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(54) **A CLAMPING DEVICE FOR CABLEWAYS**

KLEMMVORRICHTUNG FÜR SEILBAHNEN

DISPOSITIF DE SERRAGE POUR CÂBLES

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EP 2 934 981 B1

Description

Technical field

[0001] The present invention relates to a clamping device for automatic connection of a vehicle to a cable of a continuously moving cableway.

Prior art

[0002] Among the known clamping devices there are those comprising a support element securable to a suspension arm of a vehicle and forming the fixed jaw of the clamp, while the movable jaw is formed by an end of an operating rocker lever which is hinged with the support element for oscillating in a vertical plane. A slider is slidably mounted on the operating lever, said slider being elastically urged towards the jaws by two helical springs. A cam system, which is integral with the support system, interacts with the slider so as to convert the thrust exerted by the springs into a reaction force which rotates the lever upwards, causing the movable jaw to clamp the cable against the fixed jaw.

[0003] US patent 4,760,798 discloses a clamping device according to the preamble of Claim 1.

[0004] EP 0 621 163 A1 discloses a clamping device for coupling a gondola or chair to the a cable of a continuously moving cableway. The device comprises a fixed jaw, an operating rocker lever oscillating in a vertical plane, and a movable jaw formed at a first end of the operating lever, an elastic element in form of a torsion spring and a mechanism for converting the thrust exerted by the torsion spring into a force for rotating the rocker lever and the movable jaw to clamp the cable against the fixed jaw. The clamping device comprises a testing device for testing the clamping force. The testing device includes a test spring which is mounted on the rocker lever and acts counter to the torsion spring. When the compressive force of the torsion spring drops below a predetermined value, the test spring comes into action, causing a control lever to pivot outwardly. Switches that are associated with the outward-pivoted test lever are provided in the stations. As soon as the outward-pivoted test lever meets one of the switches, the cableway system is turned off.

[0005] In cableways one of the most frequent causes of faults is the breakage of the helical springs which are greatly stressed during use. The regulations stipulate that at least two springs must be provided in each clamping device of the aforementioned type. Cableway stations are provided with test devices which are designed to check the efficiency of the clamps. In particular the capacity for storing elastic energy, i.e. the undamaged condition of the springs, and the functionality of the mechanism for opening and closing the clamp are checked. It is required that this mechanism should maintain a given level of efficiency and should not be jammed such as to cause a significant reduction in the clamping force with which the clamp must engage with the cable, despite the fact that the springs are undamaged.

[0006] The cableway stations are generally provided with load cells associated with one of the ramps which cause opening or closing of the clamps. The load cells control the efficiency of the clamp springs when a vehicle passes by, measuring the thrust acting on the ramp when passed over by the clamp. Considering that this detection operation is performed in a fraction of a second and that the vehicles pass through the ramps at a considerable speed (about 5 metres per second), it can be understood that the measurement of the thrust of the springs is adversely affected both by the considerable mass of the clamp which engages the ramp and by the limited amount of time during which detection must be performed. In addition, imprecise setting of the load cells may result in a fault not being detected.

Summary of the invention

[0007] One object of the present invention is to detect, in a reliable manner and without the use of electronic devices or additional mechanisms, the undamaged condition of the springs intended to perform clamping of the clamp on the cable. Another object of the invention is to detect in good time any defects or breakages of the springs. A further object of the invention is to achieve the aforementioned objects in a low cost manner, using mechanical components which are relatively simple to produce.

[0008] These and other objects and advantages are achieved, according to an aspect of the invention, by a clamping device having the features defined in Claim 1. According to another aspect of the invention a cableway having the features defined in Claim 7 is provided. Preferred embodiments of the invention are defined in the dependent claims.

[0009] A clamping device for automatic connection of a vehicle to a cable of a continuously moving cableway comprises:

- a support element securable to a suspension arm of a vehicle;
- a fixed jaw integral with the support element;
- an operating rocker lever hinged to the support element for oscillating in a substantially vertical plane;
- a movable jaw formed at a first end of the operating lever;
- a slider slidably mounted on the operating lever;
- two or more elastic elements mounted on the operating lever so as to urge the slider towards the first end of the lever,
- a mechanism, preferably of the connecting rod type, connected to the slider and to the support element, so as to convert a thrust exerted by the elastic elements towards the first end of the lever into a force perpendicular to the lever so as to rotate the lever upwards causing the movable jaw to clamp the cable

against the fixed jaw.

[0010] The elastic elements comprise at least one first elastic unit and at least one second elastic unit. The elastic units are consecutively aligned and compressed along the operating lever. The first elastic unit, closer to the first end of the lever, acts against the slider; the second elastic unit, farther from the first end of the lever, acts against a reaction plate locked along the lever. The device also comprises an intermediate plate slidably mounted along the operating lever and arranged between the first and second elastic units. The intermediate plate has at least one portion protruding outwardly beyond the elastic units in a direction transverse to the operating lever. The position of the protruding portion provides a clear indication of the efficiency of the clamp.

[0011] Preferably, a detector is provided at a location adjacent to the path of the cable, the detector having a passage limited by a pair of surfaces spaced apart in a direction perpendicular to the cable. When all the elastic units of a single clamping device are undamaged, the protruding portion of the intermediate plate passes through the aforementioned passage, without interfering with any of the spaced surfaces of the detector.

