rotated towards said release position.

7. Fall-prevention device (1) according to any one of the preceding claims, **characterized in that** said lever (16) comprises at least two abutment surfaces (80a, 80b) cooperating with at least two engaging surfaces (53a, 53b) of the stop (50), preferably said at least two abutment surfaces (80a, 80b) are tilted one to another.

8. Fall-prevention device according to claim 7, wherein said at least two abutment surfaces (80a, 80b) are substantially perpendicular one to another, or said at least two abutment surfaces (80a, 80b) are substantially wedge shaped.

9. Fall-prevention device (1) according to any one of preceding claims 7 or 8, wherein a first abutment surface (80b) limits the rotation of the lever in the intermediate position and a second abutment surface (80a) limits the rotation of the stop (50) towards the release position.

10. Fall-prevention device (1) according to any one of the preceding claims, wherein said stop (50) is clockwise rotatable (R1a) from said operative position towards said release position.

11. Fall-prevention device (1) according to any one of the preceding claims, wherein said lever (16) is anticlockwise rotatable (R1b) from said closed position towards said open position.

12. Fall-prevention device (1) according to any one of the preceding claims, wherein the stop (50) comprises an activating arm (55) to drive the movement of the stop from said operative position towards said release position, preferably said activating arm (55) is arranged outside of said main body (1a) when said stop is in the operative position to be manually driven, the body (1a) of the device being shaped to house the activating arm (55) for at least part of the movement from said operative position to said release position.

13. Fall-prevention device (1) according to claim 12, wherein the activating arm (55) comprises a profile (P), the profile (P) is arranged at an edge (15a, 15b) of the body (1a) of the device, before reaching said release position.

14. Fall-prevention device (1) according to any one of the preceding claims, wherein at least part of the lever (16) is contacting the stop (50), preferably a back surface (52b) of the stop (50), to guide at least part of the movement thereof towards said release position.

15. Method of installing/removing a fall-prevention device (1) according to claims 1 - 14 to a securing support (6), wherein said fall-prevention device comprises a main body (1a) having a passage (40) for the insertion/removal of the securing support in/from a restraining groove (9), wherein said securing support (6) is restrained through a lever (16) rotating between an open position and a closed position, and wherein one of the lever ends comprises a locking cam (10, 25) and the other free end comprises a hole (23) intended to receive a karabiner (5), the device further comprising a stop (50) movable between an operative position, in which it limits the rotation of the lever (16) in an intermediate position when the lever is moved from the closed position to the open position, and a release position in which it allows the rotation of the lever (16) in the open position, the method comprising the step of moving the stop (50) from its operative position towards the release position in order to rotate the lever (16) from the closed position to the open position, thus allowing the insertion/removal of the securing support (6) in/from the groove (9) of the device.

Patentansprüche

1. Bewegliche Fallschutzvorrichtung (1) für einen Sicherungsträger (6), umfassend einen Hauptkörper (1a) mit einem Durchgang (40) zum Einführen/Entfernen des Sicherungsträgers in eine/aus einer Rückhaltenut (9), wobei der Sicherungsträger (6) durch einen Hebel (16) gehalten wird, der sich zwischen einer offenen Position und einer geschlossenen Position dreht, und wobei eines der Hebelenden einen Verriegelungsnocken (10, 25) umfasst und das andere freie Ende ein Loch (23) umfasst, dazu bestimmt, einen Karabiner (5) aufzunehmen, wobei die Vorrichtung ferner einen Anschlag (50) umfasst, der zwischen einer Betriebsposition, in der er die Drehung des Hebels (16) in einer Zwischenposition begrenzt, wenn der Hebel von der geschlossenen Position zu der offenen Position bewegt wird, und einer Freigabeposition, in der er die Drehung des Hebels (16) in die offene Position zulässt, bewegbar

ist, **dadurch gekennzeichnet, dass** der Hebel (16) mindestens eine Anschlagfläche (80a) umfasst, die in der Zwischenposition mit mindestens einer entsprechenden Eingriffsfläche (53a) des Anschlags (50) zusammenwirkt, um den Anschlag (50) in der Betriebsposition zu arretieren, wobei die Anschlagfläche (80a) um einen Winkel (a) geneigt ist, der im Wesentlichen zwischen 90° und 135° in Bezug auf die Bewegungsbahn (T) des Anschlags (50) von der Betriebsposition in Richtung der Freigabeposition beträgt.

2. Fallschutzvorrichtung nach Anspruch 1, wobei die mindestens eine Anschlagfläche (80a) in der Zwischenposition die mindestens eine entsprechende Eingriffsfläche (53a) des Anschlags (50) abfängt, um die Bewegung des Anschlags (50) aus seiner Betriebsposition in Richtung der Freigabeposition zu behindern.

3. Fallschutzvorrichtung nach Anspruch 1 oder 2, wobei der Anschlag (50) drehbeweglich ist und die Anschlagfläche (80a) um einen Winkel (a) geneigt ist, der im Wesentlichen zwischen 90° und 135° in Bezug auf die Tangente (T1) zur Bewegungsbahn (T) des Anschlags (50) beträgt.

4. Fallschutzvorrichtung (1) nach einem der vorhergehenden Ansprüche, wobei die Anschlagfläche (80a) im Wesentlichen komplementär zu der Eingriffsfläche (53a) konfiguriert ist.

5. Fallschutzvorrichtung (1) nach einem der vorhergehenden Ansprüche, wobei die mindestens eine Anschlagfläche (80a) an einem seitlichen Arm (16a) des Hebels (16) angeordnet ist.

6. Fallschutzvorrichtung (1) nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** der Hebel (16) einen Sitz (16b) umfasst, um zumindest einen Teil des Anschlags (50) aufzunehmen, wenn letzterer in Richtung der Freigabeposition gedreht wird.

7. Fallschutzvorrichtung (1) nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** der Hebel (16) mindestens zwei Anschlagflächen (80a, 80b) umfasst, die mit mindestens zwei Eingriffsflächen (53a, 53b) des Anschlags (50) zusammenwirken,
wobei vorzugsweise die mindestens zwei Anschlagflächen (80a, 80b) zueinander geneigt sind.

8. Fallschutzvorrichtung nach Anspruch 7, wobei die mindestens zwei Anschlagflächen (80a, 80b) im Wesentlichen senkrecht zueinander sind, oder die mindestens zwei Anschlagflächen (80a, 80b) im Wesentlichen keilförmig sind.

