

Lift shaft door unlocking mechanism

5 [0001] This invention relates to a device for the unlocking of lift shaft doors with expander skates according to claim 1. These are, for example, metal rails with ends curved slightly inward, that is to say toward one another, at the top and bottom.

10 [0002] These two skates are located at the upper marginal region of the lift cabin door and therefore travel together with the latter and project upward beyond the lift cabin. They are connected to one another in an articulated manner at two connecting
15 shackles, the shackles being mounted at their center in each case pivotably about an axle pin on a mounting plate. This therefore gives rise to a parallelogram, so that the skates are expanded away from one another counterclockwise, along with the pivoting of the
20 shackles connecting them, from a position of rest in which said skates are closed and lie opposite one another at unequal height, the left lying somewhat higher than the right. The skate arranged on the left of the shackles is in this case pivoted to the left and
25 downward away from that arranged on the right, and this skate arranged on the right is conversely pivoted away to the right and upward from the skate arranged on the left.

30 [0003] The most recent lift drive structures allow a minimum shaft head height of only 240 cm. This is the dimension from the uppermost storey floor up to the underside of the lift shaft head, that is to say to the sealing of the lift shaft. A lift to be installed there
35 should nevertheless have a cabin door with a height of 210 cm. Approximately 10 cm are required for the over travel above the cabin at the top. A height of approximately 15 cm is additionally required for the

lift door drive. In the uppermost normal lift position, therefore, only approximately 5 cm or even less are left. Thus this space is required as a safety buffer. When the lift stops with a high load in the uppermost storey, exactly at storey height, and is then relieved of the load, the cabin may rise a few more cm on account of the elasticity of the carrying cables. Even if the lift were to travel a few centimeters over the regular uppermost position for drive reasons, it needs a certain clearance for this purpose. Even then, there must still be an air gap up to the lift shaft head, so that the lift cabin can under no circumstances butt against the latter.

[0004] The parts on a lift cabin which project furthest upward are the expander skates for the shaft door unlocking mechanism which belong to the door drive. If a lift travels slightly over the regular uppermost position for any reason, there is the risk that these expander skates touch the lift shaft ceiling with their upper ends and are consequently bent and are then jammed. Such an incident may put the entire lift installation out of operation, with all the follow-up consequences, merely because of one or two slightly bent rails or these skates. People may be trapped in the lift cabin, a service and rescue team has to be called and the lift has to be repaired on site. This may last for hours and cause a lot of trouble for the operator and the users of the lift.

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[0005] The object of the present invention is, therefore, to specify a lift shaft door unlocking mechanism in the form of expander skates, which avoids the abovementioned problems.

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[0006] The object is achieved by a lift shaft door unlocking mechanism with expander skates on the door drive of the lift cabin, which is distinguished in that

the skates of the lift shaft door unlocking mechanism are designed to be flexible, so that, if they accidentally touch the lift shaft head, they are flexible over an adjustable distance, and, after the lift cabin moves away from the lift shaft head, resume their original position.

[0007] This lift shaft door unlocking mechanism is illustrated, their construction is described and their functioning is explained by means of the drawings in which:

figure 1 shows a diagrammatic illustration of the problem with the meager free space above the expander skates and the lift shaft head;

figure 2 shows the upper end region of a lift cabin with its door drive and associated lift shaft door unlocking mechanism in the form of expander skates;

figure 3 shows a door locking mechanism of a lift shaft door in the locked state, to be actuated for unlocking purposes by the expander skates of the door drive of the lift cabin;

figure 4 shows a door locking mechanism of a lift shaft door in the unlocked state, actuated by the expander skates of the door drive of the lift cabin.

[0008] Figure 1 shows the problem on which this invention is based. A lift cabin 1 is shown in its uppermost position, that is to say halted at the uppermost access level 5, in the lift shaft 7. The lift shaft head 2 is depicted at the top. The lift shaft

head 2 has a height of 260 cm here at the uppermost access level 5. On top, on the side of the lift cabin 1 here on the right, that is to say on the side of its door 26, the door drive 3 is accommodated above it.

