

DESCRIPTION

CLOSING CONFIRMATION DEVICE FOR ELEVATOR

5 FIELD

[0001]

The present invention relates to a closing confirmation device for confirming that an entrance of an elevator has been closed by a door.

10 BACKGROUND

[0002]

There are hitherto provided elevators for transporting persons or cargos.

[0003]

15 As shown in Fig. 32, an elevator 6 includes a cage that is movable to positions respectively corresponding to a plurality of elevator halls, an entrance 60 for access between the inside of the cage and each elevator hall, and doors 61 for closing the entrance 60. In Fig. 32, the cage is not shown.

[0004]

20 The entrance 60 includes a landing opening 600 provided at each of the plurality of elevator halls, and a cage opening (not shown) provided at the cage. The cage opening faces the landing opening 600 when the cage is moved to the position corresponding to each elevator hall.

[0005]

25 The doors 61 include a landing door 610 for closing the landing opening 600, and a cage door (not shown) for closing the cage opening (not shown).

[0006]

The landing door 610 includes a pair of outer doors 610a that are arranged to align in one direction (first direction). The pair of outer doors
30 610a can slide to and from each other.

[0007]

The landing door 610 and the cage door are configured to slide in association with each other. Specifically, when a pair of inner doors slide to each other, the pair of outer doors 610a slide to each other. On the other hand, when the pair of inner doors slide from each other, the pair of outer doors 610a also slide from each other. Accordingly, the doors 61 are capable of closing or opening the entrance 60.

[0008]

A closing confirmation device 7 that confirms that the landing opening 600 has been closed by the landing door 610 is attached to the elevator 6 (Patent Literature 1).

[0009]

The closing confirmation device 7 includes a circuit unit 70 that includes a junction part 700b provided on a base 700a, a switching member 71 that switches between a mode with the junction part 700b held in conductive state and a mode with the junction part 700b held in non-conductive state upon its movement relative to the circuit unit 70, and a movement restriction member 72 that is capable of restricting the movement of the switching member 71 with the junction part 700b held in conductive state.

[0010]

The circuit unit 70 is attached to the periphery of the landing opening 600, and the switching member 71 is attached to the landing door 610. Accordingly, when the landing opening 600 is closed, the switching member 71 moves close to the circuit unit 70 to thereby bring the junction part 700b into conductive state. On the other hand, when the landing opening 600 is opened, the switching member 71 moves away from the circuit unit 70 to bring the junction part 700b into non-conductive state.

[0011]

Therefore, it is possible to confirm that the landing opening 600 has been closed by the landing door 610 through detection of the conductive state of the junction part 700b.

[0012]

In the above conventional closing confirmation device 7, the switching member 71 is attached only to a first one of the pair of outer doors 610a of the landing door 610. Because of this, it is not possible to confirm whether the second one of the pair of outer doors 610a of the landing door 610 is closed.

5 Thus, according to the above conventional closing confirmation device 7, there may be a case where the cage may be moved to another elevator hall regardless of that the landing opening 600 is not completely closed by the landing door 610.

[0013]

10 Such an event may take place not only in the elevator having the above configuration where the circuit unit 70 is attached to the periphery of the landing opening 600 and the switching member 71 is attached to the landing door 610, but also in an elevator having a configuration where the circuit unit 70 is attached to the cage and the switching member 71 is attached to the cage
15 door.

CITATION LIST

Patent Literature

[0006]

20 Patent Literature 1: JP Hei-7-106866 B

SUMMARY

Object to achieve

[0015]

25 In consideration of the above circumstances, it is an object of the present invention to provide a closing confirmation device that is capable of confirming that the entrance of the elevator has been completely closed by the doors.

Solution to Problem

30 [0016]

According to the present invention, there is provided a closing

confirmation device including: a circuit unit that includes a first junction part and a second junction part; a first switching member that moves relative to the circuit unit in association with opening and closing of a first one of doors in a first direction, in which the doors of an elevator slide, to thereby switch

5 between a mode with the first junction part held in conductive state and a mode with the first junction part held in non-conductive state; and a second switching member that moves relative to the circuit unit in association with opening and closing of the second one of the doors in the first direction to thereby switch between a mode with the second junction part held in conductive state and a
10 mode with the second junction part held in non-conductive state.