Brief description of the drawings

[0012] A number of preferred embodiments of the invention are described hereinbelow with reference to the accompanying drawings, in which:

Figure 1 is a partial vertically sectioned view of a clamping device in a closed clamping condition; and
Figure 2 is a partial vertically sectioned view of the device according to Figure 1 in an open condition.

Detailed description

[0013] With reference initially to Figure 1, 10 designates overall a clamping device for automatic connection of a vehicle to a cable F of a continuously moving cableway, be it a cable-car or a chair-lift.

[0014] The clamping device 10 comprises a movable jaw 11 and a fixed jaw 12. The fixed jaw 12 is formed integrally by a support element 13 to which a suspension arm S of a vehicle (not shown) is secured. The type of suspended vehicle, for example consisting of a cabin or chair, is not relevant for the purposes of applicability of the present invention.

[0015] The support element 13, which is known per se, may comprise a pair of parallel vertical plates 14 which are spaced from each other in a direction parallel to that of the cable F. The support element 13 carries, by means of a shaft A, a roller wheel R1 known as a "third wheel".

[0016] The movable jaw 11 is defined by a first end of an operating rocker lever 15 hinged with the support element 13 to a fulcrum 16 about an axis of oscillation substantially parallel to the cable F, so as to be able to rotate in a substantially vertical plane, between a position closing on or clamping the cable (Figure 1) and an open position (Figure 2). The operating lever 15 has a second end 18 on which a roller R2 (known per se) is rotatably mounted so as to cause oscillation of the lever 15 about the fulcrum 16 with consequent displacement of the movable jaw 11 away from the cable F.

[0017] The operating lever 15 has, slidably mounted thereon, a slider 20 which is preferably formed as a flat sliding plate, with a tubular central portion 21 inserted on the lever 15 and a plate portion 22 which extends transversely with respect to the lever 15. The slider 20 is connected in an articulated manner with the support element 13 by means of a mechanism which comprises, in an advantageous embodiment, a pair of connecting rods 23 which are arranged parallel and alongside each other in a direction parallel to the cable F; only one of the connecting rods is visible in Figures 1 and 2. The connecting rods 23 are pivotably mounted to the slider 20 and on the support element 13 about two respective pins 24, 25 parallel to the axis of oscillation of the operating lever 15.

[0018] Elastic elements, preferably helical springs 30, 31, 32, 33 designed to urge the connecting rods 23 against the support element 13 are arranged between the slider 20 and the second free end 18 of the lever. The connecting rods 23 convert the axial thrust exerted by the elastic elements 30-33, which are compressed along the longitudinal axis of the lever 15, into a reaction force having a component perpendicular to the longitudinal axis of the lever. This perpendicular component stresses the lever 15, causing it to oscillate or rotate upwards so that the movable clamp 11 clamps the cable F against the fixed jaw 12.

[0019] The elastic elements 30-33 act against a fixed reaction plate 19 which is locked to the free end 18 of the lever, adjacent to the end roller R2. The end roller R2 is intended to cooperate, in a manner known per se, with a profiled fixed guide (not shown) provided at the stations for arrival and departure of the vehicle.

[0020] All the elastic elements 30-33 cooperate so as to cause the operating lever 15 to rotate towards the raised position for clamping the cable F.

[0021] In the illustrated embodiment, the elastic elements are divided into two elastic units (or groups) which are aligned consecutively along the lever 15. The first of these two units, comprising the springs 30 and 31, is closer to the movable jaw 11 and pushes against the slider 20. The second elastic unit, which comprises the springs 32 and 33, is farther from the jaw and pushes against the end reaction plate 19. Each elastic unit acts in a thrusting relationship against an intermediate plate 35 slidably mounted along the operating lever 15 in an intermediate position between the slider 20 and the reaction plate 19 and arranged between the first and second elastic units.

[0022] When the vehicle enters a station, gripped by the pulling cable F, the device is initially in the condition shown in Figure 1 where the jaws are clamped around

the cable. The springs 30-33 are compressed between the slider 20 and the end plate 19 and exert, by reacting with the connecting rods 23, a thrust which keeps the lever raised in the jaw clamping position. The open condition of the jaws, shown in Figure 2, is reached when the vehicle enters the station as a result of contact of the end roller R2 against a top profiled guide (not shown) which causes lowering of the operating lever 15. The consequent reduction in the angle between the lever 15 and the connecting rods 23 causes a further compression of the springs. When the vehicle leaves the station, an upwardly diverging profiled guide (not shown) allows raising of the roller and consequent clamping of the jaws as a result of the springs.

[0023] The intermediate plate 35, which is preferably made of light material, for example aluminium or aluminium alloy, has an outer peripheral portion 36 which protrudes outwardly beyond the helical springs 30, 32 in a radial or transverse direction with respect to the axial direction in which the lever 15 extends. The protruding portion 36 of the intermediate plate acts as a detection element for checking the undamaged condition of the springs.