9. Fallschutzvorrichtung (1) nach einem der vorhergehenden Ansprüche 7 oder 8, wobei eine erste Anschlagfläche (80b) die Drehung des Hebels in der Zwischenposition begrenzt und eine zweite Anschlagfläche (80a) die Drehung des Anschlags (50) in Richtung Freigabeposition begrenzt.

10. Fallschutzvorrichtung (1) nach einem der vorangehenden Ansprüche, wobei der Anschlag (50) im Uhrzeigersinn (R1a) von der Betriebsposition zu der Freigabeposition drehbar ist.

11. Fallschutzvorrichtung (1) nach einem der vorhergehenden Ansprüche, wobei der Hebel (16) im Gegenuhrzeigersinn (R1b) von der geschlossenen Position in die offene Position drehbar ist.

12. Fallschutzvorrichtung (1) nach einem der vorhergehenden Ansprüche, wobei der Anschlag (50) einen Aktivierungsarm (55) umfasst, um die Bewegung des Anschlags von der Betriebsposition zu der Freigabeposition anzutreiben,
wobei vorzugsweise der Aktivierungsarm (55) außerhalb des Hauptkörpers (1a) angeordnet ist, wenn sich der Anschlag in der Betriebsposition befindet, um manuell angetrieben zu werden, wobei der Körper (1a) der Vorrichtung geformt ist, um den Aktivierungsarm (55) für zumindest einen Teil der Bewegung von der Betriebsposition zu der Freigabeposition aufzunehmen.

13. Fallschutzvorrichtung (1) nach Anspruch 12, wobei der Aktivierungsarm (55) ein Profil (P) umfasst, wobei das Profil (P) vor Erreichen der Freigabeposition an einer Kante (15a, 15b) des Körpers (1a) der Vorrichtung angeordnet ist.

14. Fallschutzvorrichtung (1) nach einem der vorhergehenden Ansprüche, wobei zumindest ein Teil des Hebels (16) den Anschlag (50), vorzugsweise eine Rückfläche (52b) des Anschlags (50), berührt, um zumindest einen Teil seiner Bewegung in Richtung der Freigabeposition zu führen.

15. Verfahren zum Anbringen/Entfernen einer Fallschutzvorrichtung (1) gemäß den Ansprüchen 1 bis 14 an einen Sicherungsträger (6), wobei die Fallschutzvorrichtung einen Hauptkörper (1a) mit einem Durchgang (40) zum Einführen/Entfernen des Sicherungsträgers in eine/von einer Rückhaltenut (9) umfasst, wobei der Sicherungsträger (6) durch einen Hebel (16) gehalten wird, der sich zwischen einer offenen Position und einer geschlossenen Position dreht, und wobei eines der Hebelenden einen Verriegelungsnocken (10, 25) umfasst, und das andere freie Ende ein Loch (23) umfasst, das dazu bestimmt ist, einen Karabiner (5) aufzunehmen, wobei die Vorrichtung ferner einen Anschlag (50) umfasst, der zwi-

schen einer Betriebsposition, in der er die Drehung des Hebels (16) in einer Zwischenposition begrenzt, wenn der Hebel von der geschlossenen Position in die offene Position bewegt wird, und einer Freigabeposition, in der er die Drehung des Hebels (16) in die offene Position erlaubt, bewegbar ist, wobei das Verfahren den Schritt des Bewegens des Anschlags (50) aus seiner Betriebsposition in Richtung Freigabeposition umfasst, um den Hebel (16) von der geschlossenen Position in die offene Position zu drehen, wodurch das Einsetzen/Entfernen des Sicherungsträgers (6) in die/aus der Nut (9) der Vorrichtung ermöglicht wird.

Revendications

1. Dispositif antichute mobile (1) pour un support de fixation (6), comprenant un corps principal (1a) ayant un passage (40) pour l'insertion/retrait du support de fixation dans/de une rainure de retenue (9), dans lequel ledit support de fixation (6) est retenu par un levier (16) tournant entre une position ouverte et une position fermée, et dans lequel une des extrémités du levier comprend une came de verrouillage (10, 25) et l'autre extrémité libre comprend un trou (23) destiné à recevoir un mousqueton (5), le dispositif comprenant en outre un arrêt (50) mobile entre une position active, dans laquelle il limite la rotation du levier (16) dans une position intermédiaire lorsque le levier est déplacé de la position fermée à la position ouverte, et une position de libération dans laquelle elle permet la rotation du levier (16) dans la position ouverte, **caractérisé en ce que** ledit levier (16) comprend au moins une surface de butée (80a) coopérant, dans ladite position intermédiaire, avec au moins une surface de prise correspondante (53a) de l'arrêt (50) pour verrouiller l'arrêt (50) dans la position active, dans lequel ladite surface de butée (80a) est inclinée d'un angle (α) sensiblement compris entre 90° et 135° par rapport à la trajectoire de mouvement (T) de l'arrêt (50) de la position active vers la position de libération.

2. Dispositif antichute selon la revendication 1, dans lequel ladite au moins une surface de butée (80a) dans ladite position intermédiaire intercepte ladite au moins une surface de prise correspondante (53a) de l'arrêt (50) pour entraver le mouvement de l'arrêt (50) de sa position active vers la position de libération.

3. Dispositif antichute selon la revendication 1 ou 2, dans lequel ledit arrêt (50) est mobile en rotation et la surface de butée (80a) est inclinée d'un angle (α) sensiblement compris entre 90° et 135° par rapport à la tangente (T1) à la trajectoire de mouvement (T) de l'arrêt (50).

4. Dispositif antichute (1) selon l'une quelconque des revendications précédentes, dans lequel ladite surface de butée (80a) est configurée de manière sensiblement complémentaire à ladite surface de prise (53a).

5. Dispositif antichute (1) selon l'une quelconque des revendications précédentes, dans lequel ladite au moins une surface de butée (80a) est disposée sur un bras latéral (16a) dudit levier (16).

6. Dispositif antichute (1) selon l'une quelconque des revendications précédentes, **caractérisé en ce que** ledit levier (16) comprend un siège (16b) pour recevoir au moins une partie dudit arrêt (50) lorsque cette dernière est tournée vers ladite position de libération.

7. Dispositif antichute (1) selon l'une quelconque des revendications précédentes, **caractérisé en ce que** ledit levier (16) comprend au moins deux surfaces de butée (80a, 80b) coopérant avec au moins deux surfaces de prise (53a, 53b) de l'arrêt (50), de préférence lesdites au moins deux surfaces de butée (80a, 80b) sont inclinées l'une par rapport à l'autre.

