

Description

The present invention relates to an elevator system having an improved mechanism for locking and releasing a lock of a hoistway door and is particularly useful in systems in which the car and hoistway doors have aligned panels.

The conventional mechanisms employed to open and close automatic elevator doors are complex because they comprise a large number of elements and have complex movements. This leads to a series of problems, amongst which the following can be cited:

- A high cost for each mechanism which, since a lock has to be mounted in every hoistway door, is obviously multiplied by the number of floors that the elevator serves.
- Difficult maintenance due to the high number of parts used.
- Jerky transmission of linear movement from the car door to the hoistway door, caused by a clearance which exists between the interengaging parts of the doors during the end of the closing period or at the start of the opening process.
- Noisy operation when closing and opening, since during this phase the lock is subject to the control of the car door.
- Misalignment of the car and hoistway doors, especially in the more economic elevator doors, since ensuring alignment requires very expensive devices. This misalignment leads to the opening edge of the car door and the opening edge of the hoistway door being in different planes which leads to an unaesthetic appearance.

Complex and very expensive systems have been proposed that use sophisticated levers which, as of an initial movement of the door operating device, produce, on the basis of a pair of levers, a fastening action which firstly eliminates the operating clearances, then frees the lock and finally transmits the movement of the car door to the panels of the hoistway door.

However, as said, such systems turn out to be complex and, although they provide a solution to the aesthetic problem, do not resolve the problems of operating reliability, the high costs, or the difficulty of the maintenance operations which will obviously be increased due to the more sophisticated means and the larger number of parts used.

FR-A-2625991 discloses a system in which a car door is connected to a hoistway door at a landing by an expanded parallelogram on the hoistway door. When the door is closed, a roller on a crank of a car door closing system presses down on a ramp attached to the parallelogram to close the same and so disengage the doors. US-A-

3783977 and EP-A-164581 also disclose parallelogram engagement devices.

The present invention proposes a mechanism, using elongate members as in the parallelograms mentioned in the patents and applications above, that solves all the above-cited problems, and provides an elevator system comprising an elevator car arranged to move in a hoistway, a door on said car, and a door on said hoistway,

said hoistway door having a lock for holding it in a closed position, and a lock operating member, actuatable to release said lock,

said car door being provided with a pair of generally parallel, vertically elongate members which are arranged when moved apart to engage with respective projections on said hoistway door and to actuate said operating member to release said lock,

said elongate members being biased to move apart, and

said car including means which, on closing of the car door, move said elongate members towards one another against said bias,

said system being characterised in that said means for moving said elongate members towards one another comprise a cam roller operatively connected to one of said elongate members and a cam track fixedly attached at such a position on said car as to engage said cam roller when said car door closes, said cam roller following said cam track on closure of said car door to cause said elongate members to move towards one another.

In operation, when the car door is closed, the elongate members are positioned close to one another through the engagement of the cam roller and track so that the car can move freely in the hoistway with the elongate members passing between the hoistway door projections. However, when the car stops adjacent a hoistway door and the car door begins to open, as the cam roller moves out of the track, the elongate members move apart and operate to release the hoistway door lock and transmit the movement of the car door to the projections of the hoistway door so that the hoistway door and car door can move together.

Thus, it can be seen that the mechanism is based on a simple structure, with a high guarantee of reliability, which eliminates clearances and noise, and provides for more gentle movements.

An embodiment of the invention will now be described, by way of example only, and with reference to the accompanying drawings, in which:

Figure 1 shows a side schematic view of a hoistway door lock in the locking position, the lock being associated in its functioning with two rollers upon which the profiles of a deformable parallelogram act.

Figure 2 shows a side schematic view of a car door mechanism based on a deformable parallelogram, the latter shown occupying the locking position.

Figures 3 and 3a are side and plan views of the mechanism in the locking position, Figure 3a showing the distance between the profiles of the deformable parallelogram and the lock operating hoistway rollers.

Figures 4 and 4a show views similar to those represented in Figures 3 and 3a, but with the mechanism in the lock release position, in which the opening of the corresponding hoistway door is permitted.