[0024] In the case where any one of the springs 30-33 should break or undergo deterioration such that it is no longer able to provide the required thrust, the intermediate plate 35 will be positioned in an axial equilibrium position, different from that shown in Figure 1, i.e. closer towards or further away from the jaw 11, depending on which elastic unit includes the damaged spring. A different axial position of the intermediate plate 35 indicates a defective condition of any one of the springs 30-33.

[0025] The aforementioned checking method is inherently safe because it allows a malfunction to be detected irrespective as to the defective element involved. The present checking device distinguishes substantially the clamping device from known devices which envisage a functional check by means of a system of non self-checking opposed springs. In these known devices, a breakage of one of the opposing springs affects the checking efficiency since the breakage cannot be verified during the course of normal operation of the cableway. With the present clamping device, the spatial position of the projecting portion 36 provides a clear indication of the efficiency of the clamp based on an inherent safety principle.

[0026] In the preferred embodiment the intermediate plate 35 comprises a tubular or sleeve-like central portion 37 slidably mounted on the lever 15 so as to precisely guide the plate 35. The two series of oppositely arranged springs rest, in this example, against a disc portion 38 which extends transversely or perpendicularly with respect to the tubular central portion 37 and the operating lever 15. Those skilled in the art will understand that both the intermediate plate 35 as well as the slider 20 and the reaction plate 19 may be configured differently from the example shown here. In general, each of these components (35, 20, 19) should provide a stable support seat for the ends of the helical springs. The intermediate plate 35 may have a containing edge (not shown) for the ends of the springs, similar to the edges 26 and 27 of the slider 20 and the end plate 19. It is possible to provide the components 35, 20 and 19 with other shapes suitable for retaining the end parts of the springs, for example concavities and recesses in the form of annular grooves.

[0027] Figure 1 shows, schematically designated by D, a mechanical detector which is arranged at a location along the path of the cable, for example at a station of the cableway. The detector D provides a passage P, defined for example between a pair of facing walls B1, B2 which extend in a direction substantially parallel to the cable and which define between them a range of positions indicating the correct operation of the springs.

[0028] The detector D is positioned with respect to the path followed by the clamping device 10 so that, if the springs of the device are undamaged, the protruding portion 36 of the intermediate plate 35 passes inside the space or passage P lying between the two walls B1, B2 without coming into contact with the latter.

[0029] If, instead, at least one of the springs is damaged, when the vehicle passes the protruding portion 36 will interfere with one of the walls B1 or B2 which form the limits of the range of permissible positions. Contact of the intermediate plate 35 with the detector D may thus cause the emission of an alarm signal which alerts the personnel of the cable plant to the presence of a fault. Alternatively or in addition, the device may be set to cause immediate stoppage of the cable. For example, the detector D may be mounted in a movable or floating manner on a stationary support C, for example operationally coupled to a microswitch (not shown) of an alarm or emergency device which is activated by the contact of the intermediate plate 35 with the detector D and/or by the movement of one of the components of the detector (for example one of the two walls B1 or B2) following contact with the intermediate plate.

[0030] As may be understood, the clamping device allows a fault to be detected in good time, by means of mechanical elements which are relatively simple and inherently safe. Additional checking mechanisms or devices are not required. A possible fault affecting any one of the springs 30-33 for closing the movable jaw 11 is indicated by the springs themselves, which vary the position of the intermediate plate 35.

[0031] In an alternative embodiment, which is less preferred and not shown, each of the two elastic units may comprise a single elastic element instead of two elements. According to this variant, only two single springs (for example the single springs 31 and 33) may be provided, said springs being consecutively aligned along the lever 15 and acting respectively against the slider 20 and against the end plate 19 and being separated by the intermediate plate.

[0032] The coaxial arrangement of two springs for each elastic unit, as shown for example in the accompanying drawings, is advantageous since two coaxial springs exert a guiding action mutually retaining each other. Should

one of the two springs, for example the inner spring, break, it will maintain substantially unchanged its position and orientation determined by the outer spring which is undamaged. In this case, breakage of one of the two springs will result in a minimum loss of thrust which may be quantified as being in the region of 10-15% of the thrust of an identical undamaged spring. Owing to the containing action ensured by the other - still undamaged - spring of the pair of coaxial springs, the damaged spring will also continue to exert a residual thrust in the axial direction at least equal to 85% of the nominal value, thus contributing to the correct operation of the clamp as a whole. Differently, with a pair of springs which are for example arranged alongside each other in parallel, a broken spring may be arranged crosswise, without providing any thrust, and, protruding from the clamping device, may risk striking and damaging other parts of the cable plant, or fall off.

[0033] The intermediate plate is coupled with and guided precisely on the lever; therefore it is possible to detect a longitudinal position of the intermediate plate which is only slightly outside of a range of positions predefined as being permissible or indicative of correct operation with undamaged springs. The system comprising the clamping device with intermediate plate and the associated detector is therefore very sensitive and reliable.

[0034] The mechanism which converts the axial thrust of the springs into a transverse thrust and causes closing of the jaws could, in an alternative embodiment, comprise a cam device with rollers instead of the connecting rods 23, as illustrated for example in U.S. patent No. 4,760,798. A mechanism with connecting rods is however advantageous in that it constitutes a constructional simplification and allows a reduction in costs. The arrangement of two connecting rods 23, aligned in a direction parallel to the axis of oscillation defined by the pin 16, forms an additional safety element, making the system redundant. The clamping device may however function also with a single connecting rod 23.