8. Dispositif antichute selon la revendication 7, dans lequel lesdites au moins deux surfaces de butée (80a, 80b) sont sensiblement perpendiculaires l'une à l'autre, ou lesdites au moins deux surfaces de butée (80a, 80b) sont sensiblement cunéiformes.

9. Dispositif antichute (1) selon l'une quelconque des revendications précédentes 7 ou 8, dans lequel une première surface de butée (80b) limite la rotation du levier dans la position intermédiaire et une deuxième surface de butée (80a) limite la rotation de l'arrêt (50) vers la position de libération.

10. Dispositif antichute (1) selon l'une quelconque des revendications précédentes, dans lequel ledit arrêt (50) peut tourner dans le sens des aiguilles d'une montre (R1a) depuis ladite position active vers ladite position de libération.

11. Dispositif antichute (1) selon l'une quelconque des revendications précédentes, dans lequel ledit levier (16) est mobile en rotation (R1b) dans le sens inverse des aiguilles d'une montre depuis ladite position fermée vers ladite position ouverte.

12. Dispositif antichute (1) selon l'une quelconque des revendications précédentes, dans lequel l'arrêt (50) comprend un bras d'actionnement (55) pour entraîner le mouvement de l'arrêt de ladite position active vers ladite position de libération, de préférence ledit bras d'actionnement (55) est disposé à l'extérieur dudit corps principal (1a) lorsque ledit arrêt est en position active pour être entraînée manuellement, le

corps (1a) du dispositif étant conformé pour loger le bras d'actionnement (55) pendant au moins une partie du mouvement de ladite position active vers ladite position de libération.

13. Dispositif antichute (1) selon la revendication 12, dans lequel le bras d'actionnement (55) comprend un profil (P), le profil (P) est disposé au niveau d'un bord (15a, 15b) du corps (1a) du dispositif, avant d'atteindre ladite position de libération.

14. Dispositif antichute (1) selon l'une quelconque des revendications précédentes, dans lequel au moins une partie du levier (16) est en contact avec l'arrêt (50), de préférence une surface arrière (52b) de l'arrêt (50), pour guider au moins une partie de son mouvement vers ladite position de libération.

15. Procédé d'installation/retrait d'un dispositif antichute (1) selon les revendications 1 à 14 sur un support de fixation (6), dans lequel ledit dispositif antichute comprend un corps principal (1a) ayant un passage (40) pour l'insertion du support de fixation dans une rainure de retenue (9) et son retrait de cette dernière, dans lequel ledit support de fixation (6) est retenu par un levier (16) tournant entre une position ouverte et une position fermée, et dans lequel une des extrémités du levier comprend une came de verrouillage (10, 25) et l'autre extrémité libre comprend un trou (23) destiné à recevoir un mousqueton (5), le dispositif comprenant en outre un arrêt (50) mobile entre une position active, dans laquelle il limite la rotation du levier (16) dans une position intermédiaire lorsque le levier est déplacé de la position fermée à la position ouverte, et une position de libération dans laquelle il permet la rotation du levier (16) dans la position ouverte, le procédé comprenant l'étape consistant à déplacer l'arrêt (50) de sa position active vers la position de libération afin de faire tourner le levier (16) de la position fermée à la position ouverte, permettant ainsi l'insertion/retrait du support de fixation (6) dans/de une rainure (9) du dispositif.

