

DOOR 1

"ELEVATOR LANDING LOCKING AND UNLOCKING APPARATUS"

The present invention relates to an apparatus for locking and unlocking an elevator landing door.

Generally, an elevator landing door, which is
5 opened and closed together with a car door that forms part of the elevator when the elevator car reaches that landing door, cannot be opened by a person standing outside the elevator when the elevator car is not adjacent thereto because of the engagement of a hook mounted on the landing
10 door with an engaging piece mounted on an adjacent part of the building (as disclosed in the specification of Japanese Patent Laid-Open no. 89147/1978).

However, the landing door must sometimes be opened even when the elevator car is not located^(at) that level
15 for the purposes of maintenance and inspection by maintenance staff. For this reason, the landing door is provided with a key hole, and the hook is disengaged from the engaging piece by the turning of a key inserted into this key hole, so as to unlock the landing door. The
20 landing door can thereby be opened and closed by someone standing outside the elevator.

When the landing door is unlocked in the above described manner, it can be opened and closed freely until the landing door is relocked. This is very dangerous in
25 the sense that a janitor or someone else who knows very little about the operation of the elevator may carelessly thrust his or her body forward into the elevator shaft and

fall when unlocking the landing door while the elevator car is not located at that level, because the landing door can be opened fully very easily.

It is an object of the present invention to
5 provide an elevator landing door locking and unlocking apparatus which is capable of eliminating the danger of someone falling into an elevator shaft, and which is therefore secure.

According to the present invention there is
10 provided elevator landing door locking and unlocking apparatus for use with a landing door which is slidable and forms a partition between an elevator shaft and a landing floor of a building, said locking and unlocking apparatus including:

15 a pivotally movable plate which when in use is mounted on the landing door, said movable plate having a hook at one end thereof;

a first engaging piece which when in use is mounted on an adjacent portion of the building to engage
20 with said hook when the landing door fully closes;

a first unlocking mechanism allowing said hook to be disengaged from said first engaging piece by allowing said plate to pivotally move by a first amount;

a second engaging piece for engaging with said
25 hook and which when in use is mounted at a position at which said landing door can be opened by a predetermined amount; and

a second unlocking mechanism for disengaging said

hook from said second engaging piece by allowing said plate to pivotally move through a further second amount, said second unlocking mechanism when in use being mounted on that side of said landing door which faces the elevator shaft.

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As a result of the above construction, the landing door, when unlocked, can be easily opened to an extent that will, for

example, allow an operator to insert his or her hand.

However, it is prevented from being further opened by the ^{second} engaging ^{piece} ~~mechanism~~. In consequence, the landing door cannot be fully opened by the unlocking operation, and the possibility of someone falling into the elevator shaft which might occur should the landing door be capable of being fully opened by the unlocking operation is thereby prevented.

To fully open the landing door, the operator inserts his or her hand through the gap formed as the landing door opens, and he or she is then able to operate the ^(second unlocking) ~~locking~~ mechanism.

The invention will now be described in greater detail with reference to the accompanying drawings, wherein.

Fig. 1 is a rear view of a landing door incorporating an embodiment of an elevator landing door locking and unlocking apparatus according to the present invention;

Fig. 2 is an enlarged plan view of an essential part of a locking device of Fig. 1;

Fig. 3 is an enlarged side view of the locking device of Fig. 1 illustrating the relationship between a hook and an engaging piece of the locking device, as viewed from the right side thereof;

Figs. 4 and 5 are side views of the locking device, illustrating the operation of the hook of Fig. 3; and

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Figs. 6 to 8 are enlarged front views of the

1 locking device, illustrating the positional relationship between the operation of the hook and the engaging piece.

5 An embodiment of the present invention will be described in detail by referring to Figs. 1, 2, 3, and 6.

The upper end of an landing door 1 (which forms a partition between an elevator shaft and each landing floor of a building) mounts a door hanger 2. The door hanger 2 rotatably supports guide rollers 3A and 3B at the left and right sides thereof, respectively. The guide rollers 3A and 3B roll on a door rail 4 horizontally supported on a frame 5 fixed to the structure of the building (not shown) so as to open and close the landing door 1. The lower end of the landing door 1 is provided with a door shoe 6 which is guided along a guide groove 7G of a doorsill 7 provided at each floor of the building.