[0017]

In the above configuration, the first junction part and the second junction part may be arranged to align in the first direction.

[0018]

15 In the above configuration, the first junction part and the second junction part may be arranged to align along a plane orthogonal to the first direction.

[0019]

One aspect of the closing confirmation device of the present invention
20 may be configured such that the first junction part includes a pair of first terminal members, the second junction part includes a pair of second terminal members, a first one of the pair of first terminal members and a first one of the pair of second terminal members are electrically connected to an electric circuit including a control device for controlling the elevator, the second one of the pair
25 of first terminal members and the second one of the pair of second terminal members are electrically connected to each other, the first one and the second one of the pair of first terminal members are switched between conductive state and non-conductive state by the first switching member, the first one and the second one of the pair of second terminal members are switched between
30 conductive state and non-conductive state by the second switching member.

[0020]

In the above case, it may be configured such that the first one of the pair of first terminal members and the second one of the pair of second terminal members are arranged to align in the first direction, and the second one of the pair of first terminal members and the first one of the pair of second terminal members are arranged to align in the first direction.
[0021]

In the above case, it may be configured such that the first one of the pair of first terminal members and the first one of the pair of second terminal members are arranged to align in the first direction, and the second one of the pair of first terminal members and the second one of the pair of second terminal members are arranged to align in the first direction.
[0022]

In the above case, it may be configured such that the first one of the pair of first terminal members and the second one of the pair of first terminal members are arranged to align in the first direction, and the first one of the pair of second terminal members and the second one of the pair of second terminal members are arranged to align in the first direction.
[0023]

According to another aspect of the closing confirmation device of the present invention, it may be configured such that at least one pair of the pair of first terminal members and the pair of second terminal members are longitudinal in the first direction.
[0024]

According to still another aspect of the closing confirmation device of the present invention, it may be configured such that at least one pair of the pair of first terminal members and the pair of second terminal members are longitudinal along a plane orthogonal to the first direction.
[0025]

According to another aspect of the closing confirmation device of the present invention, it may be configured such that the closing confirmation device further includes a restriction mechanism that is capable of restricting

the movement of the first switching member with the second junction part held in conductive state, the pair of first terminal members are longitudinal in the first direction, and the pair of second terminal members are longitudinal along a plane orthogonal to the first direction.

5 [0026]

According to still another aspect of the closing confirmation device of the present invention, it may be configured such that each of the pair of first terminal members includes a plurality of first contact parts that come into abutting contact with the first switching member, and each of the pair of second
10 terminal members includes a plurality of second contact parts that come into abutting contact with the second switching member.

[0027]

According to yet another aspect of the closing confirmation device of the present invention, it may be configured such that the circuit unit includes a
15 single base, and the plurality of first contact parts and the plurality of second contact parts are provided on the base.

BRIEF DESCRIPTION OF DRAWINGS

[0028]

20 Fig. 1 is an overall schematic view of a closing confirmation device of a first embodiment of the present invention.

Fig. 2 is a front view of a circuit unit of the closing confirmation device.

Fig. 3 is a perspective view of the circuit unit of the closing confirmation device.

25 Fig. 4 is an exploded perspective view of the circuit unit of the closing confirmation device.

Fig. 5 is a plan view of the circuit unit of the closing confirmation device.

Fig. 6 is an electrical diagram of the closing confirmation device.

30 Figs. 7A and 7B are explanatory views of a first switching member of the closing confirmation device, in which Fig. 7A is a front view of the first

switching member and Fig. 7B is a plan view of the first switching member.

Fig. 8 is a perspective view of the first switching member of the closing confirmation device.

5 Figs. 9A and 9B are explanatory views of the second switching member of the closing confirmation device, in which Fig. 9A is a front view of the second switching member and Fig. 9B is a plan view of the second switching member.

Fig. 10 is a perspective view of the second switching member of the closing confirmation device.

