

Description:

**Device for monitoring cables of a lift**

5 The invention relates to a device for monitoring cables of a lift, which are connected with a carrier frame of a lift cage by means of a cable end connection and an apertured plate, wherein a respective support pin is provided for each cable for fixing the apertured plate, the movement of the support pin in the case of slack cable being able to be monitored by means of a sensor.

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A monitoring device for support cables of a lift platform has become known from the specification JP 06345352. The end of each support cable is provided with a cable eye stiffener at which a support pin is arranged. An end member is provided at the free support pin end, wherein a compression spring is arranged between a carrier frame and the end member and in the case of slack support cable moves the support pin together with the end member downwardly relative to the carrier frame. The movement of the end member is monitored by means of limit switches and issues a warning.

15 A disadvantage of the known device resides in the fact that the monitoring of each support cable is costly. Moreover, the end members of the support pins lie closely adjacent to one another, whereby arrangement of the limit switches is made difficult.

Here the invention will provide a remedy. The invention, as characterised in claim 1, meets the object of avoiding the disadvantages of the known device and of creating a device for monitoring slack cables which ensures the safety of lift passengers by simple means.

Advantageous developments of the invention are indicated in the dependent patent claims.

30 The advantages achieved by the invention are essentially to be seen in that the monitoring device is suitable for every form of arrangement of the support pins or for every hole pattern of the apertured plate serving as connecting element between carrier frame and support pin. Only one sensor is necessary for monitoring all support pins. Moreover, the monitoring device according to the invention is independent of the number of support pins to be monitored and independent of the geometry of the apertured plate. The monitoring

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device is light and able to be retrofitted without great cost, has little sensitivity to acceleration/retardation (false triggering) and has low assembly and mounting costs.

The present invention is explained in more detail by reference to the accompanying  
 5 figures, in which:

Fig. 1 shows a carrier frame with a lift cage,

Fig. 2 shows an upper carrier frame yoke with apertured plate,

10 Figs. 3, 3a and 3b show a monitoring device with pull cord for a support cable,

Figs. 4 and 4.1 show details of a trigger element for the pull cord,

15 Figs. 5 and 6 show details of the fastening of the pull cord end,

Fig. 7 shows the monitoring device with pull cord in the case of scattered arrangement of the support pins and

20 Fig. 8 shows a monitoring device with pull cord for a compensating cable.

In Fig. 1 an upper yoke is denoted by 1, which together with vertically extending beams 2 and a lower yoke 3 forms a carrier frame which is suspended at a cable train consisting of support cables 5 and is movable in a lift shaft (not illustrated) along guide rails (not  
 25 illustrated). In Figure 1 the cable train consists of three cables. The number of cables 5 in the cable train is dependent on the cage weight, on the nominal load and on the cable cross-section that is used. A base frame 6 seated on the lower yoke 3 carries a lift cage 7 provided for vertical transport of persons and goods.

30 Fig. 2 shows the upper support frame yoke 1, at which an apertured plate 10 is arranged by means of brackets 11. The apertured plate 10 supports the carrier frame 4. A respective cable eye stiffener 12, at which a support pin 13 engages, is provided as cable end connection for each cable 5. The cable 5 forms a loop in the cable eye stiffener 12, wherein the cable end is fixed to the cable 5 by means of cable clamps 14. The apertured  
 35 plate 10 has a respective bore 15 for each support pin 13, wherein the support pin 13

penetrates the bore 15 and protrudes below the apertured plate 10. The support pin 13 has at the lower end a thread with a nut 16 which is secured by means of a locknut 17. A compression spring 18 (for example at least one helical spring or at least one plate spring) is arranged between the nut 16 and the apertured plate 10. In the case of slack cable 5 the compression spring 18 moves the support pin 13 downwardly relative to the carrier frame, wherein the movement P1 of the support pin 13 is detected by means of the monitoring device according to the invention.

Fig. 3, Fig. 3a and Fig. 3b show the mode of function of the monitoring device according to the invention with pull cord 19 for a support cable 5. In the case of slack cable 5 the support pin 13 moves downwardly relative to the carrier frame as symbolised by the arrow P1. Fixedly clamped between the nut 16 and the locknut 17 is a trigger element 20 which entrains the taut pull cord 19 in the case of the movement P1 of the support pin 13. The pull cord 19 is fixed at one end to a fixing point 21 of a bracket 22. The bracket 22 is fixedly clamped to the apertured plate 10 by means of screws 23. A clip connection can also be provided instead of the screw. The nut 16 bears against a support 32, wherein the compression spring 18 is arranged between apertured plate and support 32. In the case of slack cable 5 the compression spring 18 moves the support 32 and thus the support pin 13 downwardly relative to the carrier frame, wherein the movement P1 of the support pin 13 is detected by means of the monitoring device according to the invention.

The deflection of the pull cord 19 caused by the movement P1 of the support pin 13 is illustrated by a dashed line. A sensor or a limit value detector 31 is actuated by the deflection of the pull cord 19, as illustrated in Fig. 7.

As shown in Fig. 3b, a compression spring 33 which is substantially stronger by comparison with the compression spring 18 can be provided for compensation for cable tension differences. The compression spring 33 is supported at the support 32, at which also a tab 25, which serves as trigger element 20, with bore 26 is arranged, wherein the pull cord 19 is guided through the bore. If the compression spring 33 relaxes due to cable stretching, the support pin 13 moves downwardly without having to deflect the pull cord 19. In the case of slack cable 5 the compression spring 18 moves the support 32 and thus the support pin 13 downwardly relative to the carrier frame, wherein the movement P1 of the support pin 13 is detected by means of the pull cord 19.

