(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 410 774 A2**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **90308242.8**

(51) Int. Cl.5: **B66B 13/16**

(22) Date of filing: **27.07.90**

(30) Priority: **27.07.89 ES 8902665**

(43) Date of publication of application:
30.01.91 Bulletin 91/05

(84) Designated Contracting States:
CH DE ES FR GB IT LI

(71) Applicant: **OTIS ELEVATOR COMPANY**
10 Farm Springs
Farmington, CT 06032(US)

(72) Inventor: **Martin, Juan**
Jose del Pino, 9
28021 Madrid(ES)
Inventor: **Sevilleja, Jose**
La del Manojo de Rosas, 95
28041 Madrid(ES)

(74) Representative: **Tomlinson, Kerry John et al**
Frank B. Dehn & Co. European Patent
Attorneys Imperial House 15-19
Kingswayway
London WC2B 6UZ(GB)

(54) Elevator system hoistway door operating mechanism.

(57) An elevator system is provided having a car in a hoistway. A pair of linked profiles (3) are pivotally connected to the car door (4). When the car stops at a floor, the profiles lie between rollers (6, 7) which are provided on the hoistway door (5) at each floor and which cooperate with the hoistway door lock shaft 1a. The profiles (3) are biased by a spring (10) (see Fig. 2) into an expanded condition in which they are level with one another and push against the hoistway dcor rollers (6, 7) to tilt the latch (1a) open. However when the car door (4) is closed, a cam roller (8) attached to one of the profiles (3) moves along a cam track (9) and forces the profiles (3) together to lock the lock 1. When the car door (4) opens, the cam roller (8) moves out of the cam track (9), so that the profiles (3) expand, and push the hoistway rollers (6, 7) which open the lock 1. The profiles (3) remain in engagement with said rollers (6, 7) so that the movement of the car door (4) is transmitted to the hoistway door (5) during opening and closing of the doors (4, 5).

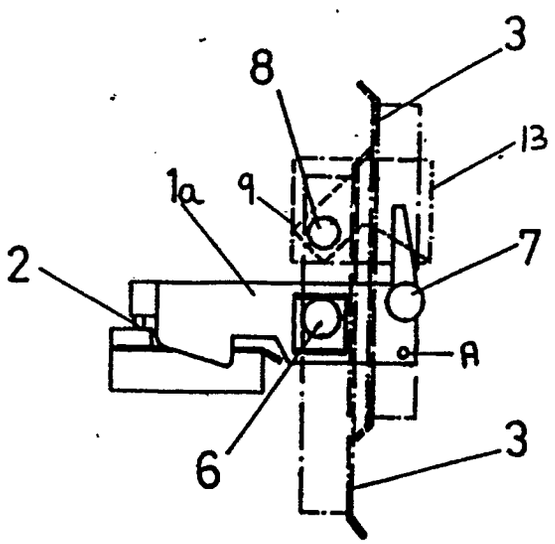

FIG-3

EP 0 410 774 A2

ELEVATOR SYSTEM HOISTWAY DOOR OPERATING MECHANISM

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.

The present invention proposes a mechanism 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, actuable to release said lock,

said car door being provided with a pair of generally parallel, vertically elongate members and an actuating means operable to move said elongate members towards one another when said car door is closed and to move said elongate members apart when said car door opens,

said elongate members being arranged when moved apart to engage with respective projections on said hoistway door, and to actuate said operating member to release said lock.

In operation, when the car door is closed, the elongate members are positioned close to one another 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, 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 tne 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 biassed 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 move-

ments 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 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, actuable to release said lock,
said car door being provided with a pair of generally parallel, vertically elongate members and an actuating means operable to move said elongate members towards one another when said car door is closed and to move said elongate members apart when said car door opens,
said elongate members being arranged when moved apart to engage with respective projections on said hoistway door, and to actuate said operating member to release said lock.

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 pivotally connects the lower ends of said elongate members and a link member pivotally connects the upper ends of said elongate members, each said link member being pivotally connected to said car door at a position between said elongate members, such that rotation of said link members causes said elongate members to move together or apart.

4. An elevator system according to claim 3, wherein said elongate members and said link members are disposed in a parallelogram arrangement.

5. An elevator system according to claim 3 or 4, wherein said link members are biased to rotate in one direction by a spring, so that said elongate members are moved apart, until they engage a stop provided to prevent them from moving past their horizontal position, means being also provided, which are operative when said car door closes, to rotate said link elements in the opposite direction to said one direction, to thereby move said elongate elements towards one another.

6. An elevator system according to claim 5, comprising a cam roller operatively connected to one of said link members and a cam track attached to said car, said cam roller following said cam track on closure of said car door to cause said link members to rotate in said opposite direction.

7. 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.

8. An elevator system according to any preceding claim, wherein said operating member comprises one of said projections.

9. An elevator system according to claim 8,

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.