Figure 1 shows a lock 1 comprising a latch plate 1b and a latch arm 1a. The latch plate 1b is mounted on the hoistway frame door and the latch arm 1a is mounted on the hoistway door 5 at pivot point A. A roller 7 is mounted on the latch arm 1a and is connected, by a spring 12, to a roller 6 mounted on the hoistway door.

As shown in Fig. 2, a pair of parallel profiles 3 are connected together at their top and bottom ends by link members 12, which are pivotally connected to the car door 4 at pivot points P3. A spring 10 is connected between the points P2 of the two link members 12 and a cam roller 8 is mounted on one of the pivot pins at point P1. This cam roller 8 follows a cam track 9 mounted on a part 13 of the car, when the car door 4 closes.

From Figures 1-4, one can see how the present embodiment acts upon the lock 1 to effect the locking and/or releasing of the elevator hoistway door 5. The lock 1 is associated with a switch 2 and cooperates with the mechanism of Fig. 2, which is formed as a deformable parallelogram by the two identical profiles 3 and the link members 12.

The above cited profiles 3 cooperate, in use, with the lock 1, through the rollers 6 and 7 which, as said, are connected to the hoistway door 5 and the latch arm 1a respectively. The rollers 6 and 7 are arranged either side of the profiles 3 and face the vertical webs of the same, in such a way that, at the beginning of the opening of the car door 4 and in a corresponding displacement of the profiles 3, the webs of the profiles 3 can contact with and push the rollers 6 and 7, which in turn cause the lock 1 to tilt, as is shown in Figure 4, thus releasing the hoistway door 5.

As can be seen in Fig. 2, roller 7 is connected to roller 6 by means of the spring 12. When roller 7 is pushed sideways by its corresponding profile 3, it causes latch arm 1a to tilt about an axis A positioned below it, thus releasing the lock 1.

The displacement of the profiles 3 is carried out by means of the cam roller 8 following the cam track 9. The track 9 has a special shape made for

this purpose, and is formed in a part 13 fixed to the car. The track 9 is represented by a chain line in Figures 2 and 3.

The profiles 3 have flanges 11 which are pivotally connected to each other at points P1 and P2 by top and bottom link members 12. Both link members 12, and through them the profiles 3, are pivotally mounted to the car door at the points P3 located between the points P1 and P2. The spring 10 is connected between the points P2 so that the link members 12 are biased to move in a clockwise direction (as seen in Fig. 2) about the points P3, thereby tending to force the profiles 3 apart. The cam roller 8 is connected to one of the link members 12 at point P1.

When the car door 4 is closed, the cam roller 8 is forced downwardly by the track 9 into a position below the upper pivot point P3. This causes the link members 12 to rotate anti-clockwise (as seen in Fig. 2) and close the profiles 3 together.

However, when the car door 4 opens, the cam roller 8 begins to move out of the track 9. This allows the link members 12 to move clockwise (as seen in Fig. 2) about the points P3, under the action of the spring 10. The parallelogram defined by the profiles 3 and link elements 12 thus expands and, as said above, the profiles 3 contact and push against the rollers 6 and 7, thereby tilting the latch arm 1a into its free position.

The parallelogram remains in its expanded form during the opening and re-closing of the car door 4 so as to transmit the movement of the car door 4 to the hoistway door 5. A stop (not shown) prevents the spring 10 from rotating the link members 12 past their horizontal positions, at which the parallelogram is fully expanded.

Due to the fact that the profiles 3 are moved apart by a rotation of the link members 12 and that the link members 12 are in their horizontal positions during movement of the car door, any jerks or jars acting on the link members 12, through the rollers 6 and 7 and the profiles 3, will, during this time, be transferred to the pivot pin at P3 so that the link members 12 remain in position and do not move the profiles 3 out of engagement from the rollers 6 and 7. This provides for a smooth opening and closing of the doors.

The track 9 can be so shaped that the profiles 3 engage the rollers 6 and 7 at an appropriate rate.

The distances from each of the rollers 6 and 7 of the hoistway door 5 to their respective profile of the deformable parallelogram are, as shown in Figures 3 and 3a, equal when the mechanism is in the locking position of the lock 1, and are indicated by the letters "a" in Figure 3a. This distance is reduced to 0 in the opening position.