With this arrangement, the landing door 1 can be moved by a predetermined amount. However, since this arrangement enables the landing door 1 to be opened and closed freely, a locking device is required for preventing the opening and closing thereof without restriction. This locking device includes a support plate 8 fixed to the door hanger 2, and engaging rollers 9 and 10 supported on the support plate 8. The engaging roller 9 is rotatably supported on a shaft 9S fixed to the support plate 8,

while the engaging roller 10 is supported on a shaft 10S fixed to a movable plate 11 which is in turn supported on a shaft 12 fixed to the support plate 8. When the engaging rollers 9 and 10 are stationary, they are aligned in the horizontal direction with the shaft 12 positioned below and midway between the two aligned engaging rollers 9 and 10. The movable plate 11 is elongated substantially in the horizontal direction, and has one end that protrudes from the end of the door hanger 2. The protruded portion of the movable plate 11 forms a hook 13, and the underside thereof is provided with a groove 14 which opens downward. A locking piece 13K is mounted on the distal end of the hook 13. An engaging member 15 comprises an engaging piece 15A to be received in the groove 14 and a mounting portion 15B, and is fixed on the frame 5 through the mounting portion 15B by means of fixing means such as bolts. An unlocking rod 16 is fixed to the movable plate 11 at a position which is relatively close to the hook 13 in such a manner that it hangs next to the rear surface of the landing door 1. A key hole 17 is formed through the landing door 1 adjacent to the unlocking rod 16. An engaging member 18 comprises an engaging piece 18A and a mounting portion 18B, and is fixed to the frame 5 via the mounting portion 18B. The top of the engaging piece 18A is at a higher level than the top of the engaging piece 15A as will be evident from Fig. 6, and the mounting portion 15B is located above the mounting portion 18B. The engaging piece 18A engages with the locking piece 13K when the hook 13 is moved to a position at which the

engaging piece 15A is disengaged from the groove 14 and the landing door 1 is moved and opened to such an extent which enables the operator to put his hand on the rear surface of the landing door 1. One end of a string member 19 such as
5 a wire rope is coupled to the other end 11E of the movable plate 11. The string member 19 extends downwardly via a guide 21, and the other end thereof is coupled to a pin 20 fixed on the lower portion of the landing door 1 adjacent to the lateral end thereof. The pin 20 must be provided
10 near the lateral end of the landing door 1 on the side which is closer to the hook 13 in order to enable the string member 19 to be operated by the operator.

It will be appreciated that in the above description reference numerals 16 and 17 indicate
15 components of the first unlocking mechanism and reference numeral 19 indicates the component of the second unlocking mechanism.

Furthermore, as will be evident from Figs. 6, 7 and 8, the first amount of pivotal movement is shown by the displacement of the plate 11 between Figs. 6 and 7 and the
20 second amount of pivotal movement is shown by the displacement of the plate 11 between Figs. 7 and 8. The predetermined amount through which the landing door can be opened when the first unlocking mechanism is released is
25 the total distance between the engaging edge of the hook 13 when the landing door is fully closed and the engaging edge of the engaging piece 18A.

With the above-described arrangement, when the elevator car arrives at a position at which it faces the landing door 1 during normal operation of the elevator, an engaging device 22 which has a U-shaped form as viewed from above and is provided on a car door 23 holds the engaging rollers 9 and 10, as shown by the two dot chain line in Fig. 2. When the car door 23 is driven in the door opening direction (to the left as viewed in Figs. 1 and 2) in this state, the engaging device 22 first makes contact with the engaging roller 10. It then pushes the engaging roller 10 as the car door 23 is driven further in the door opening direction. At this time, the movable plate 11 supporting the engaging roller 10 is pivoted counterclockwise about the shaft 12 from the position shown in Fig. 6 to the position shown in Fig. 8, whereupon the hook 13 of the movable plate 11 moves away from the engaging pieces 15A and 18A,

1 unlocking the landing door (Fig. 5). When the car door
23 is driven further, the engaging device 22 starts to
move the landing door 1 in the opening direction in the
state wherein the movable plate 11 is inclined, as shown
5 in Fig. 8. The landing door 1 can thus be opened.

On the other hand, when the car door 23 is
driven in the door closing direction to close the landing
door 1, the engaging device 22 first moves away from the
engaging roller 10, and then makes contact with the
10 other engaging roller 9. At this time, support of the
movable plate 11 is released, as a result of which it
lies substantially in the horizontal direction again.
Since the engaging roller 9 is supported on the shaft 9S
that is fixed on the support plate 8, the landing door
15 1 is pushed by the urging force of the engaging device
22, and is moved in the door closing direction. When
the landing door 1 approaches its closed position, the
hook 13 located at the distal end of the movable plate
11 runs on to the engaging piece 18A, as shown in Figs. 4
20 and 7, and proceeds toward the right. The hook 13 then
passes over the engaging piece 15A, as shown in Figs. 3
and 6, locking the landing door 1.

The landing door 1 can be opened in the follow-
ing manner even when the elevator car is not located at
25 a position at which it faces the landing door 1.

