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Lift Installation with a Device for Furnishing a Temporary Protective Space, a Method for Mounting the Device and a Method for Furnishing the Temporary Protective Space

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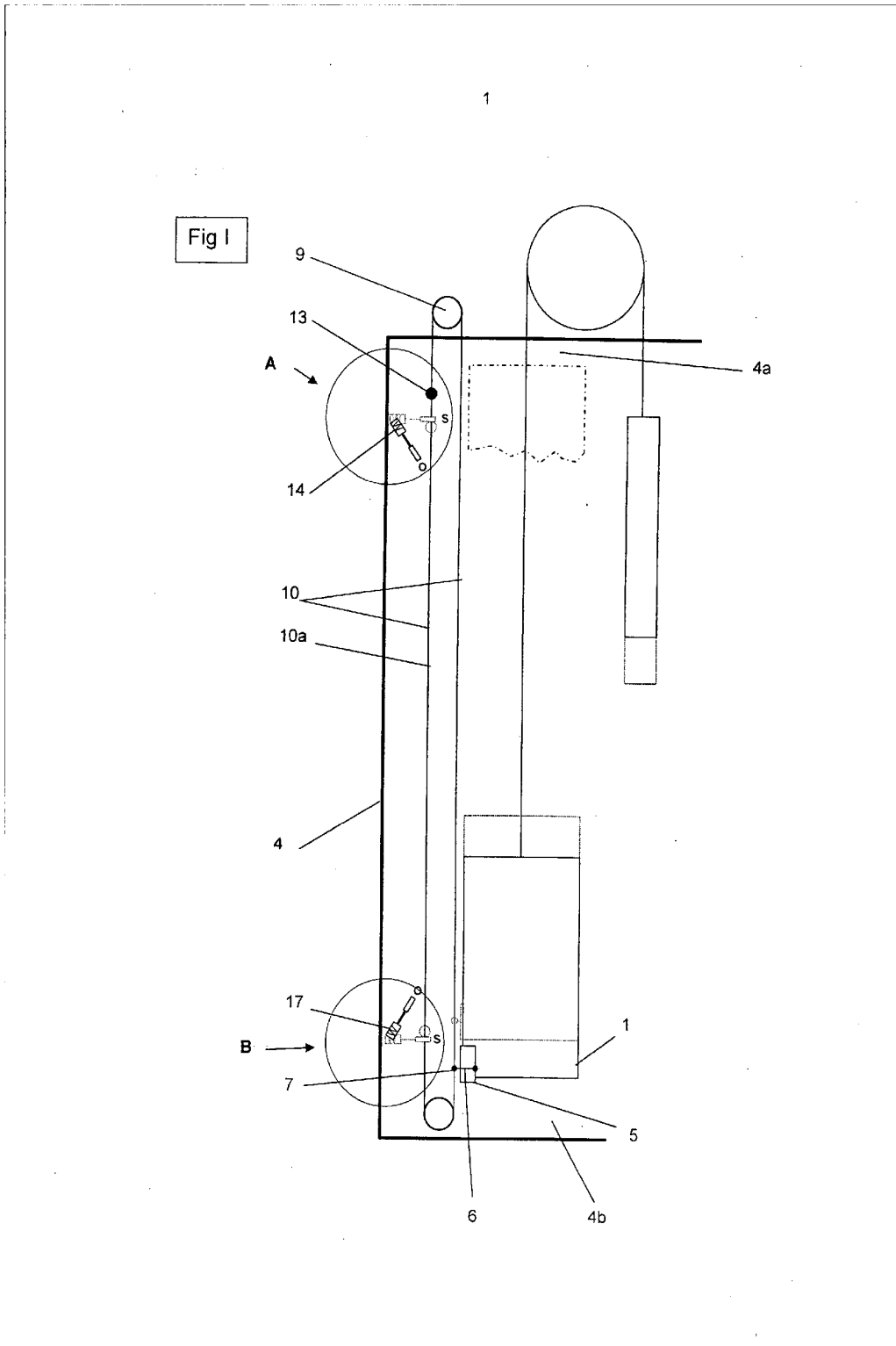
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Abstract

In the case of this lift installation with a shortened cage travel path the furnishing of a temporary protective space below and/or above the cage (1) is carried out by activation of the cage safety brake device. In that case the speed limiter cable is limited, independently of the speed limiter (9), in travel path by means of a switchable stop device. This limitation causes an actuation of the cage safety brake device in the corresponding travel direction. The construction of the abutment allows a functionally appropriate stopping of the cage (1).

