

Lock Device for Elevator Floor Door and Elevator

Technical Field

The present invention relates to a lock device for an elevator floor door, and an elevator having the lock device for an elevator floor door.

Background

In the past, the floor door locks of elevators on each floor are known to have a primary contact switch and a secondary contact switch (DC switch), and their contacts are connected to the elevator door lock circuit in series. Only when the floor door is closed, in a case where the primary contact switch and the auxiliary contact switch are turned on, the circuit will become conductive. When one or both of the primary contact switch and the auxiliary contact switch are switched off, the circuit becomes open.

Before, the primary contact switch of the floor door lock uses a shrapnel structure. When the floor door is in the open state and the door lock hook is detached from the door lock catch, the shrapnel switch due to the exposed contacts cannot meet the requirements of “preventing solid foreign objects with a diameter greater than 12mm and a length not greater than 80mm from entering the housing” in the IP2X protection class, and there is a possibility that nearby people may touch live contacts.

Contents of the invention

In view of the above problems, the object of the present invention is to provide a lock device for an elevator floor door with a contact pin structure as the primary contact switch, and an elevator having such a floor door lock device, wherein in the states where the floor door is closed and the floor door lock mechanism is locked, where the floor door lock mechanism is unlocked and the floor door is not opened, and where the floor door is opened, the above lock device for an elevator floor door can meet the IP2X protection level requirements, and can protect nearby people from touching live components.

The present invention provides a lock device for an elevator floor door, characterized by comprising: a primary contact switch, which has a primary contact switch receptacle fixed to a hoistway, and a primary contact switch pin capable of being plugged with respect to the primary contact switch receptacle to make electrical connection and release the electrical connection; a secondary contact switch, which has a secondary contact switch receptacle fixed with respect to the hoistway, and a secondary contact switch pin fixed with respect to the floor door on one side and capable of being plugged with respect to the secondary contact switch receptacle so as to make electrical connection and release the electrical connection; and a floor door lock mechanism, which includes a stationary part fixed relative to the hoistway, and a movable part that is fixed with respect to the

floor door on the other side and can move with opening and closing of the floor door on the other side, a door lock catch being provided on the stationary part, the movable part being provided with a door lock hook that can be freely engaged with the door lock catch, wherein: the primary contact switch pin is provided on the movable part and is plugged with respect to the primary contact switch receptacle as the movable part moves; wherein in a state where the floor door is closed and the floor door lock mechanism is locked, the primary contact switch pin is inserted into the primary contact switch receptacle, the secondary contact switch pin is inserted into the secondary contact switch receptacle, and the door lock hook is engaged with the door lock catch; and wherein in a state where the floor door is opened, the primary contact switch pin is extracted from the primary contact switch receptacle, the secondary contact switch pin is extracted from the secondary contact switch receptacle, and the engagement between the door lock hook and the door lock catch is released.

Preferably, in the lock device for an elevator floor door, the movable part of the floor door lock mechanism comprises: a rotating shaft rotatably attached to the floor door on the other side; an arm portion, one end of which is pivotally supported on the rotating shaft, and the other end thereof on the side opposite to the rotating shaft is equipped with the door lock hook extending downward; and a connecting plate, which is fixed to the other end of the arm portion, and has a protruding portion projecting to the side opposite to the rotating shaft, the protruding portion being equipped with the primary contact switch pin.

Preferably, in the lock device for an elevator floor door, when the door lock hook is engaged with the door lock catch, the arm portion of the movable part and the stationary part are separated by a predetermined distance.

Preferably, in the lock device for an elevator floor door, the inserting/extracting direction of the primary contact switch pin with respect to the primary contact switch receptacle is consistent with the engaging/disengaging direction of the door lock hook with respect to the door lock catch.

The present invention also provides an elevator having the above lock device for an elevator floor door.

Effects of the invention:

According to the lock device for an elevator floor door and the elevator having the same of the present invention, in the states where the floor door is closed and the floor door lock mechanism is locked, where the floor door lock mechanism is unlocked and the floor door is not opened, and where the floor door is opened, the above lock device for an elevator floor door can meet the IP2X protection level requirements, and can protect nearby people from touching live components.

Description of the Drawings

FIG. 1 is a front view showing a state in which a floor door is locked and a floor door lock mechanism is locked when the lock device for an elevator floor door of the present invention is installed on an elevator floor door.

FIG. 2 is an enlarged view showing the primary contact switch, secondary contact switch, and floor door lock mechanism in the state of FIG. 1.