5 This door drive includes two expander skates 4 which are illustrated here, as seen from the side, which is why only one of the two expander skates 4 can be seen. A lift shaft head 6 at the height of only 240 cm from the uppermost access level 5 is indicated by dashes. As

10 can be seen, the upper ends of the depicted expander skates 4 project above the lower boundary of this reduced lift shaft head 6. If this lift shaft head 6 were real, the expander skates 4 would collide with the lift shaft head 6 and would consequently be deformed.

15 These then bent expander skates 4 would damage the entire lift installation and put it out of operation, with all the adverse consequences. Major outlay would be necessary in order to put the lift into operation again, not to speak of the outage time always

20 considered troublesome.

[0009] However, there is growing pressure to implement ever lower lift shaft heads and at the same time to install high lift cabins with 210 cm high lift doors,

25 as depicted. This has hitherto come up against the expander skates which would then be put at great risk and in a limiting situation would be damaged on the lift shaft head. The lift door drive 3 requires an additional height of approximately 15 cm on a lift

30 cabin 1, thus resulting already in 210 cm plus 15 cm = 225 cm, measured from the uppermost access level 5. A further approximately 10 cm is required for overtravel at the top above the cabin 1, so that this already amounts to 235 cm. This tolerance is too low for any

35 damage to be able to be ruled out, and this is the reason for the present invention.

[0010] The solution is to design the expander skates 4 to be flexible, so that, in the event of a collision with the lift shaft head 6, these can flex and then, during the downward travel of the lift cabin 1, resume their original position. Figure 2 shows such a design of the expander skates 4 on a lift door drive. The lift cabin 1 can be seen here, specifically in a view of that side of the lift cabin 1 on which a door is present. The image shows in the form of a detail only the left upper marginal region of the lift cabin 1. The door drive includes an electric motor, not visible here, which drives a toothed belt 8. This toothed belt 8 drags the lift door, guided laterally on rollers, back and forth after the door drive is released as a result of the disengagement of the pawl 12 from the counter pawl 13. The lift door and the lift shaft door should be able to be opened only when the lift has halted at an access level or is coming to a halt at least directly in front of this access level, that is to say in the final phase of its travel.

[0011] The lift motor for the lift doors must not merely open the lift cabin doors, but also the lift shaft doors at each access level. This applies whether the lift cabin door and associated lift shaft door are in one part or a multipart and open only onto one side, or the lift cabin door and lift shaft door are composed of two one-part or multipart door wings which are pushed away from one another from the middle onto two sides for opening purposes. What serves basically for this is a driver structure, by means of which the lift shaft doors are drawn along by the lift cabin doors being displaced, both for opening and for closing the shaft door or shaft doors. The lift shaft doors therefore do not have dedicated drives. As a result, only one electric motor is necessary for the lift cabin door or lift cabin doors and opens this or these and then also closes the respective lift shaft doors at

each access level by drawing them along. This, in turn, should be possible only when the lift cabin stands in each case in the correct position with respect to the lift shaft door.