[0035] Despite the fact that the invention has been designed to be implemented with elastic elements in the form of helical springs, it will be understood that, in embodiments different from that shown here, the elastic elements may be formed by different devices, for example springs having a form other than a helical spring, such as Belleville springs.

Different aspects and embodiments of the clamping device have been described. It is understood that each embodiment may be combined with any other embodiment. The invention, moreover, is not limited to the embodiments described, but may be varied within the scope defined by the accompanying claims.

Claims

1. A clamping device (10) for automatic connection of a vehicle to a cable (F) of a continuously moving cableway, comprising:

- a support element (13) securable to a suspension arm (S) of a vehicle;
- a fixed jaw (12) integral with the support element (13);
- an operating rocker lever (15) hinged to the support element (13) for oscillating in a substantially vertical plane;
- a movable jaw (11) formed at a first end of the operating lever (15);
- a slider (20), slidably mounted on the operating lever;
- at least two elastic elements (31, 33) mounted on the operating lever (15) so as to urge the slider (20) towards the first end of the lever,
- a mechanism (23) connected to the slider (20) and the support element (13), for converting a thrust exerted by the elastic elements (31, 33) towards the first end of the lever (15) into a force perpendicular to the lever, so as to rotate the lever upwards causing the movable jaw (11) to clamp the cable (F) against the fixed jaw (12);

characterized in that

the elastic elements comprise at least one first elastic unit (30, 31) and at least one second elastic unit (32, 33), consecutively aligned and compressed along the operating lever (15), wherein the first elastic unit (30, 31), closer to the first end of the lever, acts against the slider (20), and the second elastic unit (32, 33), farther from the first end of the lever, acts against a reaction plate (19) locked along the lever, and that

the device (10) further comprises an intermediate plate (35) slidably mounted along the operating lever (15) and arranged between the first (31) and second (33) elastic units, wherein the intermediate plate provides at least one portion (36) protruding outwardly beyond the elastic units (30, 32) in a direction transverse to the operating lever (15) .

2. A clamping device according to Claim 1, **characterized in that** the elastic elements (30-33) comprise helical springs.

3. A clamping device according to Claim 2, **characterized in that**

the first elastic unit comprises two helical springs (30, 31) arranged coaxially relative to each other and compressed between the slider (20) and the intermediate plate (35), and that

the second elastic unit comprises two helical springs (32, 33) arranged coaxially relative to each other and compressed between the intermediate plate (35) and the reaction plate (19).

4. A clamping device according to any one of the pre-

ceding claims, **characterized in that** the mechanism (23) comprises at least one connecting rod (23) pivotably mounted to the slider (20) and the support element (13) about two respective pins (24, 25) which are parallel to an axis of oscillation defined by a further pin (16) by means of which the operating lever (15) is hinged to the support element (13).

5. A clamping device according to Claim 4, **characterized in that** the mechanism (23) comprises at least two connecting rods (23) both pivotably mounted to the slider (20) and the support element (13) around two respective pins (24, 25) which are parallel to an axis of oscillation defined by the further pin (16) by means of which the operating lever (15) is hinged with the support element (13) and that the two connecting rods are spaced from one another and aligned in a direction parallel to the direction of the axis of oscillation of the further pin (16).

6. A clamping device according to any one of the preceding claims, **characterized in that** the intermediate plate (35) comprises a central guiding portion (37) of tubular shape, slidably mounted on the operating lever (15), and a disc portion (38) extending transversely from the central portion (37), and that the protruding portion (36) is formed by an outer peripheral portion of the disc portion (38), the spatial position of the protruding portion (36) providing a clear indication of the efficiency of the clamp according to an inherent safety principle.

7. A continuously moving cableway, comprising a cable (F) and a plurality of vehicles, each automatically connectable to the cable (F) by means of a respective plurality of clamping devices (10) according to at least one of the preceding claims, **characterized in that** the cableway comprises at least one detector (D) arranged at a location adjacent to the path of the cable (F), the detector having a passage (P) limited by a pair of surfaces (B1, B2) spaced apart in a direction essentially perpendicular to the cable (F) at said location, whereby the protruding portions (36) of the intermediate plates (35) pass through the passage (P) without interfering with either of the surfaces (B1, B2) when both the elastic units of a single clamping device (10) are undamaged.

8. A cableway according to Claim 7, **characterized in that** the surfaces (B1, B2) are defined by two respective walls extending in a direction substantially parallel to the cable at said location.

9. A cableway according to Claim 7 or 8, **characterized in that** the surfaces (B1, B2) are movably mounted on a stationary support (C).

10. A cableway according to any one of Claims 7 to 9, **characterized in that** the detector (D) is associated with a signal generator set to generate a signal when at least one of the protruding portions (36) of the intermediate plates (35) contacts at least one of the surfaces (B1, B2) of the passage (P).