FIG. 3 is a front view showing a state in which the floor door lock mechanism is unlocked and the floor door is not opened when the lock device for an elevator floor door of the present invention is installed on an elevator floor door.

FIG. 4 is an enlarged view showing the primary contact switch, secondary contact switch, and floor door lock mechanism in the state of FIG. 3.

FIG. 5 is a front view showing a state in which the floor door lock mechanism is unlocked and the floor door is opened when the lock device for an elevator floor door of the present invention is installed on an elevator floor door.

FIG. 6 is an enlarged view showing the primary contact switch, secondary contact switch, and floor door lock mechanism in the state of FIG. 5.

FIG. 7 is a front view showing the movable part of the present invention.

List of reference signs:

100: lock device for an elevator floor door;

1: primary contact switch;

11: primary contact switch receptacle;

12: primary contact switch pin;

12a: pin;

2: secondary contact switch;

21: secondary contact switch receptacle;

22: secondary contact switch pin;

22a: pin;

3: movable part;

31: door lock hook;

32: connecting plate;

32a: protruding portion;

33: arm portion;

34: rotating shaft;

4: stationary part;

41: door lock catch;

42: bent plate

Embodiments

Hereinafter, embodiments of the invention will be described based on the drawings. In addition, in each figure, the same or equivalent parts are given the same reference signs for explanation.

Next, the structure of the lock device for an elevator floor door of the present invention will be described according to FIGS. 1-2.

FIG. 1 is a front view showing a state in which the floor door is locked and the floor door lock mechanism is locked when the lock device for an elevator floor door 100 of the invention is installed on an elevator floor door.

FIG. 2 is an enlarged view showing a primary contact switch 1, a secondary contact switch 2, and a floor door lock mechanism having a movable part 3 and a stationary part 4 in the state of FIG. 1.

As shown in FIG. 1, the lock device for an elevator floor door 100 mainly comprises a primary contact switch 1, a secondary contact switch 2, and a floor door lock mechanism having a movable part 3 and a stationary part 4.

As shown in FIG. 2, the primary contact switch 1 has a primary contact switch receptacle 11 fixed with respect to a hoistway, and a primary contact switch pin 12 capable of being plugged with respect to the primary contact switch receptacle 11 to make electrical connection and release the electrical connection; the upper end of the primary contact switch receptacle 11 has a groove, and the groove has an insertion hole inside, in which contact springs of the primary contact switch receptacle 11 are located; the groove allows a pin 12a of the primary contact switch pin 12 to be inserted into the insertion hole; and the primary contact switch pin 12 is provided on the movable part 3, which will be described in detail later.

The secondary contact switch 2 is a DC switch, which has a secondary contact switch receptacle 21 fixed relative to the hoistway, and a secondary contact switch pin 22 fixed with respect to the floor door on one side (here, the left side) and capable of being plugged with respect to the secondary contact switch receptacle 21 so as to make electrical connection and release the electrical connection, wherein the secondary contact switch pin 22 has a pin 22a inserted into the secondary contact switch receptacle 21 (see FIG. 6).

The floor door lock mechanism comprises a stationary part 4 fixed with respect to the hoistway, and a movable part 3 that is fixed with respect to the floor door on the other side (here, the right side) and can move with the opening and closing of the floor door on the right side.

Hereinafter, the movable part 3 and the stationary part 4 will be described in detail.

FIG. 7 is a front view showing the movable part 3 of the present invention.

As shown in FIG. 7, the movable part 3 comprises: a door lock hook 31 extending downward, which can be freely engaged with a door lock catch 41 of the stationary part 4; a connecting plate 32, which is used for connecting the primary contact switch pin 12 to

the movable part 3; an arm portion 33 that is integrated with door lock hook 31 and the connecting plate 32; and a rotating shaft 34, which is rotatably attached to the floor door on the right side. Here, one end (here, the right end) of the arm portion 33 is pivotally supported by the rotating shaft 34, and at the other end (here, the left end) opposite to the rotating shaft 34, the door lock hook 31 and the connecting plate 32 are mounted, the door lock hook 31 being mounted below the arm portion 33, and the connecting plate 32 being mounted above the arm portion 33. The connecting plate 32 has a protruding portion 32a projecting toward the side opposite to the rotating shaft 34, and the protruding portion 32a is equipped with the primary contact switch pin 12. Specifically, the protruding portion 32a is formed by vertically bending the connecting plate 32 from the horizontal direction, and is fastened to the primary contact switch pin 12 by bolts, and the horizontal portion of the connecting plate 32 is also fastened to the arm portion 33 by bolts.