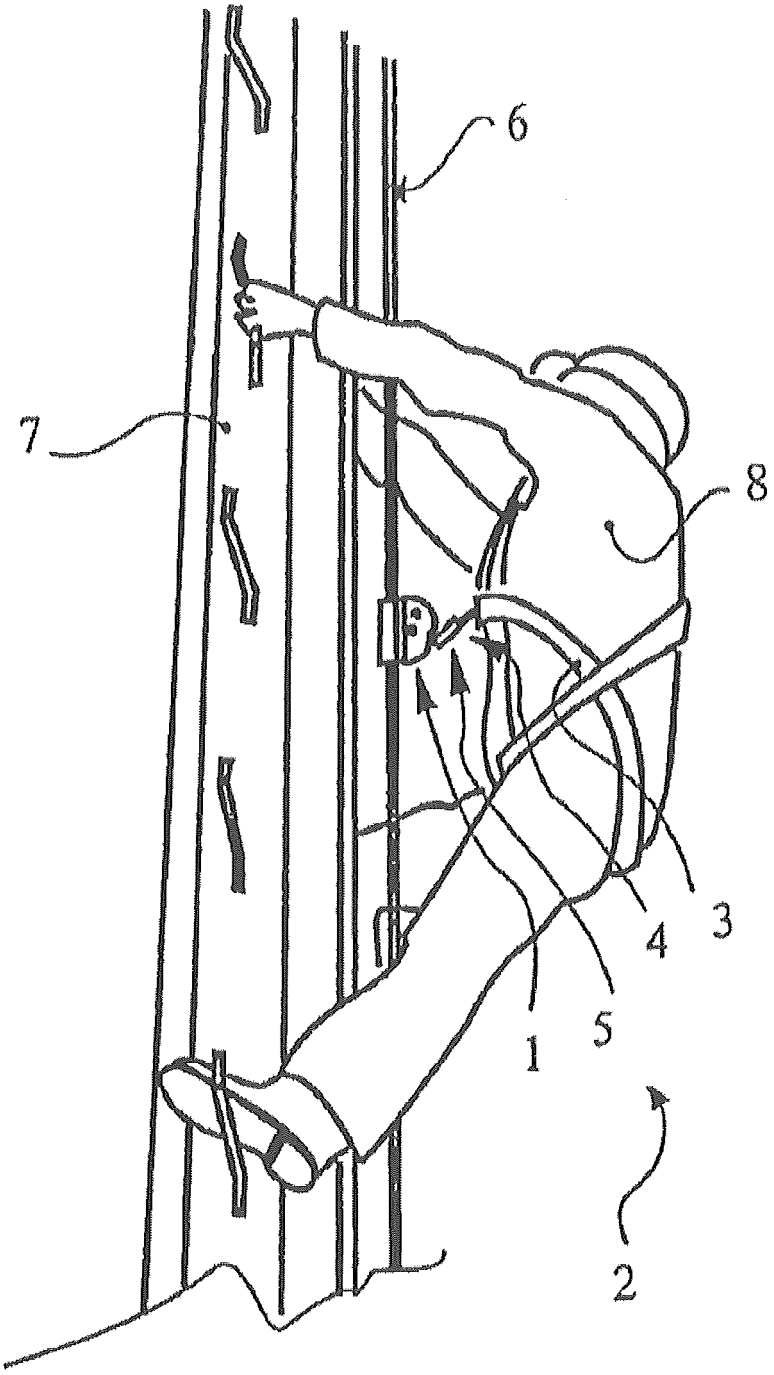


FIG. 1

FIG. 2

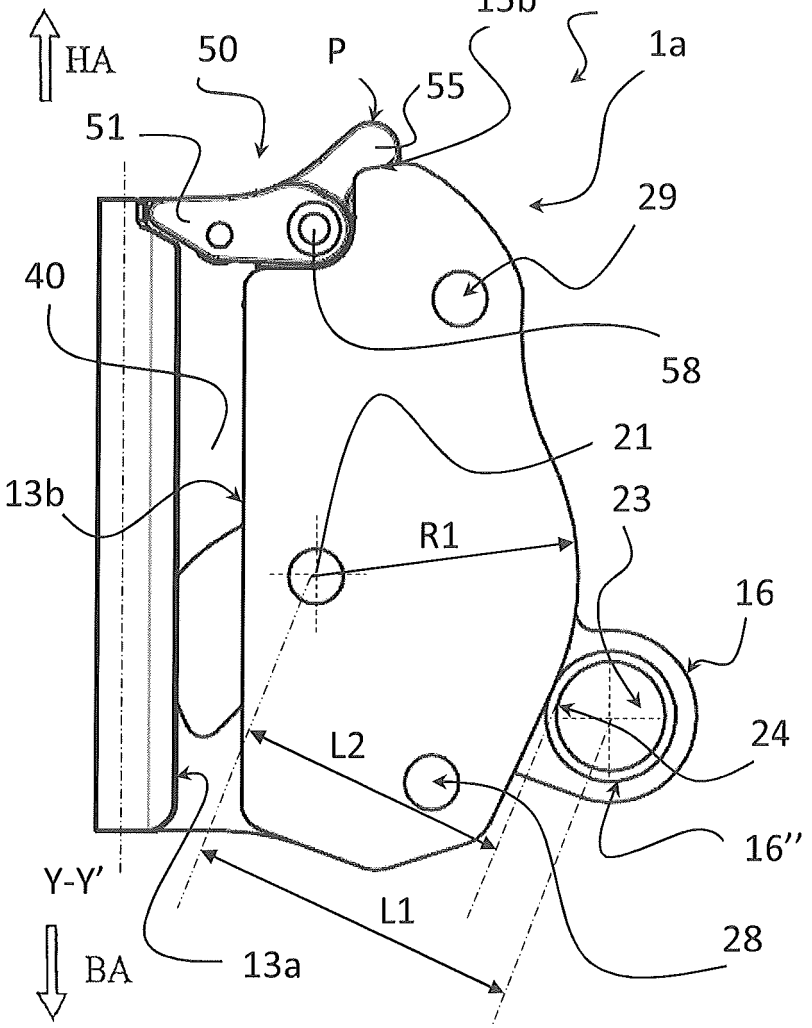
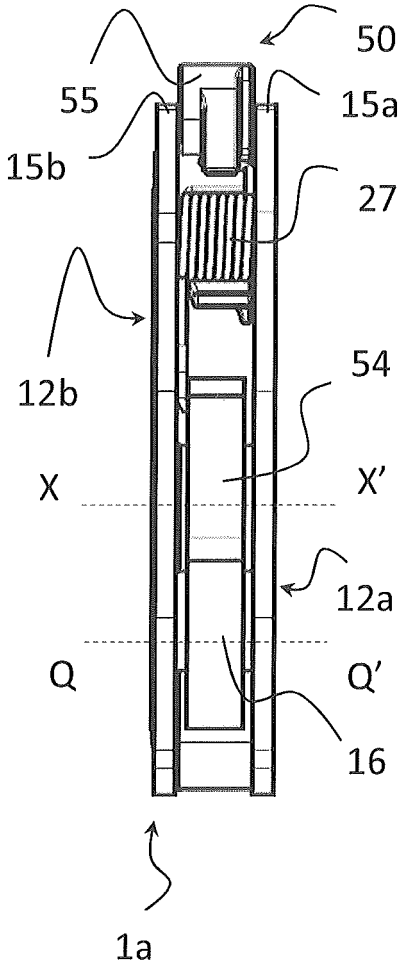