Thus, on the basis of this structure and starting from the position shown in Figure 3 with the lock 1

locked, the following movements are carried out in order to attain the released position.

When the car door 4 (operated by any operating device) begins its horizontal displacement to the right in Figure 3, the cam roller 8 of the car door 4 begins to move along the special path or track 9 belonging to the part 13, the latter, as said, being fixed to the car itself. As a result of the movement of the cam roller 8, the deformable parallelogram formed by the profiles 3 and link members 12 begins to turn, opening in the direction of its width and contacting with the rollers 6 and 7, which it pushes, thereby causing the latch arm 1a to tilt. As of then, and once the corresponding switch 2 is open, the hoistway door 5 can move freely with the car door 4, in such a way that in the movement of the profiles 3 and of the cam roller 8, the initial movement of the car door 4 will be followed by the hoistway door 5, and both edges will be aligned, as when the doors are closed or totally open.

In the process of closing the lock 1, the movements will be identical but in the opposite direction.

Of course, the lock 1 and rollers 6 and 7 will be provided on the hoistway doors 5 of each floor served by the lift, and the profiles 3 will move between these rollers 6 and 7 as the lift travels up and down between the floors. The webs of the profiles 3 can be of an appropriate vertical length such that the profiles 3 can still cooperate with the rollers 6 and 7 even if the car and the floor at which it stops are slightly misaligned.

According to the above, and referring to Figures 3 and 4, it will be seen that the movement of the mechanism is controlled without clearance, thus avoiding all jerks and noise produced in the opening and closing operation, which have not been eliminated from other conventional door systems.

Likewise it can be seen in the drawings how the opening and closing mechanism permits, in any position, the edges of the panels of the car door 4 and hoistway door 5 to be permanently aligned, therefore making it possible to simplify the car door stile as well as the hoistway door stile.

The advantages derived from the structure and functioning of the mechanism can be summarized as follows:

Firstly, it permits synchronized movement of the car door and hoistway door panels, the edges of which are permanently aligned, with a solid connection existing between them, and without any clearance, in both the closing and opening directions of the doors.

Secondly, the number of parts and elements, such as rollers, shafts, moving elements, springs, etc., which form the mechanism is drastically reduced. This simplification of course affects each

floor of the elevator.

Thirdly, smooth and clearance-free movement of the door panels is provided.

Fourthly, there is a reduction in the number of faulty elevator operations due to the reduced number of parts.

Fifthly, simplified maintenance is possible for the same reason.

Sixthly, disturbing noises made when latching and unlatching the lock are eliminated.

Finally, it allows for the alignment of the car and door panels with the hoistway door and car frames, enabling the use of an electromagnetic lock actuated by a switch on the hoistway door frame.

Of course, various modifications within the scope of the attached claims can be envisaged. For example, the lock need not be opened by the same members (in this case the rollers 6 and 7) as those with which the profiles 3 connect. Instead, a button or other switch could, for example, be actuated by one of the profiles.

Claims

1. An elevator system comprising an elevator car arranged to move in a hoistway, a door (4) on said car, and a door (5) on said hoistway, said hoistway door (5) having a lock (1) for holding it in a closed position, and a lock operating member (7), actuatable to release said lock (1), said car door (4) being provided with a pair of generally parallel, vertically elongate members (3) which are arranged when moved apart to engage with respective projections (6, 7) on said hoistway door (5), and to actuate said operating member (7) to release said lock (1), said elongate members (3) being biased to move apart, and said car including means (8, 9, 10) which, on closing of the car door (4), move said elongate members (3) towards one another against said bias, said system being characterised in that said means for moving said elongate members (3) towards one another comprise a cam roller (8) operatively connected to one of said elongate members (3) and a cam track (9) fixedly attached at such a position on said car as to engage said cam roller (8) when the car door (4) closes, said cam roller (8) following said cam track (9) on closure of said car door (4) to cause said elongate members (3) to move towards one another.