As shown in FIG. 4, the stationary part 4 has a door lock catch 41 that can be freely engaged with the door lock hook 31 of the movable part 3, and the downwardly-bent bent plate 42 at the right end of the stationary part 4 is located at the lower left of the arm portion 33 and spaced from the arm portion 33 by a prescribed distance, in order not to interfere with the door lock hook 31 regardless of whether the door lock hook 31 is engaged with the door lock catch 41.

Next, the working principle and the effects of the lock device for an elevator floor door 100 will be described.

As described above, the primary contact switch receptacle 11 of the primary contact switch 1, the secondary contact switch receptacle 21 of the secondary contact switch 2, and the stationary part 4 as a whole are fixed with respect to the hoistway; the secondary contact switch pin 22 of the secondary contact switch 2 is fixed to the left floor door; and the primary contact switch pin 12 of the primary contact switch 1 and the movable part 3 are together fixed to the right floor door.

As shown in Figures 1 and 2, in the state where the floor door is closed and the floor door lock mechanism is locked, the secondary contact switch pin 22 of the secondary contact switch 2 is inserted into the secondary contact switch receptacle 21, and the switch contact of the secondary contact switch 2 and the switch socket form a closed state; the primary contact switch pin 12 of the primary contact switch 1 that is provided on the movable part 31 is inserted into the primary contact switch receptacle 11 of the primary contact switch 1, and the switch contact of the primary contact switch 1 and the switch socket also forms a closed state. The door lock hook 31 of the movable part 3 is snapped into the door lock catch 41 of the stationary part 4, and the direction in which the primary contact switch pin 12 is inserted into the primary contact switch receptacle 11 coincides with the direction in which the door lock hook 31 is snapped into the door lock catch 41, so the floor door is locked, both the primary contact switch 1 and the secondary contact

switch 2 become the ON-state, and the circuit of the elevator is turned on.

At this time, both the primary contact switch 1 and the secondary contact switch 2 are in the closed state, and the closing gap is set to ensure that the relevant personnel cannot touch the live parts, so as to meet the IP2X protection level requirements.

As shown in Figures 3-4, before the elevator arrives at the station and the floor door is about to open, the rotating shaft 34 starts to rotate clockwise under the mechanical push of the vane, so the end of the movable part 3 with the door lock hook 31 is lifted in a manner of rotating in a clockwise rotation, and the floor door is about to open. In the state where the door lock hook 31 is raised but the floor door is not opened, the secondary contact switch pin 22 of the secondary contact switch 2 is still inserted in the secondary contact switch receptacle 21 because it is fixed relative to the floor door on the left. As the door lock hook 31 is lifted, the primary contact switch pin 12 is disengaged from the primary contact switch receptacle 11 of the primary contact switch 1, the door lock hook 31 of the movable part 3 is disengaged from the door lock catch 41 of the stationary part 4, and the direction in which the primary contact switch pin 12 is disengaged from the primary contact switch receptacle 11 coincides with the direction in which the door lock hook 31 is disengaged from the door lock catch 41, so the floor door is unlocked but not opened. At this time, the primary contact switch 1 becomes the off state, the secondary contact switch 2 is still on, and the circuit of the elevator is disconnected.

Here, the primary contact switch 1 is in the disconnected state, the primary contact switch pin 12 is not charged, and the primary contact switch receptacle 11 is set to meet the IP2X protection level requirements, so it meets the IP2X protection level requirements. On the other hand, the secondary contact switch 2 is in the closed state, and the closed gap is set to ensure that the relevant personnel cannot touch the live parts, so it also meets the IP2X protection level requirements.

As shown in Figures 5-6, when the floor door is opened after the floor door lock mechanism is unlocked, the secondary contact switch pin 22 of the secondary contact switch 2 is driven by the left floor door and is extracted from the secondary contact switch receptacle 21, so that the secondary contact switch 2 is brought into the off state. The movable part 3 still maintains the lifted posture in the previous state, so the primary contact switch pin 12 is still disengaged from the primary contact switch receptacle 11 of the primary contact switch 1, and the door lock hook 31 of the movable part 3 also is still disengaged from the door lock catch 41 of the stationary part 4. However, under the driving of the left and right floor doors, the secondary contact switch pin 22 moves to the left, and the movable part 3 moves to the right as a whole, so the secondary contact switch pin 22 and the movable part 3 move away from the secondary contact switch receptacle 21 and the stationary part 4 to the left and right, respectively. At this time, both the primary contact switch 1 and the secondary contact switch 2 become disconnected, and the circuit

of the elevator is disconnected.