FIG. 3



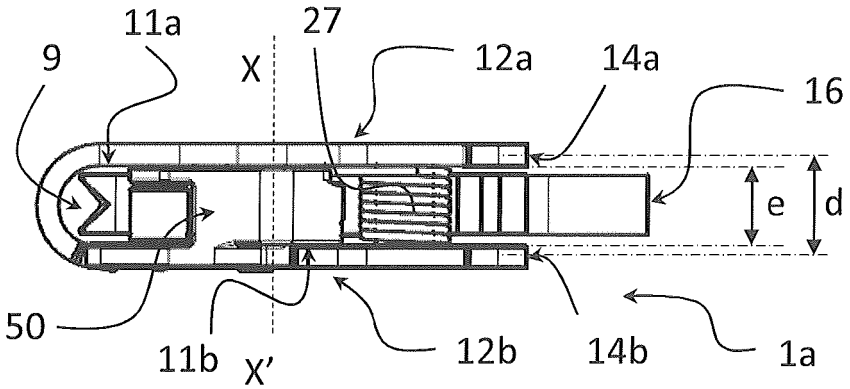


FIG. 4

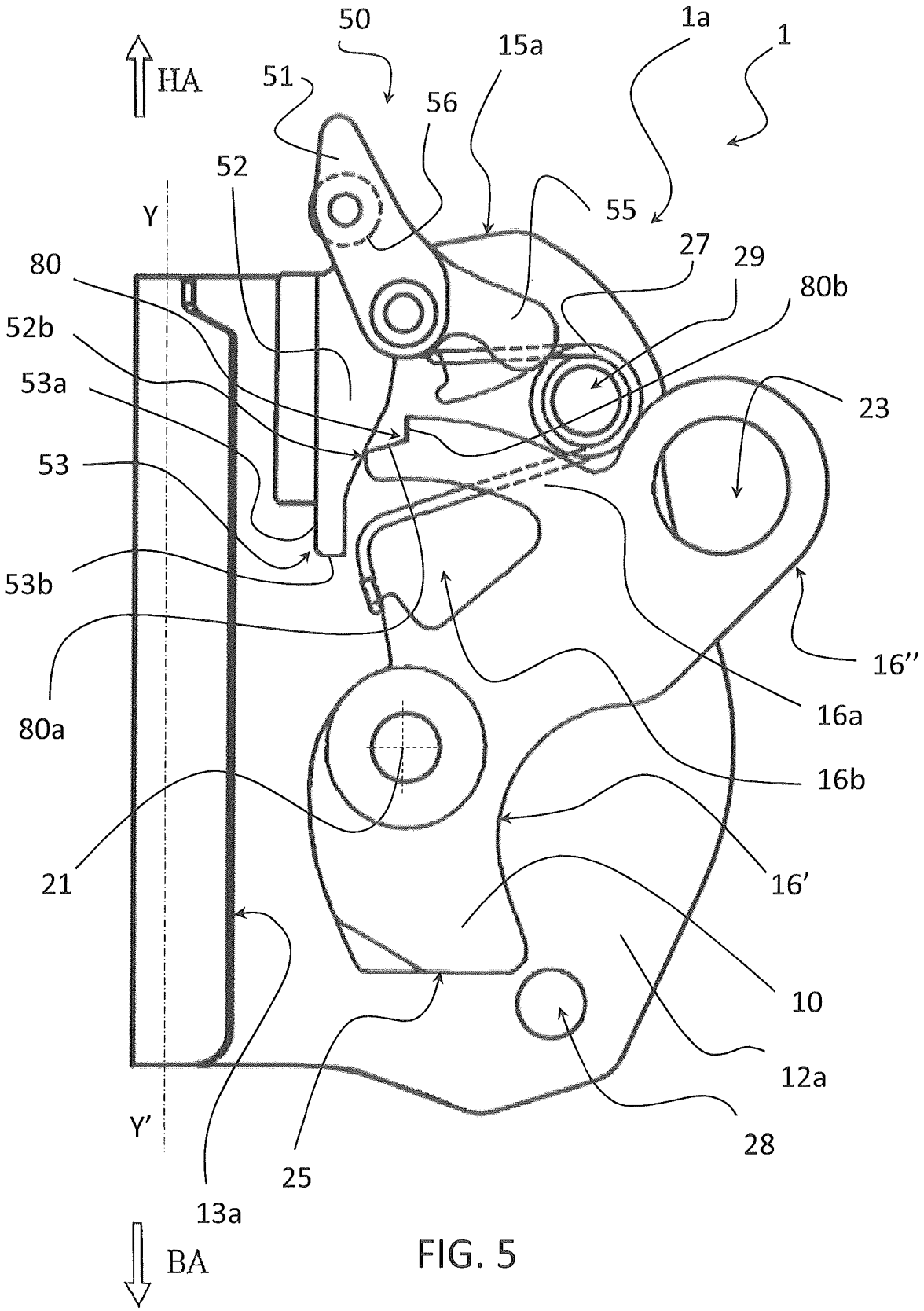

HA
50
51
56
15a
1a
1
52
Y
55
27
29
80b
80
52b
53a
23
53
53b
16''
80a
16a
16b
21
16'
10
12a
28
Y'
25
13a
BA