(Fig. 1)



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**LIFT INSTALLATION WITH A DEVICE FOR FURNISHING A TEMPORARY
PROTECTIVE SPACE, A METHOD FOR MOUNTING THE DEVICE AND A
METHOD FOR FURNISHING THE TEMPORARY PROTECTIVE SPACE**

5 **1. FIELD OF THE INVENTION**

The invention relates to a lift installation with a device for furnishing a temporary zone of protection, a method for mounting the device and a method for furnishing the temporary zone of protection and to such device for example, retrofitting to existing lift installations.

10 **2. BACKGROUND OF THE INVENTION**

Lift installations essentially include a cage (or lift car) which is connected with a counterweight by way of support means (eg. cables). The cage is moved along a substantially vertical cage travel path within a lift shaft by means of a drive which selectably acts on the support means or directly on the cage or the counterweight. For protection of maintenance personnel, protective spaces conforming to specified standards are to be guaranteed in the end zones of the cage travel path. The protective spaces ensure that maintenance personnel, who stand in the protective space or on the cage, are not put at risk even in the case of unexpected movements of the cage. When a lift installation is newly fitted in an old (or new building), or the travel speed of the cage is increased, in many instances the length of cage travel path that is available is not sufficient in order to also provide the necessary minimum protective spaces.

Where the protective space available is insufficient, the cage travel path is usually limited at the time of maintenance or when a person stands in the shaft or on the cage so that the requisite protective space can be temporarily guaranteed. The cage travel path limited in such manner is termed shortened shaft region.

A lift installation is known from EP 1 118 574 in which a temporary protective space is created under the travel frame by activation of at least one braking device which is present. The activation is effected by, for example, the speed limiter.

One problem of this approach is that an activation by the speed limiter presupposes taking into consideration the positional information of the cage, since the cage, as long as it is not located in the critical end zones, has to carry on travelling. This causes an increase in cost of the drive control. In addition, the

drive control is not readily obvious and thereby makes visual checking by the maintenance expert difficult. Also, the conventional method of triggering the speed limiter introduces uncertainty with respect to the instant of actuation of the braking device, since the blocking distance of the speed limiter, for example cam distance and build up of frictional force at the speed limiter, can be difficult to

define.

Consequently, it would be desirable to provide an arrangement that enables simple actuation of the cage braking device for furnishing a temporary protection space and a method of furnishing the same, which addresses or ameliorates the problems outlined above. It would be also desirable to provide a solution that is economic and permits simple mounting in existing lift installations.

3. SUMMARY OF THE INVENTION

In general terms, the present invention provides a device for furnishing a temporary protection space in the lift shaft of a lift installation that has a lift cage which is movable in the shaft, and also has a cage safety brake device which acts on the cage at one side or at both sides and which is actuable by means of a speed limiter cable. The device includes an abutment that can be fastened to the speed limiter cable which, in co-operation with at least one switchable stop device fastened in the shaft, blocks the travel path of the speed limiter cable in one of the switched states of the stop device and thereby actuates the cage safety brake device to prevent lift cage travel.

In a first aspect, therefore, the present invention provides a device for creating a temporary protection space in a lift installation that includes a lift cage which is movable in a lift shaft and a lift cage safety brake device with an actuating unit disposed to stop movement of the lift cage and being actuable by a speed limiter cable of the lift cage, the device including:

at least one abutment arranged for fastening at a fixed location to one of the speed limiter cable and the actuating unit for the safety brake device; and

at least one stop device arranged for mounting at a fixed location in the lift shaft, the stop device being switchable between an open position, in which the at least one abutment is free to travel past the stop device, and a stopping position, in which it is enabled to cooperate with the abutment for blocking movement of the speed limiter cable and actuate the safety brake device so as to prevent

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movement of the lift cage, thereby creating a temporary protection space in the lift shaft.