Patentansprüche

1. Klemm- bzw. Spannvorrichtung (10) zur automatischen Verbindung eines Fahrzeugs mit einem Kabel (F) einer sich kontinuierlich bewegenden Seilbahn, umfassend:

- ein Stütz- bzw. Trägerelement (13), das an einem Aufhängungsarm (S) eines Fahrzeugs befestigbar ist;
- eine feste Backe (12), die integral bzw. einstückig mit dem Trägerelement (13) ausgebildet ist;
- einen Betätigungskipphebel (15), der an dem Trägerelement (13) angelenkt ist, um in einer im Wesentlichen vertikalen Ebene zu schwingen;
- eine bewegliche Backe (11), die an einem ersten Ende des Betätigungshebels (15) ausgebildet ist;
- einen Schieber (20), der verschiebbar an dem Betätigungshebel montiert ist;
- zumindest zwei elastische Elemente (31, 33), die an dem Betätigungshebel (15) montiert sind, um den Schieber (20) in Richtung des ersten Endes des Hebels zu drängen,
- einen Mechanismus (23), der mit dem Schieber (20) und dem Trägerelement (13) verbunden ist, um einen von den elastischen Elementen (31, 33) auf das erste Ende des Hebels (15) ausgeübten Druck in eine Kraft senkrecht zu dem Hebel umzuwandeln, um den Hebel nach oben zu drehen, wodurch die bewegliche Backe (11) veranlasst wird, das Kabel (F) gegen die feste Backe (12) zu klemmen;

dadurch gekennzeichnet, dass
die elastischen Elemente zumindest eine erste elastische Einheit (30, 31) und zumindest eine zweite elastische Einheit (32, 33) umfassen, die nacheinander entlang des Betätigungshebels (15) ausgerichtet und zusammengedrückt sind, wobei die erste elastische Einheit (30, 31), die näher an dem ersten Ende des Hebels ist, gegen den Schieber (20) wirkt, und die zweite elastische Einheit (32, 33), die weiter von dem ersten Ende des Hebels entfernt ist, gegen eine Reaktionsplatte (19) wirkt, die entlang des Hebels verriegelt ist, und dass die Vorrichtung (10) ferner eine Zwischenplatte (35) umfasst, die verschiebbar entlang des Betätigungshebels (15) montiert und zwischen der ersten (31) und der zweiten (33) elastischen Einheit angeordnet ist, wobei die Zwischenplatte zumindest einen Abschnitt (36) bereitstellt, der

über die elastischen Einheiten (30, 32) in einer Richtung quer zu dem Betätigungshebel (15) hinausragt.

2. Klemmvorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** die elastischen Elemente (30-33) Schraubenfedern umfassen.

3. Klemmvorrichtung nach Anspruch 2, **dadurch gekennzeichnet** die erste elastische Einheit zwei Schraubenfedern (30, 31) umfasst, die koaxial zueinander angeordnet und zwischen dem Schieber (20) und der Zwischenplatte (35) zusammengedrückt sind, und dass
die zweite elastische Einheit zwei Schraubenfedern (32, 33) umfast, die koaxial zueinander angeordnet und zwischen der Zwischenplatte (35) und der Reaktionsplatte (19) zusammengedrückt sind.

4. Klemmvorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** der Mechanismus (23) zumindest eine Verbindungsstange (23) umfasst, die schwenkbar an dem Schieber (20) und dem Trägerelement (13) um zwei jeweilige Stifte (24, 25) montiert ist, die parallel zu einer Schwingungsachse sind, die durch einen weiteren Stift (16) definiert ist, mittels dem der Betätigungshebel (15) an dem Trägerelement (13) angelenkt ist.

5. Klemmvorrichtung nach Anspruch 4, **dadurch gekennzeichnet, dass** der Mechanismus (23) zumindest zwei Verbindungsstangen (23) umfasst, die beide schwenkbar am Schieber (20) und an dem Trägerelement (13) um zwei jeweilige Stifte (24, 25) montiert sind, die parallel zu einer Schwingungsachse sind, die durch den weiteren Stift (16) definiert ist, mittels dem der Betätigungshebel (15) an dem Trägerelement (13) angelenkt ist, und dass die beiden Verbindungsstangen voneinander beabstandet und in einer Richtung parallel zu der Richtung der Schwingungsachse des weiteren Stifts (16) ausgerichtet sind.

6. Klemmvorrichtung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Zwischenplatte (35) einen am Betätigungshebel (15) verschiebbar montierten zentralen Führungsabschnitt (37) in Rohrform und einen Scheibenabschnitt (38) umfasst, der sich quer von dem zentralen Abschnitt (37) erstreckt, und dass der vorstehende Abschnitt (36) durch einen Außenumfangsabschnitt des Scheibenabschnitts (38) gebildet ist, wobei die räumliche Position des vorstehenden Abschnitts (36) einen deutlichen Hinweis auf die Effizienz der Klemme gemäß einem inhärenten Sicherheitsprinzip liefert.