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[0012] The lift shaft doors must basically be locked, so that they cannot be opened from outside, so that no one could fall into the empty lift shaft. A lift cabin door unlocking mechanism in the form of expander skates
10 4 on the door drive of the lift cabin serves for unlocking the lift cabin door and the lift shaft doors at each access level. These two skates 4 are arranged on a mounting plate 10 and are guided displaceably in a vertical direction along guides 11, as indicated at the
15 top of the double arrows. The two ends, that is to say the upper and the lower end of the skates 4, are sloped toward one another. Moreover, the guides 11 and therefore also the skates 4 are connected to one another via the connecting shackles 14 and 15 pivotable
20 on the pins 16, 17, so that a parallelogram is formed. The guides 11 with the skates 4 held and guided by them can therefore be pivoted about the pivot axes of the pins 16, 17 of these two shackles 14, 15, that is to say along the two curved double arrows depicted for
25 each guide 11. The guide 11 on the left, with its skate 4, is therefore pivoted clockwise to the right upward, and vice versa, and the guide 11 on the right, with its skate 4, is simultaneously pivoted clockwise to the left and downward, and vice versa. In the state shown,
30 the skates are expanded at the maximum possible distance away from one another and consequently, when the lift travels onto an access level, actuate the shaft door locking mechanism and unlock it in the interaction with a pawl on the shaft door. The skates
35 are therefore designed with a length such that they can be activated even before the lift cabin has reached an access level completely, and therefore the lift shaft door can be unlocked and the lift shaft door opened

even during the operation of coming to a halt, whether the lift cabin comes from below or from above. During the normal travel of the lift cabin, that is to say outside the access levels, the skates 4 are pivoted together, that is to say in the end positions according to the curved double arrows depicted. The skates 4 are actuated motively via the upper connecting shackle 14 and its extension 23 as soon as the door opening motor comes into action, this taking place as a result of the arrival of the lift in the region near an access level which has previously been selected. These two skates 4 are therefore then expanded apart from one another from their closed state, after they have moved from below or above, in this still closed state, between two rollers 19, 20 which are mounted on the shaft door locking mechanism, such rollers being shown in figures 3 and 4. By the skates 4 being expanded apart from one another and the two rollers 19, 20 consequently being pressed away from one another, the pivoting plate 18 to which the rollers 19, 20 are attached is pivoted with its lengthening piece 24 counterclockwise in the drawing, to be precise out of the position, as shown in figure 3, into the position, as shown in figure 4. The pawl 21 on the lengthening piece 24 is thereby pivoted out of the pawl 22 and the shaft door locking mechanism is consequently unlocked, as is also described in more detail below.

[0013] As a particular feature, then, the two skates 4 of this lift cabin door locking mechanism are designed to be flexible in relation to the lift cabin. This is implemented here in that they are not displaceable upward in the respective guide 11, but instead can be displaced a little way downward. Between the guide 11 and the lower end of the skate 4 carried by it, a tension spring 9 is installed, which therefore constantly draws the skate 4 in the guide 11 upward into its uppermost position within the guide 11. If the

skate 4 accidentally touches the lift shaft head at the upper end of the lift shaft, it can therefore deviate an adjustable distance downward and the tension spring 9 is correspondingly drawn out. As soon as the lift cabin 1 travels away from the lift shaft head again, the spring 9 pulls the skate 4 back into its original position again.

[0014] Figure 3 shows a view of the locking mechanism in the upper region of a lift shaft door, that is to say on the lift shaft, specifically in the locked state of the door. This mechanism then lies directly opposite the lift shaft door unlocking mechanism, as shown in figure 2 and described above, that is to say opposite as if the front side of the drawing sheet with figure 2 has been laid onto the front side of the drawing sheet with figures 3 and 4, that is to say face to face. This mechanism on the lift shaft door is illustrated in figures 3 and 4 and is composed of a pivotal plate 18 which carries two rollers 19, 20, one roller 19 at bottom right and one roller 20 at top left on an upwardly extending lever 25. The pivoting plate 18 extends on the left into a lateral lengthening piece 24 which has at the bottom a pawl 21 angled forward toward the viewing direction of the observer. In the position illustrated, this movable pawl 21 is in mechanical engagement with a stationary pawl 22 on the lift shaft door. The lift shaft door, which is connected to the stationary pawl 22, is therefore locked and can be displaced back and forth inside the stationary pawl 22 only within the slight play of the pawl 21. For unlocking purposes, the expander skates 4 travel over the upper side of the lift cabin facing the lift shaft door, in their closed state, first between the two rollers 19, 20 at the pivoting plate 18 from below or from above, depending on from where the lift cabin is just coming. At the earliest after their sloped ends have passed the rollers 19, 20 and have therefore