The operator who is standing outside the
elevator first inserts the key into the key hole in the
landing door 1 and turns it through about 90 degrees

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1 toward the unlocking rod. This causes the unlocking rod
16 to be displaced, as shown by the one dot chain line
in Fig. 1, inclining the movable plate 11 formed
integrally with the unlocking rod 16, as shown by the
5 one dot chain line, and thereby moving the hook 13 away
from the engaging piece 15A and unlocking it, as shown
in Figs. 4 and 7. In this state the landing door 1 can
be easily moved to a position at which the engaging piece
18A engages with the locking piece 13K, but is prevented
10 from being opened any further.

To fully open the landing door 1, the operator
inserts his hand through the space formed as the landing
door 1 is opened and pulls the string member 19 hanging
next to the rear surface of the landing door toward
15 himself (in the direction shown by the arrow in Fig. 1),
thereby to displace it, as shown by the two dot chain
line. This causes the movable plate 11 to pivot
counterclockwise about the shaft 12, inclining it through
a larger angle, as shown by the two dot chain line and
20 as illustrated in Figs. 5 and 8, and thereby moving the
locking piece 13K away from the engaging piece 18A.
In this state, the landing door 1 can be moved to its
fully opened position. After the landing door 1 has
started to move, the operator releases the string member
25 19, so that he can open the landing door 1 without being
forced to take an unnatural posture. When the string
member 19 has been released from the grasp of the operator,
the movable plate 11 lies substantially in the horizontal

1 direction again.

To close the landing door 1, it is merely moved in the door closing direction, and the key is then removed from the key hole 17 when the landing door 1 is fully
5 closed, as a result of which the groove 14 of the hook 13 engages with the engaging piece 15A so as to lock the landing door, as shown in Figs. 1, 2, 3 and 6.

As can be seen from the foregoing description, when opening the landing door 1 at the time when the
10 elevator car is not facing the same, it can only be opened slightly by the unlocking operation with the key. This is effective in preventing an operator from accidentally falling into the elevator shaft if he forgets that he has unlocked the landing door 1 with the key and
15 carelessly opens the landing door 1 fully.

Further, since the string member 19 which is pulled when unlocking the landing door 1 is mounted on the rear surface thereof, only a maintenance man who has knowledge of this fact can manually open the landing
20 door 1, thereby preventing any worker who has little knowledge of the operation of the elevator from fully opening the landing door 1.

In consequence, even if a person other than a maintenance worker unlocks the landing door 1 by this
25 operation with the key, he cannot open it fully without the help of the maintenance man qualified to do so. This makes this unlocking apparatus very safe.

The amount of movement of the landing door 1

which is secured by the first unlocking operation can be freely set by changing an interval L between the engaging pieces 15A and 18A.

It is also to be understood that the positional relationship between the engaging pieces 15A and 18A and the groove 14 and the locking piece 13K is not limited to that described in this embodiment.

CLAIMS:

1. Elevator landing door locking and unlocking apparatus for use with a landing door which is slidable and forms a partition between an elevator shaft and a landing floor of a building, said locking and unlocking apparatus including:
- 5 a pivotally movable plate which when in use is mounted on the landing door, said movable plate having a hook at one end thereof;
- 10 a first engaging piece which when in use is mounted on an adjacent portion of the building to engage with said hook when the landing door fully closes;
- a first unlocking mechanism allowing said hook to be disengaged from said first engaging piece by allowing
- 15 said plate to pivotally move by a first amount;
- a second engaging piece for engaging with said hook after said hook has been disengaged from said first engaging piece, and which when in use is mounted at a position at which said landing door can be opened by a
- 20 predetermined amount; and
- a second unlocking mechanism for disengaging said hook from said second engaging piece by allowing said plate to pivotally move through a further second amount, said second unlocking mechanism when in use being mounted on
- 25 that side of said landing door which faces the elevator shaft.
2. An elevator landing door locking and unlocking



apparatus according to claim 1, wherein said pivotally movable plate is supported on a shaft which when in use is fixed to said landing door, and said second unlocking mechanism is an operating member coupled to the end of the pivotally movable plate opposite from the hook.

3. An elevator landing door locking and unlocking apparatus according to claim 2, wherein said operating member constituting said second unlocking mechanism is a string member having one end coupled to the end of said pivotally movable plate, the other end of said string member being coupled to a pin which when in use is mounted on the lower portion of that surface of said landing door which faces the elevator shaft.

4. An elevator landing door locking and unlocking apparatus according to any one of the preceding claims, wherein the underside of said hook is provided with a groove which opens downwards and the top of said second engaging piece to be engaged with said hook is located at a higher level than the top of said first engaging piece.

5. An elevator landing door locking and unlocking apparatus according to any one of the preceding claims, wherein said first and second engaging pieces are mounted on respective horizontally located portions which are fixed one above the other to a frame which when in use constitutes said adjacent portion of the building.



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6. An elevator landing door locking and unlocking apparatus constructed substantially as herein described with reference to the accompanying drawings.

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