In a second aspect of the present invention, there is provided a lift installation with arrangement to provide a temporary protection space in one or both of a lift shaft pit and lift shaft head room, including:

a lift cage which is movable in a lift shaft between its shaft pit and head rooms;

a lift cage safety brake device with an actuating unit disposed to stop movement of the lift cage;

a speed limiter cable operatively connected with the lift cage and arranged to trigger the lift cage safety brake device thereby to stop or prevent movement of the lift cage;

at least one abutment fastened at a fixed location on the speed limiter cable; and

at least one stop device arranged for mounting at the lift shaft for selective interaction with the abutment, the stop device being switchable between an open position, in which the at least one abutment is free to travel past the stop device, and a stopping position, in which it is enabled to cooperate with the abutment for blocking movement of the speed limiter cable and so actuate the safety brake device and prevent movement of the lift cage, whereby a temporary protection space is created in the lift shaft above or below the lift cage.

In a third aspect, there is provided a method of providing a temporary protection space in one or both of a lift shaft pit room and a lift shaft head room of an existing or a new lift installation, wherein the lift installation includes a lift cage arranged for travel within the lift shaft and a lift cage safety brake device which is arranged to be triggered by blocking movement of a speed limiter cable of the lift cage, including the steps of fastening at least one abutment element onto the speed limiter cable, mounting a switchable stop device within an upper end, a lower end or both upper and lower ends of the lift shaft, as the case may require, and selectively causing the stop device at the lower end of the lift shaft to assume a stopping position in which travel of the abutment at least in one travel direction of the lift cage is obstructed by the stop device and thus the safety brake device is triggered to prevent movement of the lift cage, thereby providing an upper temporary protection space in the shaft head room, and/or selectively causing

the stop device at the upper end of the lift shaft to assume a stopping position in which travel of the abutment at least in one travel direction of the lift cage is obstructed by the stop device and thus the safety brake device is triggered to prevent movement of the lift cage, thereby providing a lower temporary protection space in the shaft pit room.

One advantage of a preferred embodiment of the present invention is that it can be used for modernisation of existing buildings or for new installations.

Existing cage safety brake devices are usually attached to the cage and acting at one side or at both sides, and are actuated by the speed limiter cable.

The speed limiter cable is connected at one end with the actuating unit of the cage safety brake device. Usually, the speed limiter's main run is followed by a loop in the shaft head or engine room and the runs, in the counter run, parallel to the first portion to a deflecting and tensioning roller which is arranged in the shaft pit of the speed limiter system. From there, the speed limiter cable is led in the second portion back to the connecting point at the actuating unit of the cage safety brake device and fastened. On stopping of the speed limiter cable, the cage safety brake device is actuated in correspondence with the travel direction of the cage and the cage safety brake device brings the cage to a safe stop. Depending on the mode of constructions of the cage safety brake device, the stopping function is given only in downward travel direction or is given in both travel directions. According to the invention, the abutment can be fastened at the speed limiter cable. The abutment follows the travel path corresponding with the cage travel path. Fixedly mounted in the shaft is at least one stop device which can be moved out and which, in moved-out setting (the stopping position), stops the abutment, which is fastened to the speed limiter cable, in the corresponding travel direction so that the speed limiter cable stops, whereby the cage safety brake device is actuated. The fastening point of the stop device in the shaft thus limits the travel path of the cage in the associated travel direction. Through arrangement of a respective stop device in the upper region of the shaft and in the lower region of the shaft, a temporary protective space can be furnished at both ends of the cage travel path if a cage safety brake device acting at both sides is used at the cage. The temporary protection space at the lower end of the cage travel path is termed lower temporary protection space and the temporary

protection space at the upper end of the cage travel path is termed upper temporary protection space.