FIG. 5

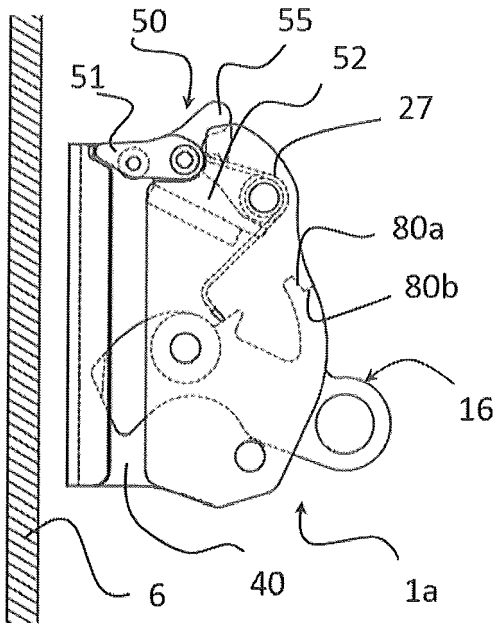


FIG. 6a

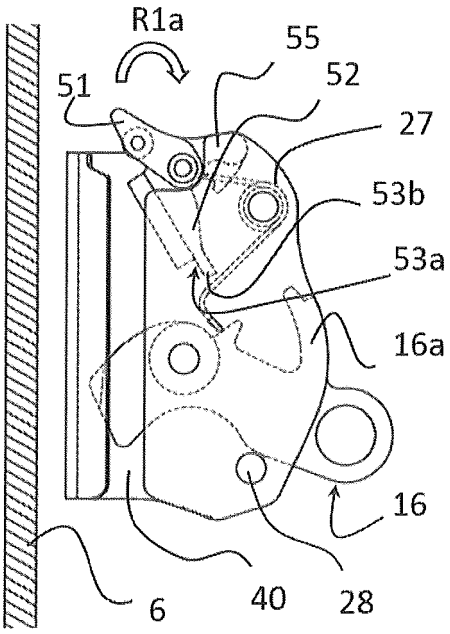


FIG. 6b

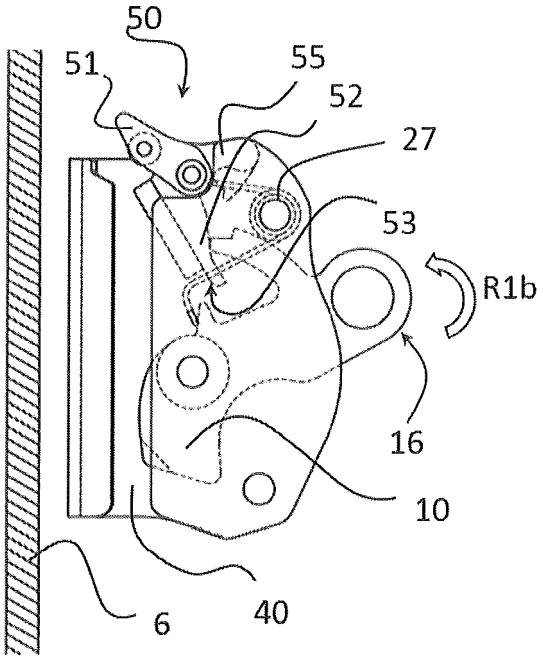


FIG. 6c

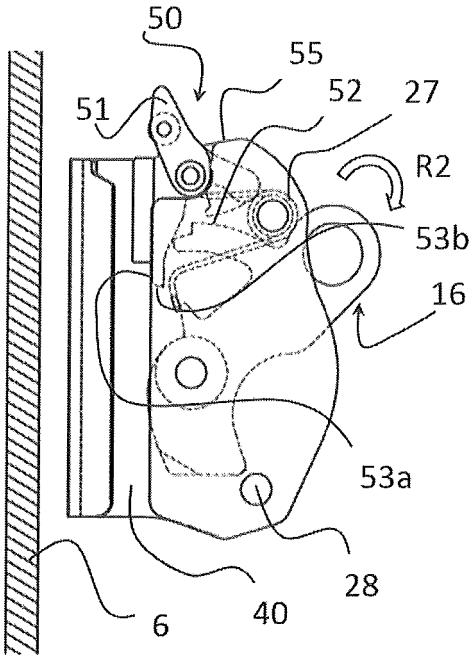


FIG. 6d

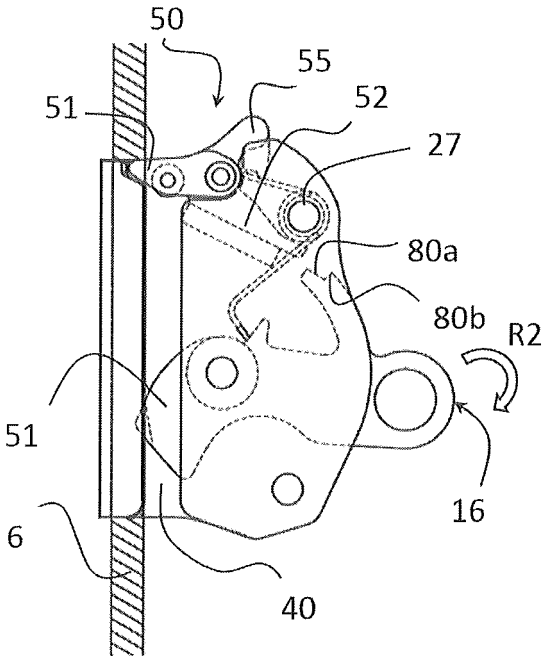


FIG. 6e

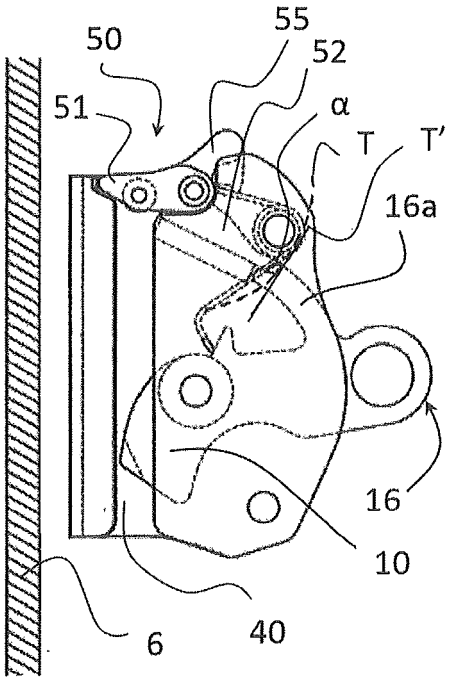


FIG. 7