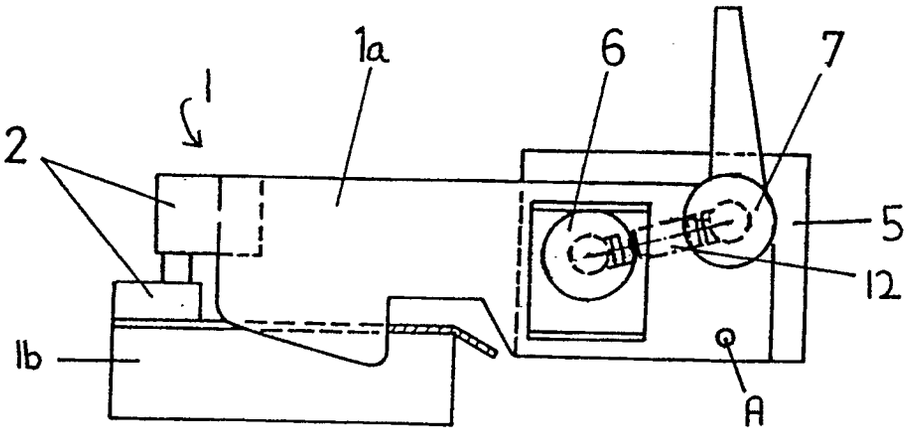

FIG-1

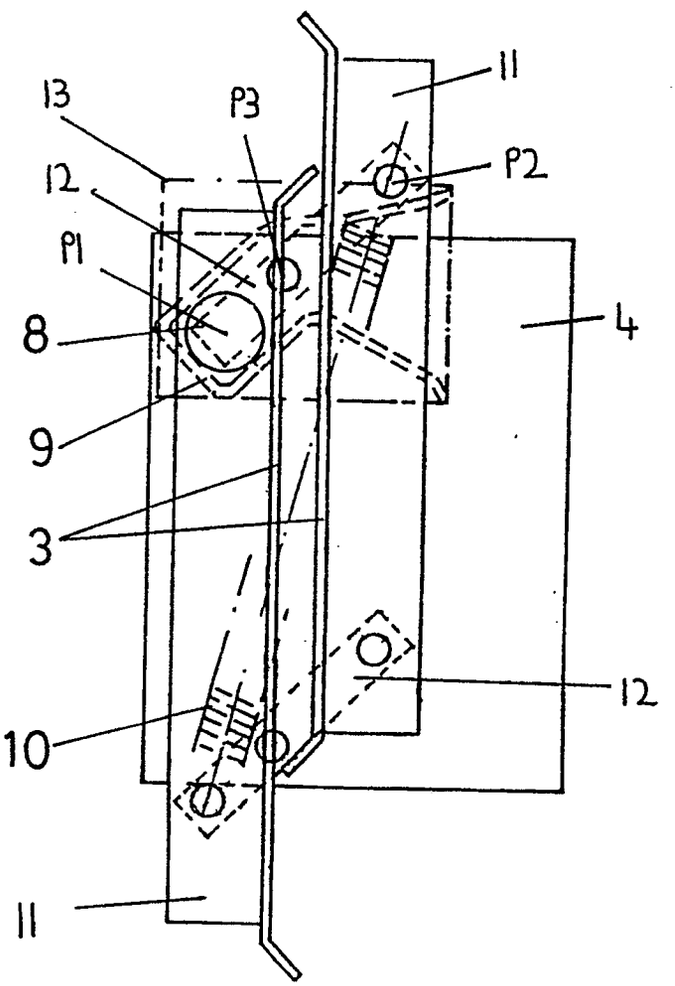

FIG-2

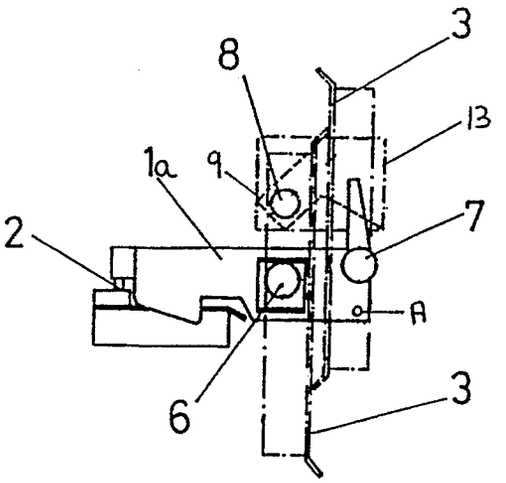

FIG-3

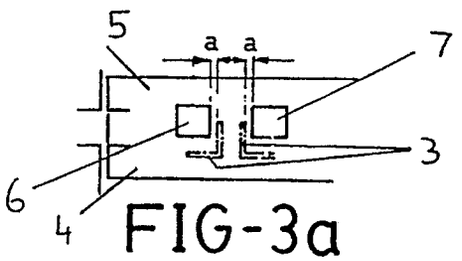

FIG-3a

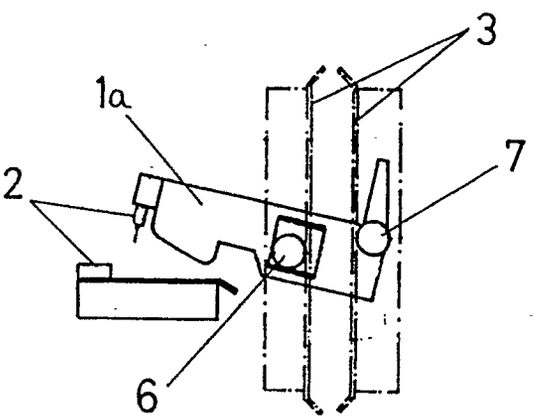

FIG-4

FIG-4a