7. Kontinuierlich bewegende Seilbahn, umfassend ein Kabel (F) und eine Mehrzahl von Fahrzeugen, die jeweils automatisch mittels einer jeweiligen Mehrzahl von Klemm- bzw. Spannvorrichtungen (10) nach zumindest einem der vorhergehenden Ansprüche mit dem Kabel (F) verbindbar sind, **dadurch gekennzeichnet, dass** die Seilbahn zumindest einen Detektor (D) umfasst, der an einer Stelle benachbart zu dem Weg des Kabels (F) angeordnet ist, wobei der Detektor einen Durchgang (P) aufweist, der durch ein Paar Flächen bzw. Oberflächen (B1, B2) begrenzt ist, die in einer Richtung im Wesentlichen senkrecht zu dem Kabel (F) an dieser Stelle voneinander beabstandet sind, wodurch die vorstehenden Abschnitte (36) der Zwischenplatten (35) durch den Durchgang (P) verlaufen, ohne mit einer der Flächen (B1, B2) zusammenzutreffen, wenn beide elastischen Einheiten einer einzelnen Klemmvorrichtung (10) unbeschädigt sind.

8. Seilbahn nach Anspruch 7, **dadurch gekennzeichnet, dass** die Flächen (B1, B2) durch zwei jeweilige Wände definiert sind, die sich in einer Richtung im Wesentlichen parallel zu dem Kabel an der Stelle erstrecken.

9. Seilbahn nach Anspruch 7 oder 8, **dadurch gekennzeichnet, dass** die Flächen (B1, B2) an einem stationären Träger (C) beweglich montiert sind.

10. Seilbahn nach einem der Ansprüche 7 bis 9, **dadurch gekennzeichnet, dass** dem Detektor (D) ein Signalgenerator zugeordnet ist, der so eingestellt ist, dass er ein Signal erzeugt, wenn zumindest einer der vorspringenden Abschnitte (36) der Zwischenplatten (35) zumindest eine der Flächen (B1, B2) des Durchlasses (P) berührt.

Revendications

1. Dispositif de serrage (10) pour relier automatiquement un véhicule à un câble (F) d'un téléphérique à mouvement continu comprenant :

- un élément de support (13) fixable à un bras de suspension (S) d'un véhicule ;
- une mâchoire fixe (12) faisant partie intégrante avec l'élément de support (13) ;
- un levier oscillant opérationnel (15) articulé sur l'élément de support (13) pour osciller dans un plan sensiblement vertical ;
- une mâchoire mobile (11) formée à une première extrémité du levier opérationnel (15) ;
- un coulisseau (20), monté de manière coulissante sur le levier opérationnel ;
- au moins deux éléments élastiques (31, 33) montés sur le levier opérationnel (15) de façon à pousser le coulisseau (20) vers la première extrémité du levier,

- un mécanisme (23) relié au coulisseau (20) et à l'élément de support (13), pour convertir une poussée exercée par les éléments élastiques (31, 33) vers la première extrémité du levier (15) en une force perpendiculaire au levier, de façon à faire tourner le levier vers le haut amenant la mâchoire mobile (11) à serrer le câble (F) contre la mâchoire fixe (12) ;

caractérisé en ce que
les éléments élastiques comprennent au moins une première unité élastique (30, 31) et au moins une seconde unité élastique (32, 33), alignées consécutivement et comprimées le long du levier opérationnel (15), dans lequel la première unité élastique (30, 31), plus proche de la première extrémité du levier, agit contre le coulisseau (20), et la seconde unité élastique (32, 33), plus éloignée de la première extrémité du levier, agit contre une plaque de réaction (19) verrouillée le long du levier, et **en ce que**
le dispositif (10) comprend en outre une plaque intermédiaire (35) montée de manière coulissante le long du levier opérationnel (15) et agencée entre les première (31) et seconde (33) unités élastiques, dans lequel la plaque intermédiaire fournit au moins une partie (36) qui fait saillie vers l'extérieur au-delà des unités élastiques (30, 32) dans une direction transversale au levier opérationnel (15).

2. Dispositif de serrage selon la revendication 1, **caractérisé en ce que** les éléments élastiques (30 à 33) comprennent des ressorts hélicoïdaux.

3. Dispositif de serrage selon la revendication 2, **caractérisé en ce que**
la première unité élastique comprend deux ressorts hélicoïdaux (30, 31) agencés coaxialement l'un par rapport à l'autre et comprimés entre le coulisseau (20) et la plaque intermédiaire (35), et **en ce que**
la seconde unité élastique comprend deux ressorts hélicoïdaux (32, 33) agencés coaxialement l'un par rapport à l'autre et comprimés entre la plaque intermédiaire (35) et la plaque de réaction (19).

4. Dispositif de serrage selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le mécanisme (23) comprend au moins une tige de liaison (23) montée de manière pivotante sur le coulisseau (20) et l'élément de support (13) autour de deux broches (24, 25) respectives qui sont parallèles à un axe d'oscillation défini par une autre broche (16) au moyen de laquelle le levier opérationnel (15) est articulé sur l'élément de support (13).

5. Dispositif de serrage selon la revendication 4, **caractérisé en ce que** le mécanisme (23) comprend au moins deux tiges de liaison (23) toutes deux montées de manière pivotante sur le coulisseau (20) et l'élément de support (13) autour de deux broches (24, 25) respectives qui sont parallèles à un axe d'oscillation défini par l'autre broche (16) au moyen de laquelle le levier opérationnel (15) est articulé avec l'élément de support (13) et **en ce que** les deux tiges de liaison sont espacées l'une de l'autre et alignées dans une direction parallèle à la direction de l'axe d'oscillation de l'autre broche (16).