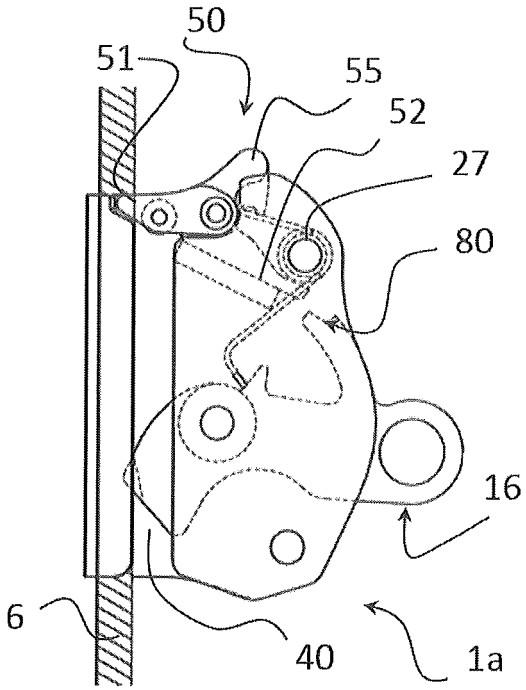


FIG. 8a

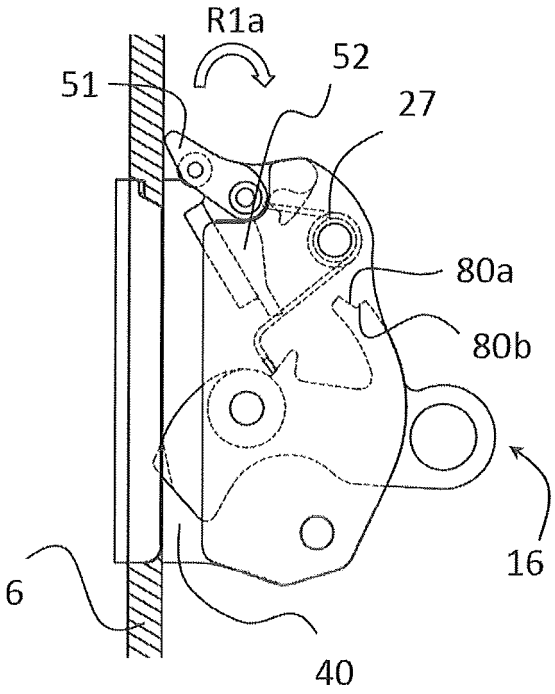


FIG. 8b

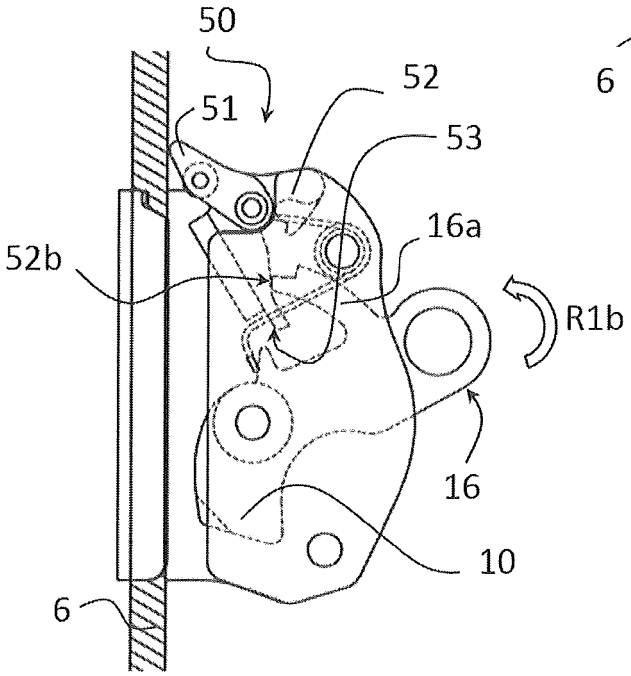


FIG. 8c

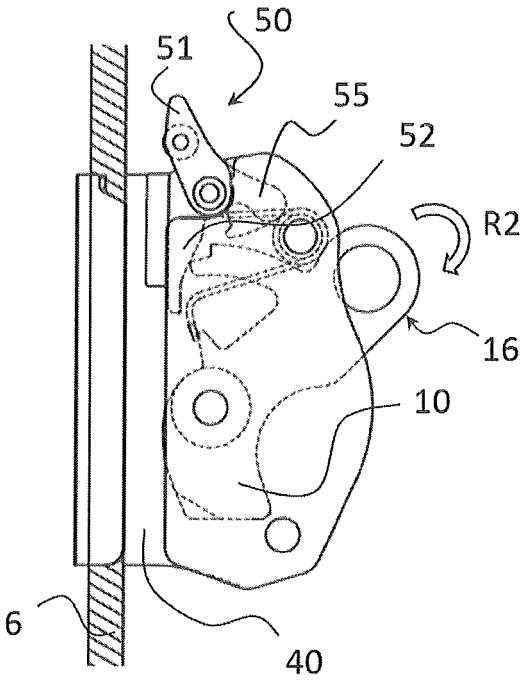


FIG. 8d

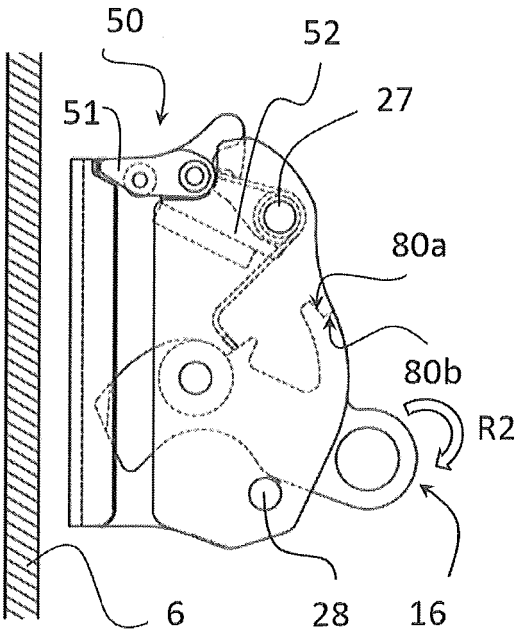


FIG. 8e

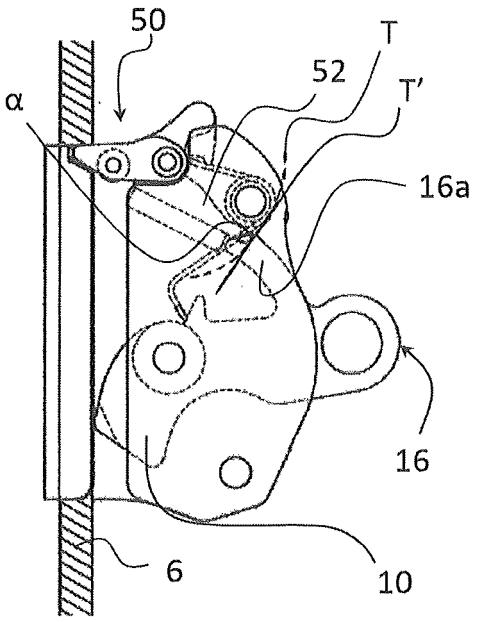


FIG. 9