travelled past them, the two skates 4 are expanded
apart from one another in parallel by the door drive of
the lift cabin via the extension 23 and the upper
connecting shackle 14. The rollers 19, 20 are thereby
5 pressed away from one another, thus generating a torque
on the pivoting plate 18 which is consequently pivoted
slightly counterclockwise to the direction of the
curved arrow in figure 4. The pawl 21 thereby moves
downward and is pivoted away from the counter pawl 22,
10 and therefore the lift shaft door is unlocked and is
released for lateral displacement.

[0015] Figure 4 shows the same locking mechanism, but
in this case in the open state of the locking
15 mechanism. The pivoting plate 18 has been pivoted
downward counterclockwise by a few degrees of angle by
the two rollers 19, 20 being pressed away from one
another and by the intermediate skates 4, so that the
pawl 21 has been moved away from the counter pawl 22.
20 The shaft door is consequently unlocked and can be
driven by a driver on the lift door drive and therefore
opened and also closed again.

[0016] What is essential in this lift shaft door
25 unlocking mechanism, therefore, is that deformation of
the expander skates is avoided, should these possibly
touch the lift shaft head at the upper end of the lift
shaft, in that the skates 4 of the lift shaft door
unlocking mechanism are designed to be flexible in
30 relation to the lift cabin 1. This is ensured, for
example, in that, as described, they are mounted
displaceably, in each case along a guide 11, on the
expander skate structure itself, that is to say on the
mounting plate 10. And, as described, these can be
35 implemented in that they are held, spring-loaded, in
the uppermost displacement position and, by the action
of force upon their upper ends from above as a result
of collision with the lift shaft head, can be displaced

downward on the mounting plate 10 counter to the force of the springs and, after their upper ends are released, are returned to the uppermost displacement position by these springs.

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[0017] As an alternative version, however, the lift shaft door unlocking mechanism may also be configured such that the entire expander skate structure is built on a mounting plate 10 which is itself mounted on the lift cabin 1 so as to be flexible in the vertical direction. That is to say, it is guided displaceably, so that, if the upper ends of the expander skates 4 accidentally touch the lift shaft head, the entire mounting plate 10 can be displaced counter to a spring force and therefore the expander skates 4 arranged on it are flexible over an adjustable distance with respect to the lift cabin. As the lift cabin 1 moves away from the lift shaft head, the mounting plate 10 with the expander skates 4 resumes its original position. This construction may be designed such that the mounting plate 10 is mounted displaceably along a dedicated guide, and at the same time being held, spring-loaded in the uppermost displacement position. By the action of force on the upper ends of the expander skates 4 attached to it from above as a result of collision with the lift shaft head, this mounting plate is then displaced downward counter to the force of the springs. And after the release of the upper ends of the expander skates 4, the mounting plate 10 is returned to its uppermost displacement position again by the force of the springs. In both cases, the springs used may be springs of all types, for example steel tension springs 9, steel compression springs, cushion springs, cup springs, gas pressure springs, oil pressure springs, etc., depending on the most preferred design. As a variant, as a result of adapted structures, simple leaf springs made from steel or plastic material may also be used, which are then

active between the lift cabin 1 and the skates 4 or between the lift cabin 1 and the mounting plate 10. A leaf spring made from glass fiber may also prove to be suitable.

Claims

1. A lift shaft door unlocking mechanism with
5 expander skates (4) on the door drive (3) of the lift
cabin, which are intended, when the lift cabin travels
to an access level, to move between rollers (19, 20) on
a pivoting plate (18) with a pawl (21) on the lift
10 shaft door and at the same time to push the rollers
(19, 20) apart from one another, along with the
pivoting of the pivoting plate (18) and disengagement
of the pawl (21), and thereby unlock the lift shaft
door locking mechanism, characterized in that the
15 expander skates (4) of the lift shaft door unlocking
mechanism are designed to be flexible with respect to
the lift cabin (1), so that, if they accidentally touch
the lift shaft head (2, 6) at the upper end of the lift
shaft, they are flexible over an adjustable distance
and, after the lift cabin (1) moves away from the lift
20 shaft head (2), resume their original position.