The illustrated solution gives an economic possibility for creation of a temporary protection space. It is simple to install and the function can be visually checked by maintenance personnel at any time, since the setting of the stop device is readily apparent in visual terms.

In the stopping position, ie in the moved-out setting of the stop device, the normal operation of the lift installation is blocked. Depending on the control figuration, journeys at low speed are possible as long as the lift cage is located within the now shortened shaft region. An optimum service-friendliness of the lift installation is thereby given. A further positional checking before engagement of the stop device is redundant, since the cage can move at any time within the shortened shaft region.

Additional preferred and/or optional features of the invention will become clearer from the following description of a preferred embodiment of the invention which is provided with reference to the accompanying drawings.

4. BRIEF DESCRIPTION OF THE DRAWINGS

- Fig. 1 shows a schematic view of a lift installation with reduced shaft pit depth and reduced shaft head height, incorporating means in accordance with the invention to provide upper and lower temporary protection spaces;
- Fig. 2 shows a schematic detail view of the blocking device located at an upper cage travel path location identified at A in fig. 1;
- Fig. 3 shows a schematic detail view of the blocking device located at a lower cage travel path location identified at B in fig. 1;
- Fig. 4 shows a schematic detail of a fork, element used in the blocking devices of fig. 2 and 3;
- Fig. 5 shows a schematic example of a first embodiment of an abutment in accordance with the invention mounted to the speed limiter cable; and
- Fig. 6 shows a schematic example of a second embodiment of a (resilient) abutment as per fig. 5.

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5. DESCRIPTION OF PREFERRED EMBODIMENT

One possible overall arrangement of a lift installation incorporating a device, according to the present invention, for providing a temporary protective space at both ends (upper end 4a and lower end 4b) of lift cage travel path is illustrated in FIG. 1. The illustrated lift installation has a lift cage 1 provided with a cage safety brake device 5 acting at both sides. The cage safety brake device 5 is actuated by a speed limiter 9 by way of an associated actuating unit 6 for the safety brake device 5 and a speed limiter cable 10 in the case of excess speed of the cage 1. The actuated cage safety brake device 5 brings the cage 1 to a standstill.

According to the embodiment of the present invention illustrated, an abutment 13 is fastened in the speed limiter cable 10. A first stop device 14 is fastened at the top, and a second stop device 17 at the bottom, in lift shaft 4. As shown in FIGS. 2 and 3, forks 15 at the top and bottom stop devices 14, 17 can selectively be brought by an actuating element 16 into a stopping position S or into an open position O. In the open position O, the abutment 13 can pass the stop devices 14, 17 unhindered. Thus, the cage 1 can reach the end positions provided in accordance with the lift installation. In the stopping position S, the abutment 13 is limited in its travel path by the stop devices 14, 17. The abutment 13 fastened to the speed limiter cable 10, on reaching one of the stop devices 14, 17, stops the speed limiter cable 10, which thus actuates the cage safety brake device 5 and necessarily leads the cage 1 to a standstill. The cage 1 can no longer reach the end positions of the shaft 4. The requisite temporary protective spaces 4a, 4b at the lower and upper ends respectively of the cage travel path are thus provided. The illustrated solution gives an economic possibility for securing the requisite temporary protective space. It is simple to install and the function can be visually checked at any time by the maintenance personnel, since the setting of the stop devices 14, 17 is readily apparent visually.

In a preferred version, each of the stop devices 14, 17 is additionally designed in such a manner, as shown in FIGS. 2 and 3, that it can apply the required actuating force to prevent further travel of abutment 13 in only one travel direction and does not obstruct movement in the opposite travel direction. That is, the stop devices 14, 17 act as one way travel gates. This allows that a special monitoring unit does not have to observe the location of the cage 1 on movement

out of the stop devices 14, 17. If, for example, the cage 1 is disposed at the lowermost stop when the stop device 17 is moved out, i.e. within the space 4b to be protected, the stop device 17 nevertheless can be moved out to the stopping position S. A risk does not thereby arise, since access to the shaft pit is blocked via the cage 1 standing at the lowermost stop. However, the cage 1 can now be moved at low speed to outside the protective space 4b without this being prevented by the stop device 17. However, after travelling past the stop device 17 in the opposite direction return travel into the protective space 4b is prevented.