Fig. 4 shows details of the trigger element 20 for the pull cord 19. The trigger element 20 substantially consists of a washer 24, at which a tab 25 with bore 26 is arranged. The pull cord 19 is drawn through the bore 26.

5 Fig. 4.1 shows a variant of embodiment of the trigger element 20. An arm 24.1 is arranged at the washer 24 instead of the tab 25. The arm 24.1 deflects the pull cord 19 in the case of slack cable 5.

Fig. 5 and Fig. 6 show details of the fastening of a pull cord end at the fixing point 21. One  
10 end of the pull cord 19 is fixedly clamped by means of shackle 27 and screw 27.1 to the bracket 22.

Fig. 7 shows the monitoring device with pull cord 19 in the case of an apertured plate 10 with a scattered arrangement of the support pins 13. The apertured plate 10 is shown as  
15 seen from below. The other end of the pull cord 19 is arranged at a slide 28 which is guided in a housing 29. The housing 29 is fixed to the apertured plate 10 by means of brackets. With the deflection of the pull cord 19 the slide 28 is set into the movement symbolised by the arrow P2, wherein the slide 28 actuates, by means of its control chamfer 30, a limit value detector 31.

20 As soon as the deflection of the pull cord 19 is eliminated by readjustment of the tripped support pin 13 by means of the nuts 16, 17, the spring-loaded slide 28 automatically moves back into its starting position. The monitoring device according to the invention is operationally ready again.

25 Fig. 8 shows the mode of function of the monitoring device according to the invention with pull cord 19 for a compensating cable, also called balance cable. The apertured plate 10 is arranged at the lower carrier frame yoke 3. Construction, fastening and mode of functioning of the cable end connection and the monitoring device are comparable with the  
30 device according to Fig. 3, Fig. 3a and Fig. 3b.

The monitoring device according to the invention can also be arranged at the counterweight side.

## Patent Claims:

1. Device for monitoring cables (5) of a lift, which are connected with a carrier frame (4) of a lift cage (7) by means of a cable end connection and an apertured plate (10), wherein a respective support pin (13) is provided for each cable (5) for fixing to said apertured plate (10), the movement (P1) of each said support pin in the case of slack cable (5) being monitored by means of a sensor (31), for monitoring the movement (P1) there is provided a pull cord (19) which in the case of slack cable (5) actuates said sensor (31), characterized in that each said support pin has its own trigger element which actuates said pull cord.
2. Device for monitoring cables (5) of a lift, which are connected with a carrier frame (4) of a lift cage (7) by means of a cable end connection and an apertured plate (10), wherein a respective support pin (13) is provided for each cable (5) for fixing to said apertured plate (10), the movement (P1) of each said support pin in the case of slack cable (5) being monitored by means of a sensor (31), for monitoring the movement (P1) there is provided a pull cord (19) which in the case of slack cable (5) actuates said sensor (31), characterised in that each trigger element (20) is a washer (24) with a tab (25), wherein said pull cord (19) is drawn through a bore (26) arranged at the tab (25).
3. Device for monitoring cables (5) of a lift, which are connected with a carrier frame (4) of a lift cage (7) by means of a cable end connection and an apertured plate (10), wherein a respective support pin (13) is provided for each cable (5) for fixing to said apertured plate (10), the movement (P1) of each said support pin in the case of slack cable (5) being monitored by means of a sensor (31), for monitoring movement (P1) there is provided a pull cord (19) which in the case of slack cable (5) actuates said sensor (31) characterised in that each trigger element (20) is a washer (24) with an arm (24.1), wherein the arm (24.1) deflects said pull cord (19) in the case of slack cable (5).
4. Device for monitoring cables (5) of a lift according to claim 2 to 3, characterised in that a respective trigger element (20) is provided for each support pin (13) and transmits the movement (P1) of the support pin (13) to the pull cord (19).

5. Device for monitoring cables (5) of a lift according to one of claims 1 to 3, characterised in that the support pin (13) is spring-loaded, wherein a compression spring (18) is supported at said apertured plate (10) moves said support pin (13) in the case of slack cable (5).
6. Device for monitoring cables (5) of a lift according to one of claim 1 or claim 3, characterised in that each said trigger element (20) is a washer (24) with a tab (25), wherein said pull cord (19) is drawn through a bore (26) arranged at the tab (25).
7. Device for monitoring cables (5) of a lift according to one of claim 1 to claim 2, characterised in that each said trigger element (20) is a washer (24) with an arm (24.1), wherein the arm (24.1) deflects said pull cord (19) in the case of slack cable (5).
8. Device for monitoring cables (5) of a lift according to claim 2, characterised in that a respective trigger element (20) is provided for each support pin (13) and transmits the movement (P1) of the support pin (13) to the pull cord (19) the each said trigger element (20) is a washer (24) with an arm (24.1), wherein the arm (24.1) deflects the said pull cord (19) in the case of slack cable (5).
9. Device for monitoring cables (5) of a lift according to any one of the preceding claims, characterised in that said pull cord (19) is fixed at one end at a fixing point (21) and at the other end by its deflection sets in motion (P2) a slide (28), wherein the slide (28) actuates said sensor (31) by means of a control chamfer (30).
10. Device for monitoring cables (5) of a lift according to claim 8, characterised in that said slide (28) is guided in a housing (29) to be movable and after elimination of the deflection of said pull cord (19) automatically returns to its starting position.