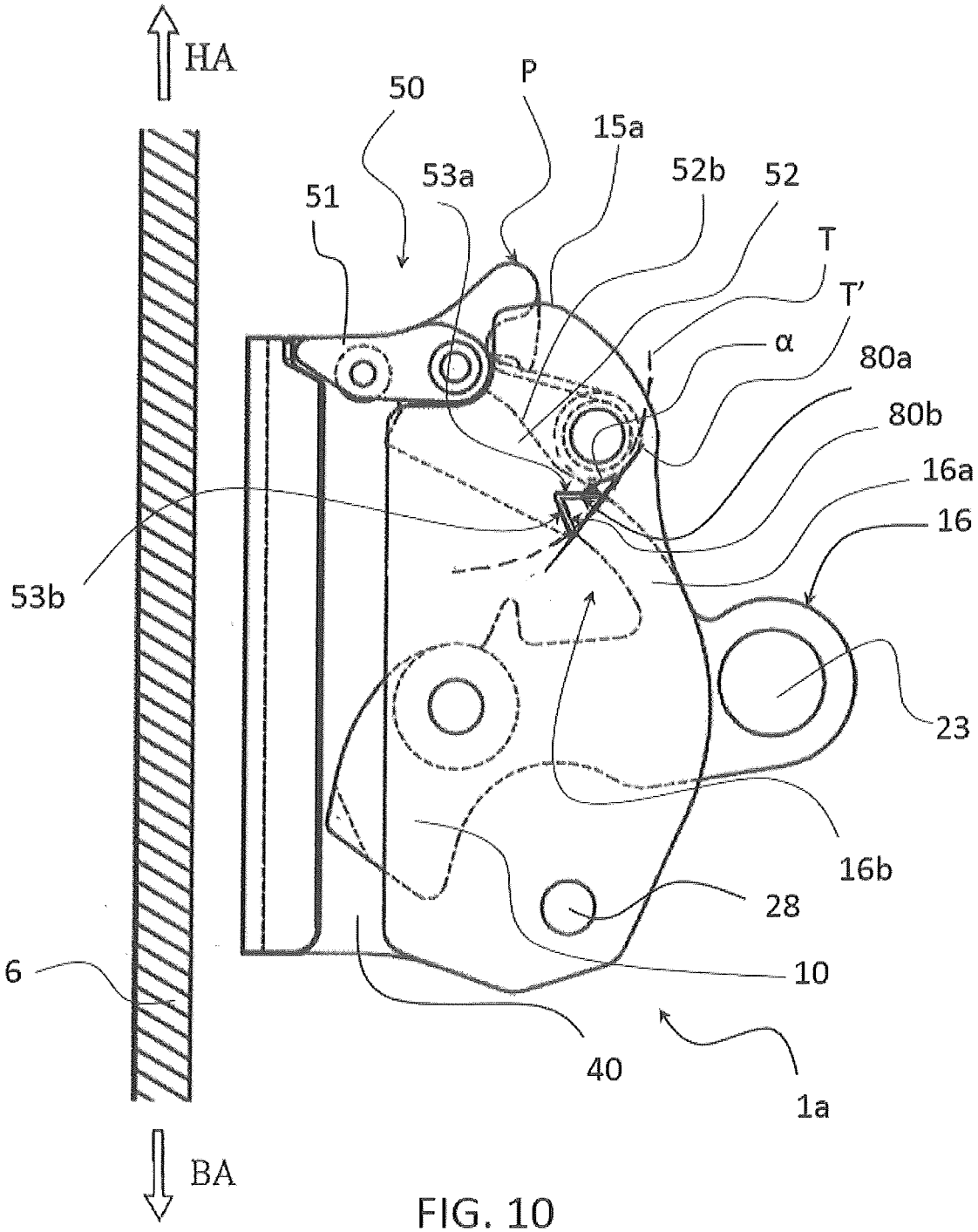

HA
50
P
15a
53a
52b
52
51
T
T'
α
80a
80b
16a
16
53b
23
16b
28
6
10
40
1a
BA

FIG. 10

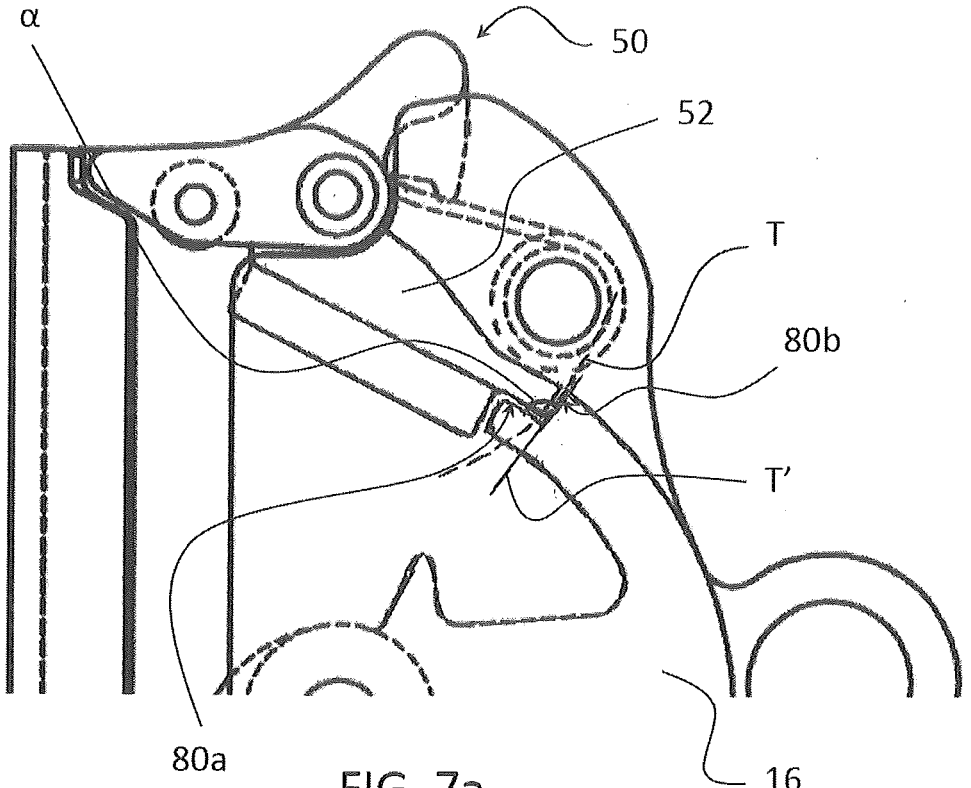


FIG. 7a

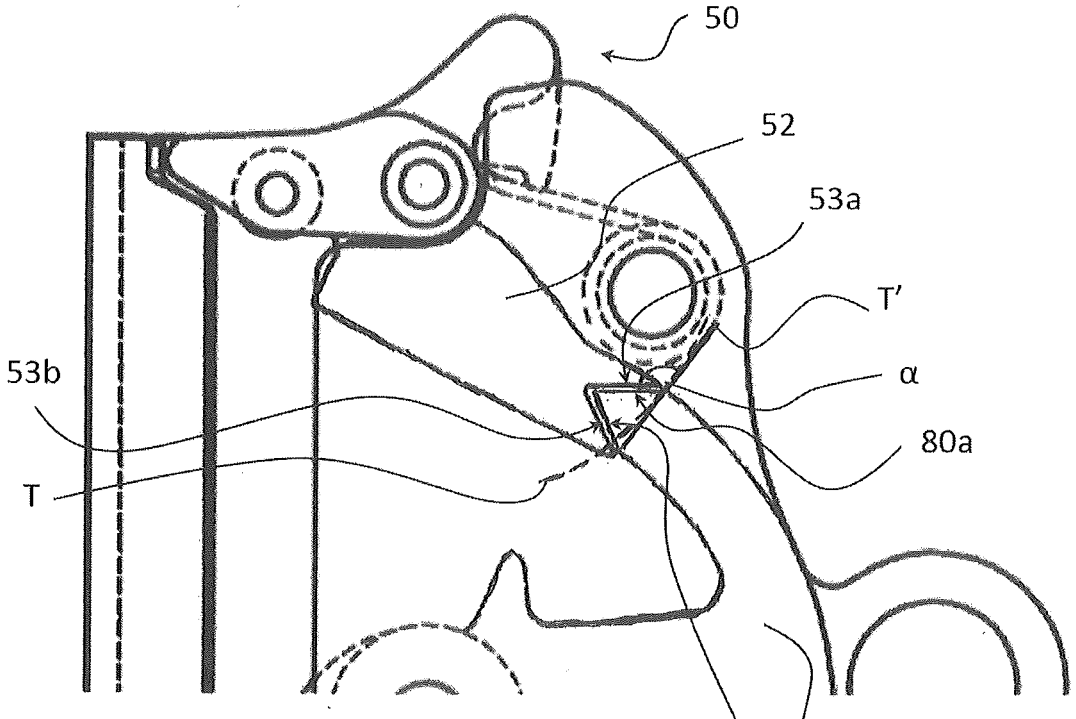


FIG. 10a

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 1359980 A **[0006]**
- US 5265696 A **[0010]**