The advantage of this solution is to be seen in that on the one hand the lift installation can be moved in a simple manner for maintenance purposes, but, also in evacuation operation, the evacuation is not prevented by the illustrated solution.

In a preferred version, the abutment 13 is, as illustrated in FIG. 1, arranged in a counter run 10a of the speed limiter cable 10. This has the advantage that a large measure of freedom exists in placement of the stop devices 14, 17, since there is no collision with the actuating unit 6 of the safety brake device 5.

Alternatively, the abutment 13 is connected together with a coupling point 7 at the actuating unit 6 of the safety brake device 5 to form a subassembly. In the individual case this enables a better possibility of placement of the stop devices 14, 17.

The abutment 13 is constructed, as shown in FIG. 5 by way of example, in the form of a cylinder with rounded end regions. It is clamped onto the speed limiter cable 10 in the counter run 10a of the speed limiter cable 10 or forms, together with the coupling point 7, a subassembly. The embodiment shown in FIG. 5, without a specific resilient characteristic, is primarily suitable for cage safety brake devices 5 with a blocking function. This embodiment is particularly economic to realize and simple to install.

In the case of an alternate embodiment abutment 13 shown in FIG. 6, opposed abutment ends 22 are connected with an abutment block 20 by means of biased springs 21. The abutment block 20 is clamped onto the speed limiter cable 10 in the counter run 10a of the speed limiter cable or forms, together with the coupling point 7, a subassembly. The abutment ends 22 and springs 21 are guided in a guide 23. This embodiment makes possible for the speed limiter cable 10, after actuation of the cage safety brake device 5, a further movement in

correspondence with the stopping travel of the cage 1, wherein the abutment ends, after resetting of the cage 1 into the shortened shaft region, automatically return to the starting setting. This embodiment is preferably suitable for cage safety brake devices 5 with a braking characteristic (braking safety brake devices).

The stop devices 14, 17 are preferably constructed, as shown in FIG. 4, in the form of a fork 15. The fork 15 in the stopping position S of the stop device 14, 17 encloses the speed limiter cable 10 on three sides. The speed limiter cable 10 is thereby substantially guided. This embodiment is economic and simple to execute.

If the fork 15 of the stop device 14, 17 is supported, for example as shown in FIG. 3, by means of a resilient element 18 on the shaft wall support, there is similarly made possible for the speed limiter cable 10 a further movement in correspondence with the stopping travel of the cage 1. The proposed construction allows the fork 15 to push back into the desired setting as soon as the cage 1 is reset into the shortened shaft region.

The position of the stop device 14, 17 is, as illustrated in FIGS. 2 and 3, preferably controlled in each instance by the actuating element 16 in the form of a stroke magnet. This enables a reliable and cost-optimal actuation of the stop devices 14, 17 in correspondence with the desired control.

If a cage safety brake system acting at both sides is used, a respective stop device is employed for limiting the travel path in both end zones. In the case of fastening of the abutment 13 in the counter run 10a, the stop device 14 installed in the upper shaft region is, as shown in FIGS. 1, 2 and 3, used for furnishing a temporary protective space at the bottom and in the case of a corresponding requirement the stop device 17 is selectively employed in the lower shaft region for furnishing a temporary protective space at the top. The association is correspondingly changed with the arrangement of the abutment 13 at the coupling point 7. The optional use of the stop devices 14, 17 allows a solution, which is appropriate to requirements and thus cost-efficient, for furnishing a temporary protective zone.

The parts required for furnishing a temporary protective zone, such as the abutment 13, one or more stop devices 14, 17 and switching elements, can be mounted in a simple manner in the lift installation. The function is readily

apparent. The device according to the present invention is suitable for existing installations and also for new installations.