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Of course, the lock 1 and rollers 6 and 7 will be provided on the hoistway doors 5 of each floor served by the lift, and the profiles 3 will move between these rollers 6 and 7 as the lift travels up and down between the floors. The webs of the profiles 3 can be of an appropriate vertical length such that the profiles 3 can still cooperate with the rollers 6 and 7 even if the car and the floor at which it stops are slightly misaligned.

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floor of the elevator.

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Fourthly, there is a reduction in the number of faulty elevator operations due to the reduced number of parts.

Fifthly, simplified maintenance is possible for the same reason.

Sixthly, disturbing noises made when latching and unlatching the lock are eliminated.

Finally, it allows for the alignment of the car and door panels with the hoistway door and car frames, enabling the use of an electromagnetic lock actuated by a switch on the hoistway door frame.

Of course, various modifications within the scope of the attached claims can be envisaged. For example, the lock need not be opened by the same members (in this case the rollers 6 and 7) as those with which the profiles 3 connect. Instead, a button or other switch could, for example, be actuated by one of the profiles.

Claims

1. An elevator system comprising an elevator car arranged to move in a hoistway, a door (4) on said car, and a door (5) on said hoistway,

said hoistway door (5) having a lock (1) for holding it in a closed position, and a lock operating member (7), actuatable to release said lock (1),

said car door (4) being provided with a pair of generally parallel, vertically elongate members (3) which are arranged when moved apart to engage with respective projections (6, 7) on said hoistway door (5), and to actuate said operating member (7) to release said lock (1),

said elongate members (3) being biased to move apart, and

said car including means (8, 9, 10) which, on closing of the car door (4), move said elongate members (3) towards one another against said bias,

said system being characterised in that said means for moving said elongate members (3) towards one another comprise a cam roller (8) operatively connected to one of said elongate members (3) and a cam track (9) fixedly attached at such a position on said car as to engage said cam roller (8) when the car door (4) closes, said cam roller (8) following said cam track (9) on closure of said car door (4) to cause said elongate members (3) to move towards one another.



2. An elevator system according to claim 1, wherein both said elongate members move relative to the car door.
3. An elevator system according to claim 1 or 2, wherein a link member (12) pivotally connects the lower ends of said elongate members (3) and a link member (12) pivotally connects the upper ends of said elongate members (3), each said link member (12) being pivotally connected to said car door (4) at a position (P3) between said elongate members (3), such that rotation of said link members (12) causes said elongate members (3) to move together or apart.
4. An elevator system according to claim 3, wherein said elongate members (3) and said link members (12) are disposed in a parallelogram arrangement.
5. An elevator system according to claim 3 or 4, wherein said link members (12) are biased to rotate in one direction by a spring (10), so that said elongate members (3) are moved apart until they engage a stop provided to prevent them from moving passed their horizontal position, and wherein said cam roller (8) is operatively connected to one of said link members (12), such that, when said cam roller (8) engages said track (9) on closure of said car door (4), said link element (12) is rotated in the opposite direction, to thereby move said elongate elements towards one another.
6. An elevator system according to any preceding claim, wherein said projections comprise a pair of rollers arranged to lie one to each side of said elongate members.
7. An elevator system according to any preceding claim, wherein said operating member comprises one of said projections.
8. An elevator system according to claim 7, wherein said one of said projections is pushed sideways by one of said elongate members, thereby causing a latch of said lock to rotate about a pivot point and release said lock.

Patentansprüche

1. Aufzugssystem mit einer Aufzugskabine, die zur Bewegung in einem Aufzugschacht ausgelegt ist, mit einer Tür (4) an der Aufzugskabine und mit einer Tür (5) an dem Aufzugschacht, wobei die Aufzugschachttür (5) eine Verriegelung (1) zum Halten derselben in einer ge-