6. Dispositif de serrage selon l'une quelconque des revendications précédentes, **caractérisé en ce que** la plaque intermédiaire (35) comprend une partie de guidage centrale (37) de forme tubulaire, montée de manière coulissante sur le levier opérationnel (15), et une partie de disque (38) s'étendant de manière transversale depuis la partie centrale (37), et **en ce que** la partie en saillie (36) est formée par une partie périphérique externe de la partie de disque (38), la position spatiale de la partie en saillie (36) fournissant une indication claire de l'efficacité du serrage selon un principe de sécurité intrinsèque.

7. Téléphérique à mouvement continu, comprenant un câble (F) et une pluralité de véhicules, chacun connectable automatiquement au câble (F) au moyen d'une pluralité respective de dispositifs de serrage (10) selon au moins une des revendications précédentes, **caractérisé en ce que** le téléphérique comprend au moins un détecteur (D) agencé à un emplacement adjacent au trajet du câble (F), le détecteur présentant un passage (P) limité par une paire de surfaces (B1, B2) espacées dans une direction essentiellement perpendiculaire au câble (F) audit emplacement, moyennant quoi les parties en saillie (36) des plaques intermédiaires (35) passent à travers le passage (P) sans interférer avec l'une ou l'autre des surfaces (B1, B2) lorsque les deux unités élastiques d'un dispositif de serrage (10) unique ne sont pas endommagées.

8. Téléphérique selon la revendication 7, **caractérisé en ce que** les surfaces (B1, B2) sont définies par deux parois respectives s'étendant dans une direction essentiellement parallèle au câble audit emplacement.

9. Téléphérique selon la revendication 7 ou 8, **caractérisé en ce que** les surfaces (B1, B2) sont montées de manière mobile sur un support fixe (C).

10. Téléphérique selon l'une quelconque des revendications 7 à 9, **caractérisé en ce que** le détecteur (D) est associé à un groupe générateur de signal pour générer un signal lorsqu'au moins une des parties en saillie (36) des plaques intermédiaires (35) entre en contact avec au moins une des surfaces (B1, B2) du passage (P).