5 The stopping position S of the abutments 14, 17 is electrically monitored (not illustrated in the figures). A normal travel is thus prevented in the stopping position S. On actuation of the cage safety brake device 5, a safety contact of the cage safety brake device 5 is necessarily opened, which leads to an electrical switching-off of the drive. A provided evacuation device (not shown) enables a return movement of the cage from the overrun zone into the shortened shaft region. A rapid evacuation of trapped persons is thereby possible.

10 Several possibilities exist for controlling or switching the stop device for the stop devices 14, 17. The stop devices 14, 17 are advantageously moved out on manual opening of a shaft closure, for example for carrying out maintenance operations within the shaft 4. A resetting of the stop devices 14, 17 can be undertaken only from outside the shaft 4 by an authorized person. Checking of
15 the authorization is carried out by known elements such as a key, input of a code or a similar method. Alternatively, the resetting can be blocked by additional systems such as, for example, detectors of a presence in the shaft space. In the case of multiple shafts, the stop devices 14, 17 can additionally be checked by monitoring of the intermediate barriers. The intermediate barriers are, for
20 example, gratings which are installed between two adjacent cage travel paths and which are usually provided with passage openings.

With knowledge of the present invention the lift expert can change the set forms and arrangements as desired. For example, the illustrated pivot format of the stop devices can also be replaced by a thrust format or there can be used, for
25 switching the stop device, apart from stroke magnets, also other mechanical elements such as, for example, Bowden pulls, or electromagnetic elements such as, for example, setting motors, other electromagnets or further elements.

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THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. Device for creating a temporary protection space in a lift installation that includes a lift cage which is movable in a lift shaft and a lift cage safety brake device with an actuating unit disposed to stop movement of the lift cage and
5 being actuatable by a speed limiter cable of the lift cage, the device including:
at least one abutment arranged for fastening at a fixed location the speed limiter cable; and
at least one stop device arranged for mounting at a fixed location in the lift shaft, the stop device being switchable between an open position, in which the at
10 least one abutment is free to travel past the stop device, and a stopping position, in which it is enabled to cooperate with the abutment for blocking movement of the speed limiter cable and actuate the safety brake device so as to prevent movement of the lift cage, thereby creating a temporary protection space in the lift shaft.
- 15 2. The device according to claim 1, wherein the at least one abutment is operatively connected with a coupling point of the actuating unit and forms therewith a subassembly.
3. The device according to claim 1, wherein the at least one abutment has a
20 cylindrical body with rounded ends and is arranged for clamping onto the speed limiter cable.
4. The device according to claim 1, 2 or 3, wherein the at least one abutment includes means for providing a further very limited movement of the lift cage in its original travel direction when said at least one abutment engages said at least one stop device.
- 25 5. The device according claim 4, wherein said means providing a further limited movement includes a spring biasing an abutment end of said at least one abutment.

6. The device of any one of claims 1 to 5, wherein the at least one stop device includes a fork shaped to enclose the speed limiter cable on three sides and block said at least one abutment in said stopping position.
7. The device of any one of claims 1 to 6, wherein the at least one stop device includes an electrically actuated magnet for switching the stop device into the stopping position.
8. The device of any one of claims 1 to 7, wherein the at least one stop device includes means for resiliently supporting it at the lift shaft in such manner that limited further movement of the lift cage is possible in a stopping direction thereof when the stop device is in its stopping position and engaged with the abutment element.
9. Lift installation with arrangement to provide a temporary protection space in one or both of a lift shaft pit and lift shaft head room,
including a lift cage which is movable in a lift shaft between its shaft pit and head rooms;
a lift cage safety brake device with an actuating unit disposed to stop movement of the lift cage;
a speed limiter cable operatively connected with the lift cage and arranged to trigger the lift cage safety brake device thereby to stop or prevent movement of the lift cage;
at least one abutment fastened at a fixed location on the speed limiter cable; and
at least one stop device arranged for mounting at the lift shaft for selective interaction with the abutment, the stop device being switchable between an open position, in which the at least one abutment is free to travel past the stop device, and a stopping position, in which it is enabled to cooperate with the abutment for blocking movement of the speed limiter cable thereby and so actuate the safety brake device and prevent movement of the lift cage, whereby a temporary protection space is created in the lift shaft above or below the lift cage.