schlossenen Position sowie ein Verriegelungs-Betätigungselement (7) aufweist, das zum Entriegeln der Verriegelung (1) betätigbar ist, wobei die Aufzugskabinentür (4) mit einem Paar allgemein paralleler, in vertikaler Richtung länglicher Elemente (3) versehen ist, die derart ausgebildet sind, daß sie bei einer Auseinanderbewegung an jeweiligen Vorsprüngen (6, 7) an der Aufzugachachttür (5) angreifen sowie das Betätigungselement (7) zum Entriegeln der Verriegelung (1) betätigen, wobei die länglichen Elemente (3) in Richtung auf eine Auseinanderbewegung vorgespannt sind, und wobei die Aufzugskabine eine Einrichtung (8, 9, 10) aufweist, die beim Schließen der Aufzugskabinentür (4) die länglichen Elemente (3) gegen die Vorspannung in Richtung aufeinander zu bewegt, wobei das System dadurch gekennzeichnet ist, daß die Einrichtung zum Bewegen der länglichen Elemente (3) in Richtung aufeinander zu eine mit einem der länglichen Elemente (3) betriebsmäßig verbundene Steuerflächenrolle (8) sowie eine Steuerflächenbahn (9) aufweist, die an einer derartigen Stelle fest an der Aufzugskabine angebracht ist, daß sie beim Schließen der Aufzugskabinentür (4) an der Steuerflächenrolle (8) angreift, wobei die Steuerflächenrolle (8) beim Schließen der Aufzugskabinentür (4) der Steuerflächenbahn (9) folgt und dadurch eine Bewegung der länglichen Elemente (3) in Richtung aufeinander zu hervorruft.

2. Aufzugssystem nach Anspruch 1, wobei eich beide länglichen Elemente relativ zu der Aufzugskabinentür bewegen.
3. Aufzugssystem nach Anspruch 1 oder 2, wobei ein Gestängeelement (12) schwenkbar die unteren Enden der länglichen Elemente (3) verbindet und ein Gestängeelement (12) schwenkbar die oberen Enden der länglichen Elemente (3) verbindet, wobei jedes der Gestängeelemente (12) mit der Aufzugskabinentür (4) an einer zwischen den länglichen Elementen (3) gelegenen Stelle (P3) schwenkbar verbunden ist, so daß eine Rotationsbewegung der Gestängeelemente (12) eine zusammenbewegung oder eine Auseinanderbewegung der länglichen Elements (3) hervorruft.
4. Aufzugssystem nach Anspruch 3, wobei die länglichen Elemente (3) und die Gestängeelemente (12) in einer Parallelogrammanordnung angeordnet sind.



5. Aufzugssystem nach Anspruch 3 oder 4,
wobei die Gestängeelemente (12) durch eine
Feder (10) zur Ausführung einer Rotationabe-
wegung in einer Richtung vorgespannt sind, so
daß die länglichen Elemente (3) auseinander-
bewegt werden, bis sie an einem Anschlag
angreifen, der zur Verhinderung einer Bewe-
gung derselben über ihre horizontale Position
hinaus vorgesehen ist, und wobei die Steuer-
flächenrolle (8) mit einem der Gestängeele-
mente (12) betriebsmäßig verbunden ist, so
daß dann, wenn die Steuerflächenrolle (8) beim
Schließen der Aufzugskabinentür (4) an der
Steuerflächenbahn (9) angreift, das Gestänge-
element (12) in der entgegengesetzten Rich-
tung verschwenkt wird, um dadurch die längli-
chen Elemente in Richtung aufeinander zu zu
bewegen.
6. Aufzugssystem nach einem der vorausgehen-
den Ansprüche,
wobei die Vorsprünge ein Paar Rollen umfas-
sen, die derart angeordnet sind, daß eine auf
jeder Seite der länglichen Elemente angeord-
net ist.
7. Aufzugssystem nach einem der vorausgehen-
den Ansprüche,
wobei das Betätigungselement einen der Vor-
sprünge aufweist.
8. Aufzugssystem nach Anspruch 7,
wobei der genannte eine Vorsprung durch ei-
nes der länglichen Elemente seitwärts ge-
drückt wird und dadurch ein Verriegelungs-
glied der Verriegelung zur Ausführung einer
Rotationsbewegung um einen Schwenkpunkt
sowie zur Entriegelung der Verriegelung veran-
laßt wird.