Fig.1

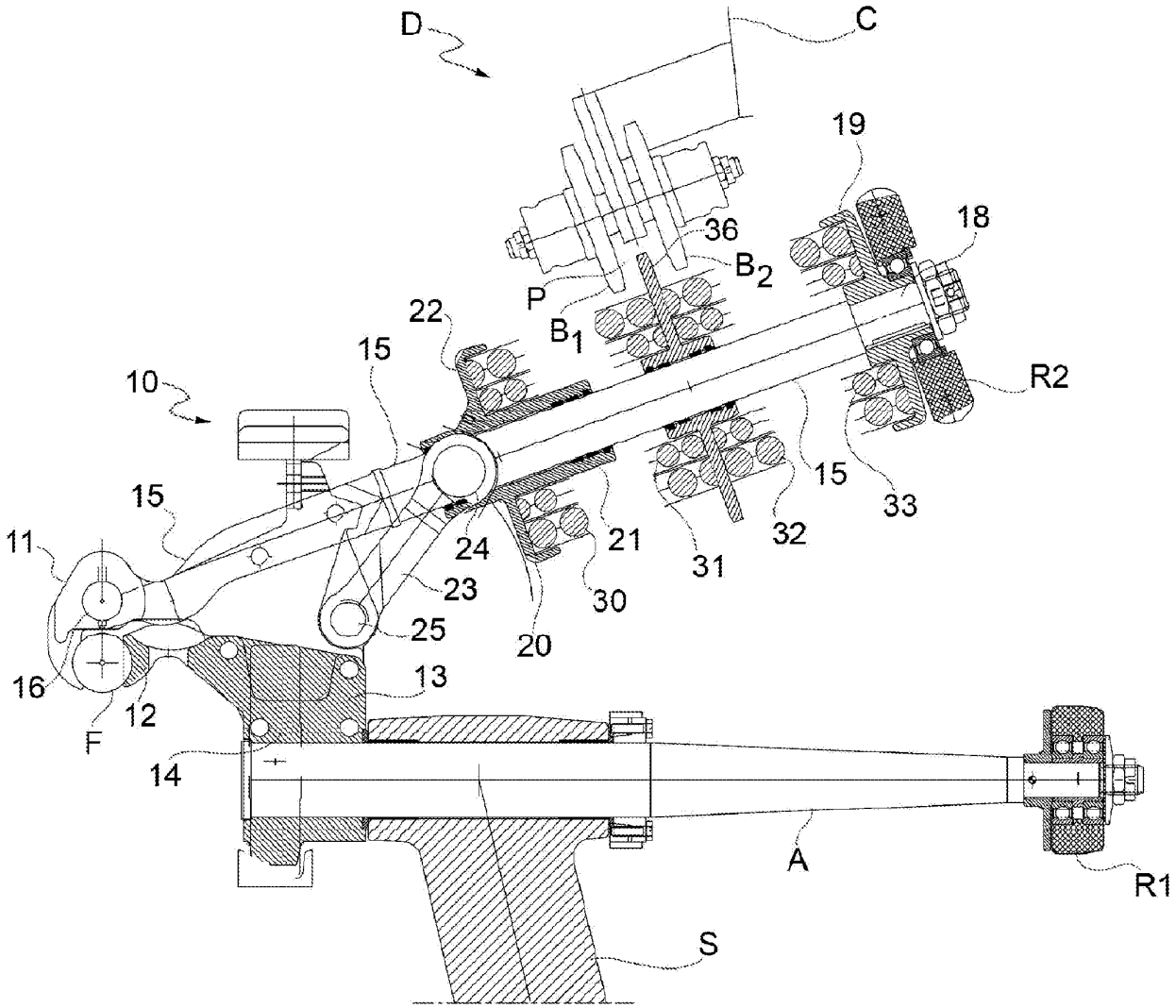
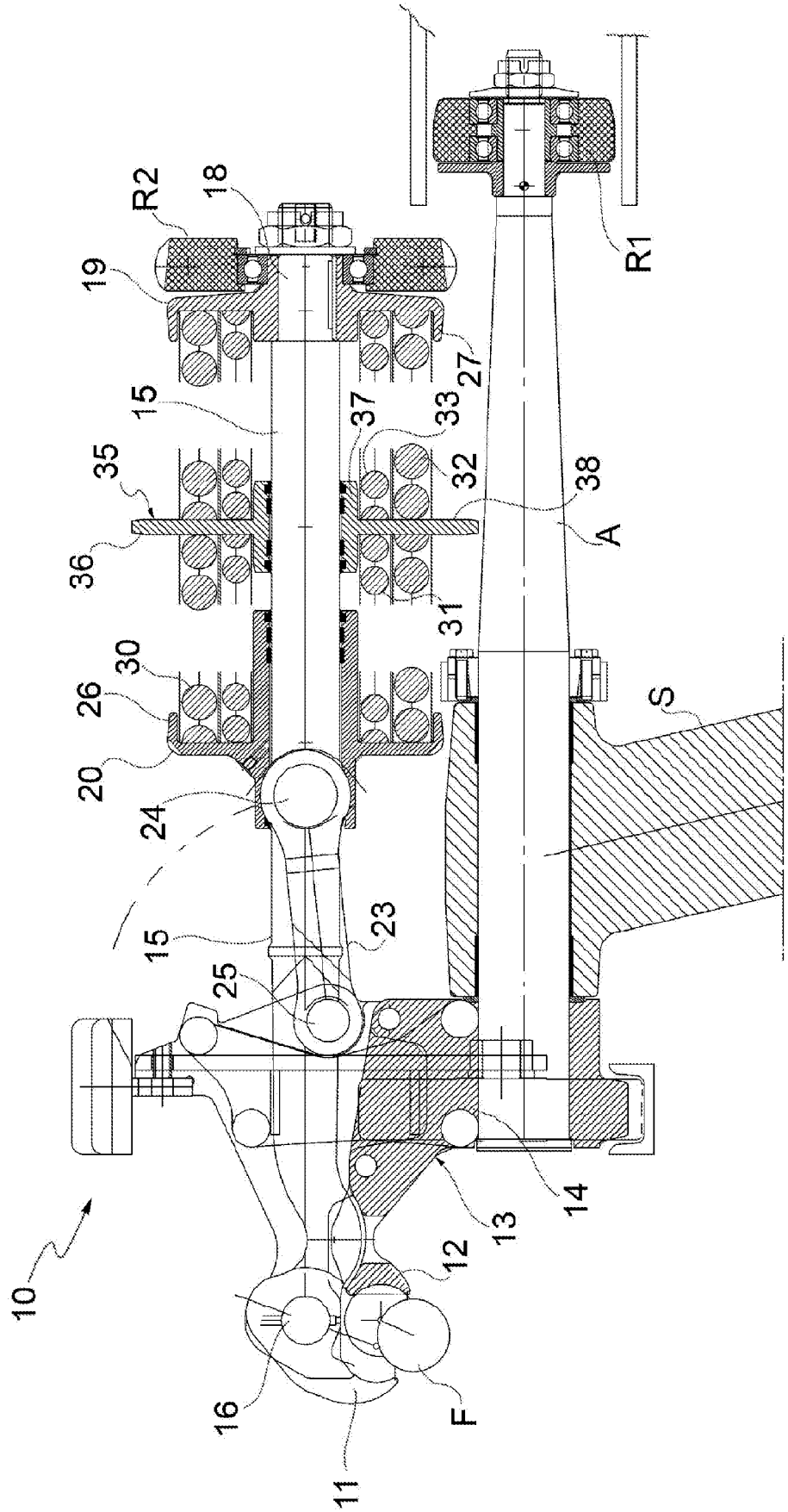

D
C
19
18
36
B_2
P
B_1
22
15
10
R2
15
15
33
11
24
21
32
31
23
30
25
20
16
13
12
F
14
A
R1
S

Fig.2


R2
18
19
27
15
37
33
35
32
38
A
36
31
30
26
S
20
24
23
15
25
14
13
12
10
16
F
11
R1

REFERENCES CITED IN THE DESCRIPTION

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