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10. Lift installation according to claim 9, wherein the at least one stop device is mounted at an upper end of the lift shaft and said at least one stop device cooperates with said at least one abutment to provide a lower temporary protection space in the shaft pit room when said at least one stop device is in said stopping position.
- 5
11. The device according to claim 9, wherein the at least one stop device is mounted at a lower end of the lift shaft and said at least one stop device cooperates with said at least one abutment to provide an upper temporary protection space in the shaft head room when said at least one stop device is in said stopping position.
- 10
12. The device according to claim 9, wherein two of said stop devices are provided, one mounted at a lower end of the lift shaft and one mounted at an upper end of the lift shaft, both stop devices arranged to cooperate with one and the same abutment to provide an upper temporary protection space in the shaft head room when the relevant stop device is in said stopping position and to provide a lower temporary protection space in the shaft pit room when the relevant stop device is in said stopping position.
- 15
13. The device of any one of claims 9 to 12, wherein the at least one abutment is fixed to the speed limiter cable in a counter run section thereof.
- 20
14. The device of any one of claims 9 to 13, wherein the at least one abutment is operatively connected with a coupling point of the actuating unit and forms therewith a subassembly.
- 25
15. The device of any one of claims 9 to 14, wherein the at least one abutment has a cylindrical body with rounded ends and is arranged for clamping onto the speed limiter cable.
16. The device according to any one of claims 9 to 15, wherein the at least one abutment includes means for providing a further very limited movement of the car in its original travel direction when said at least one abutment engages said at least one stop device.

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17. The device according claim 16, wherein said means providing a further limited movement includes a spring biasing an abutment end of said at least one abutment.

5 18. The device of any one of claims 9 to 17, wherein the at least one stop device includes a fork shaped to enclose the speed limiter cable on three sides and block said at least one abutment in said stopping position.

19. The device of any one of claims 9 to 18, wherein the at least one stop device includes an electrically actuated magnet for switching the stop device into the stopping position.

10 20. Method of providing a temporary protection space in one or both of a lift shaft pit room and a lift shaft head room of an existing or a new lift installation, wherein the lift installation includes a lift cage arranged for travel within the lift shaft and a lift cage safety brake device which is arranged to be triggered by blocking movement of a speed limiter cable of the lift cage, including the steps of fastening at least one
15 abutment element onto the speed limiter cable, mounting a switchable stop device within an upper end, a lower end or both upper and lower ends of the lift shaft, as the case may require, and selectively causing the stop device at the lower end of the lift shaft to assume a stopping position in which travel of the abutment at least in one travel direction of the lift cage is obstructed by the stop device and thus the safety
20 brake device is triggered to prevent movement of the lift cage, thereby providing an upper temporary protection space in the shaft head room, and/or selectively causing the stop device at the upper end of the lift shaft to assume a stopping position in which travel of the abutment at least in one travel direction of the lift cage is obstructed by the stop device and thus the safety brake device is triggered to prevent
25 movement of the lift cage, thereby providing a lower temporary protection space in the shaft pit room.