2. The lift shaft door unlocking mechanism with
expander skates (4) on the door drive (3) of the lift
cabin (1) as claimed in claim 1, characterized in that
25 the skates (4) of the lift cabin door are designed to
be flexible in relation to the lift cabin (1), in that
they are mounted displaceably, in each case along a
guide (11), on a mounting plate (10) attached firmly to
the lift cabin, while at the same time they are held,
30 in each case spring-loaded by a spring (9), in the
uppermost displacement position and by the action of
force upon their upper ends from above as a result of
collision with the lift shaft head (2, 6), can be
displaced downward counter to the force of the springs
35 (9) and, after the release of their upper ends, are
returned to the uppermost displacement position by
these springs (9).

3. The lift shaft door unlocking mechanism with expander skates (4) on the door drive of the lift cabin (1) as claimed in claim 1, characterized in that the expander skates (4) are attached to a mounting plate (10) which is attached to the lift cabin displaceably in the vertical direction counter to a spring force, so that, if the upper ends of the expander skates (4) accidentally touch the lift shaft head (2, 6), the mounting plate (10) and therefore the expander skates (4) arranged on it can be displaced flexibly over an adjustable distance and, after the lift cabin has moved away from the lift shaft head, resume their original position.

4. The lift shaft door unlocking mechanism with expander skates (4) on the door drive (3) of the lift cabin (1) as claimed in claim 3, characterized in that the mounting plate (10) of the lift shaft door locking mechanism is designed to be displaceable in relation to the lift cabin (1), in that it is mounted displaceably along a guide, and at the same time it is held, spring-loaded by at least one spring, in the uppermost displacement position and, by the action of force upon the upper ends of the expander skates (4) firmly attached to it from above as a result of collision with the lift shaft head (2, 6), can be displaced downward counter to the force of the at least one spring and, after the release of the upper ends of the expander skates (4), is returned into the uppermost displacement position by this at least one spring (9).

5. The lift shaft door unlocking mechanism with expander skates (4) on the door drive (3) of the lift cabin (1) as claimed in either one of claims 2 and 4, characterized in that the at least one spring (9) is a steel tension spring.

6. The lift shaft door unlocking mechanism with expander skates (4) on the door drive (3) of the lift cabin (1) as claimed in either one of claims 2 and 4, characterized in that the springs include at least one
5 steel compression spring, cushion spring or cup spring.

7. The lift shaft door unlocking mechanism with expander skates (4) on the door drive (3) of the lift cabin (1) as claimed in either one of claims 2 and 4,
10 characterized in that the springs include at least one gas pressure spring or oil pressure spring.

8. The lift shaft door unlocking mechanism with expander skates (4) on the door drive (3) of the lift
15 cabin (1) as claimed in either one of claims 2 and 4, characterized in that the springs are composed in each case of a leaf spring made from steel which is active between the lift cabin (1), on the one hand and the skates (4) or the mounting plate (10), on the other
20 hand.

9. The lift shaft door unlocking mechanism with expander skates (4) on the door drive (3) of the lift cabin (1) as claimed in either one of claims 2 and 4,
25 characterized in that the springs are composed in each case of a leaf spring made from plastic material which is effective between the lift cabin (1), on the one hand, and the skates (4) or the mounting plate (10), on the other hand.

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10. The lift shaft door unlocking mechanism with expander skates (4) on the door drive (3) of the lift cabin (1) as claimed in either one of claims 2 and 4, characterized in that the springs are composed in each
35 case of a leaf spring made from glass fiber which is active between the lift cabin (1), on the one hand, and the skates (4) or the mounting plate (10).