Revendications

1. Système d'ascenseur comprenant une cabine
d'ascenseur agencée pour se déplacer dans
une cage, une porte (4) sur ladite cabine, et
une porte (5) sur ladite cage,
ladite porte de cage (5) ayant un verrou (1)
pour la maintenir dans une position fermée, et
un élément de mise en oeuvre de verrou (7),
pouvant être mis en oeuvre pour libérer ledit
verrou (1),
ladite porte de cabine (4) étant munie
d'une paire d'éléments allongés verticaux (3),
globalement parallèles, qui sont agencés,
quand ils sont écartés, pour venir en prise
dans des parties en saillie respectives (6, 7)
sur ladite porte de cage (5) et pour mettre en
oeuvre ledit élément de mise en oeuvre (7)

pour libérer ledit verrou (1),

lesdits éléments allongés (3) étant poussés
pour s'écarter, et

ladite cabine comprenant des moyens (8,
9, 10) qui, lors de la fermeture de la porte de
cabine (4), déplacent lesdits éléments allongés
(3) l'un vers l'autre contre ledit moyen de
poussée,

ledit système étant caractérisé en ce que
lesdits moyens pour déplacer lesdits éléments
allongés (3) l'un vers l'autre comprennent un
galet de came (8) relié, de manière opération-
nelle, à l'un desdits éléments allongés (3) et
un chemin de came (9) attaché, de manière
fixe, sur ladite cabine à une position telle que
ledit galet de came (8) est mis en prise lors-
que ladite porte de cabine (4) se ferme, ledit
galet de came (8) suivant ledit chemin de
came (9) lors de la fermeture de ladite porte
de cabine (4) pour obliger lesdits éléments
allongés (3) à se déplacer l'un vers l'autre.

2. Système d'ascenseur selon la revendication 1,
dans lequel les dits deux éléments allongés se
déplacent par rapport à la porte de cabine.
3. Système d'ascenseur selon la revendication 1
ou 2, dans lequel un élément de liaison (12)
relie, de manière pivotante, les extrémités infé-
rieures desdits éléments allongés (3) et dans
lequel un élément de liaison (12) relie, de
manière pivotante, les extrémités supérieures
desdits éléments allongés (3), chacun desdits
éléments de liaison (12) étant relié, de manière
pivotante, à ladite porte de cabine (4) à une
position (P3) comprise entre lesdits éléments
allongés (3), telle que la rotation desdits élé-
ments de liaison (12) oblige lesdits éléments
allongés (3) à se rapprocher ou à s'écarter.
4. Système d'ascenseur selon la revendication 3,
dans lequel lesdits éléments allongés (3) et
lesdits éléments de liaison (12) sont disposés
dans un agencement en parallélogramme.
5. Système d'ascenseur selon la revendication 3
ou 4, dans lequel lesdits éléments de liaison
(12) sont poussés pour tourner dans un sens
particulier par un ressort (10), de manière que
lesdits éléments allongés (3) soient écartés
jusqu'à ce qu'ils viennent en contact avec une
butée prévue pour les empêcher de se dépla-
cer au-delà de leur position horizontale, et
dans lequel ledit galet de came (8) est relié, de
manière opérationnelle, à l'un desdits éléments
de liaison (12), de sorte que, lorsque ledit galet
de came (8) vient en prise dans ledit chemin
de came (9) lors de la fermeture de ladite



porte de cabine (4), ledit élément de liaison (12) est tourné dans le sens opposé pour déplacer, de ce fait, lesdits éléments allongés l'un vers l'autre.

6. Système d'ascenseur selon l'une quelconque des revendications précédentes, dans lequel lesdites parties en saillie comprennent une paire de galets agencés pour être placés de part et d'autre desdits éléments allongés. 5
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7. Système d'ascenseur selon l'une quelconque des revendications précédentes, dans lequel ledit élément de mise en oeuvre comprend une desdites parties en saillie. 15
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8. Système d'ascenseur selon la revendication 7, dans lequel ladite partie en saillie particulière desdites parties en saillie est poussée sur le côté par l'un desdits éléments allongés, obligeant, de ce fait, un dispositif de verrouillage dudit verrou à tourner autour d'un pivot et à libérer ledit verrou. 25
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