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Fig 1

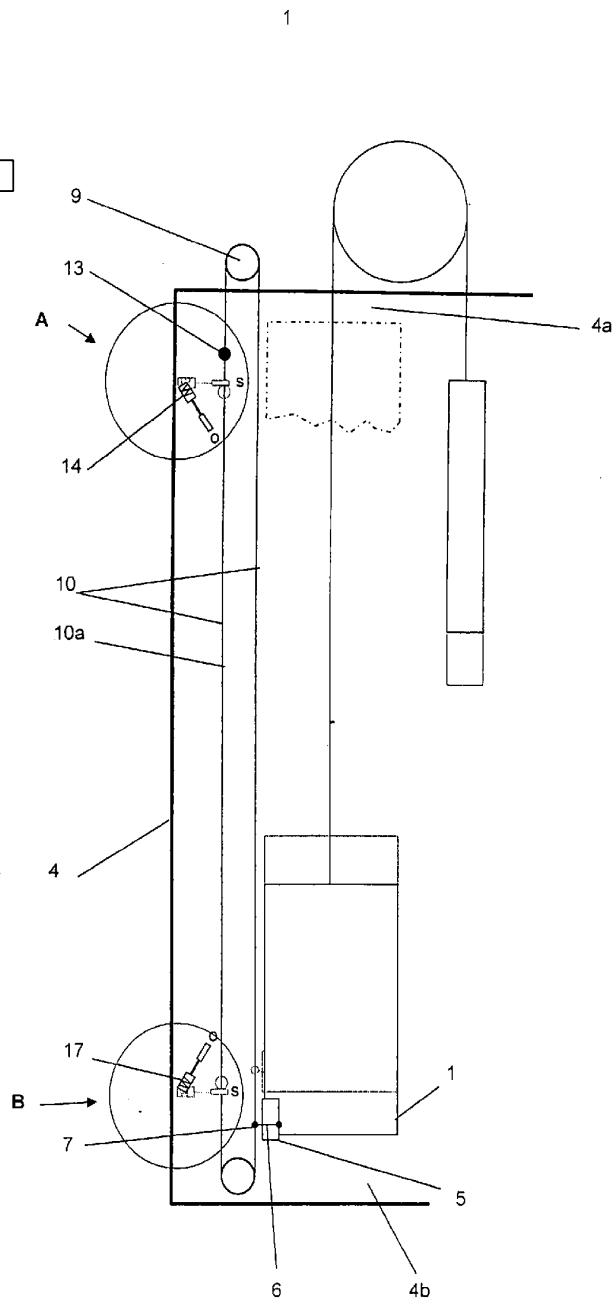


Fig 2 Detail A

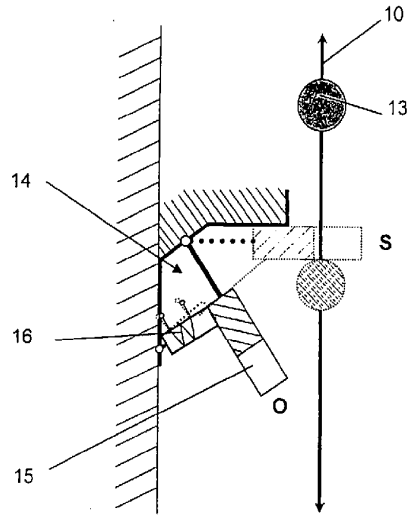


Fig 4

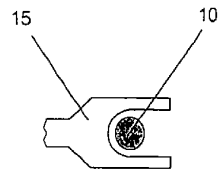


Fig 3 Detail B

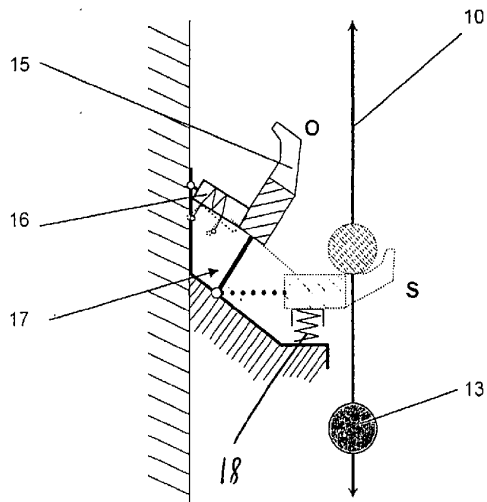


Fig 5

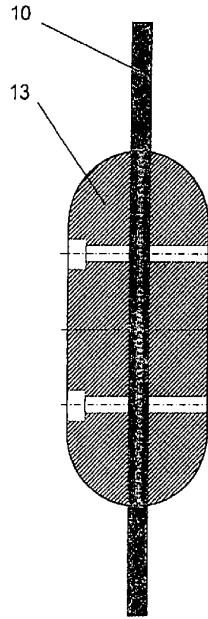


Fig 6