Here, the primary contact switch 1 and the secondary contact switch 2 are in the disconnected state, as in the previous state, and the socket portions of the primary contact switch 1 and the secondary contact switch 2 all are set to meet the IP2X protection level requirements, so it meets the IP2X protection level requirements.

Thus, no matter what state the floor door is in (closed, in the process of opening, fully opened), it can meet the IP2X protection level requirements, and can protect nearby people from touching live parts.

Further, it is possible to ensure that the switches are reliably switched off to disconnect the circuit when the floor door is opened, since the primary contact switch receptacle 11, the secondary contact switch receptacle 21 and the stationary part 4 as a whole are fixed with respect to the hoistway, and the secondary contact switch pin 22 and movable part 3 provided with the primary contact switch pin 12 are fixed to the left and right floor doors, respectively.

Moreover, since the direction in which the primary contact switch pin 12 is inserted into the primary contact switch receptacle 11 coincides with the direction in which the door lock hook 31 is snapped into the door lock catch 41, it is possible to conduct the circuit while locking the floor doors. Since the direction in which the primary contact switch pin 12 is extracted from the primary contact switch receptacle 11 also coincides with the direction in which the door lock hook 31 is disengaged from the door lock catch 41, it is possible to disconnect the circuit while unlocking the floor doors, thereby improving safety and reducing man-hours.

In the above, the preferred embodiments have been used to describe the lock device for an elevator floor door according to the invention. However, the above embodiments are only given as an example, and are not intended to limit the scope of the invention. Of course, the device of the invention described in the description can be implemented in various ways, and further various omissions, substitutions, and changes can be made without departing from the gist of the invention. The scope of the claims and their equivalents are intended to cover the embodiments or improvements thereof within the scope of the gist of the invention.

CLAIMS

1. A lock device for an elevator floor door, characterized by comprising:

a primary contact switch, which has a primary contact switch receptacle fixed to a hoistway, and a primary contact switch pin capable of being plugged with respect to the primary contact switch receptacle to make electrical connection and release the electrical connection;

a secondary contact switch, which has a secondary contact switch receptacle fixed with respect to the hoistway, and a secondary contact switch pin fixed with respect to the floor door on one side and capable of being plugged with respect to the secondary contact switch receptacle so as to make electrical connection and release the electrical connection; and

a floor door lock mechanism, which includes a stationary part fixed with respect to the hoistway, and a movable part that is fixed with respect to the floor door on the other side and can move with opening and closing of the floor door on the other side, a door lock catch being provided on the stationary part, the movable part being provided with a door lock hook that can be freely engaged with the door lock catch, wherein:

the primary contact switch pin is provided on the movable part and is plugged with respect to the primary contact switch receptacle as the movable part moves,

in a state where the floor doors are closed and the floor door lock mechanism is locked, the primary contact switch pin is inserted into the primary contact switch receptacle, the secondary contact switch pin is inserted into the secondary contact switch receptacle, and the door lock hook is engaged with the door lock catch,

in a state where the floor doors are opened, the primary contact switch pin is extracted from the primary contact switch receptacle, the secondary contact switch pin is extracted from the secondary contact switch receptacle, and the engagement between the door lock hook and the door lock catch is released.

2. The lock device for an elevator floor door as claimed in claim 1, characterized in that,

the movable part of the floor door lock mechanism comprises:

a rotating shaft rotatably attached to the floor door on the other side;

an arm portion, one end of which is pivotally supported on the rotating shaft, and the other end thereof on the side opposite to the rotating shaft is equipped with the door lock hook extending downward; and

a connecting plate, which is fixed to the other end of the arm portion, and has a protruding portion projecting to the side opposite to the rotating shaft, the protruding portion being equipped with the primary contact switch pin.

3. The lock device for an elevator floor door as claimed in claim 2, characterized in that,

when the door lock hook is engaged with the door lock catch, the arm portion of the movable part is separated from the stationary part by a predetermined distance.

4. The lock device for an elevator floor door as claimed in claim 1 or 2, characterized in that,

the inserting/extracting direction of the primary contact switch pin with respect to the primary contact switch receptacle coincides with the engaging/disengaging direction of the door lock hook with respect to the door lock catch.

5. An elevator, characterized by comprising a lock device for an elevator floor door according to any one of claims 1 to 4.