10 Figs. 11A and 11B are explanatory views for the operation of the closing confirmation device, in which Fig. 11A is an overall view of the closing confirmation device in the state where an entrance of an elevator is being closed, and Fig. 11B is a partially enlarged view of Fig. 11A.

Figs. 12A and 12B are explanatory views for the operation of the closing confirmation device, in which Fig. 12A is an overall view of the closing confirmation device in the state where the entrance of the elevator has been closed, and Fig. 12B is a partially enlarged view of Fig. 12A.

20 Figs. 13A and 13B are explanatory views for the operation of the closing confirmation device, in which Fig. 13A is an overall view of the closing confirmation device in the state where the entrance of the elevator is being opened, and Fig. 13B is a partially enlarged view of Fig. 13A.

Fig. 14 is an overall schematic view of the closing confirmation device according to a second embodiment of the present invention.

Fig. 15 is a front view of a circuit unit of the closing confirmation device.

25 Fig. 16 is a perspective view of the circuit unit of the closing confirmation device.

Fig. 17 is a plan view of the circuit unit of the closing confirmation device.

Fig. 18 is an electrical diagram of the closing confirmation device.

30 Figs. 19A and 19B are explanatory views of a first switching member of the closing confirmation device, and Fig. 19B is a plan view of the first switching member.

Fig. 20 is a perspective view of the first switching member of the closing confirmation device.

5 Figs. 21A and 21B are explanatory views of a second switching member of the closing confirmation device, in which Fig. 21A is a front view of the second switching member, and Fig. 21B is a plan view of the second switching member.

Fig. 22 is a perspective view of the second switching member of the closing confirmation device.

10 Figs. 23A and 23B are explanatory views for the operation of the closing confirmation device, in which Fig. 23A is an overall view of the closing confirmation device in the state where an entrance of an elevator is being closed, and Fig. 23B is a partially enlarged view of Fig. 23A.

Figs. 24A and 24B are explanatory views for the operation of the closing confirmation device, in which Fig. 24A is an overall view of the closing confirmation device in the state where an entrance of an elevator is being closed, and Fig. 24B is a partially enlarged view of Fig. 24A.

20 Figs. 25A and 25B are explanatory views for the operation of the closing confirmation device, in which Fig. 25A is an overall view of the closing confirmation device in the state where the entrance of the elevator is being opened, and Fig. 25B is a partially enlarged view of Fig. 25A.

Fig. 26 is a front view of the closing confirmation device according to another embodiment of the present invention.

Fig. 27 is an electrical diagram of the closing confirmation device according to still another embodiment of the present invention.

25 Fig. 28 is a plan view of the circuit unit of the closing confirmation device according to yet another embodiment of the present invention.

Fig. 29 is a front view of the closing confirmation device according to another embodiment of the present invention.

30 Figs. 30A and 30B are explanatory views of a base of the closing confirmation device, in which Fig. 30A is a front view of the base, and Fig. 30B is a front view of the base.

Figs. 31A and 31B are explanatory views of a second arm of the closing confirmation device, in which Fig. 31A is a front view of the second arm, and Fig. 31B is a front view of the second arm.

Fig. 32 shows a schematic view and a partially enlarged view of a
5 conventional closing confirmation device.

DESCRIPTION OF EMBODIMENTS

[0029]

Hereinafter, a closing confirmation device according to a first
10 embodiment of the present invention is described with reference to the attached drawings. Prior to the description of the closing confirmation device, an elevator as an object, to which the closing confirmation device is attached, is first described.

[0030]

15 As shown in Fig. 1, an elevator 6 includes a cage that is movable to positions respectively corresponding to a plurality of elevator halls, an entrance 60 for access between the inside of the cage and each elevator hall, and a door 61. The elevator 6 includes a header frame 62 fixed to each elevator hall, a guide rail 63 provided at the header frame 62 and is longitudinal in one
20 direction, and door hangers 64 that can slide in the longitudinal direction of the guide rail 63. The elevator 6 includes a sandwiching device (not shown) for sandwiching later-described first and second sandwiched parts. Fig. 1 does not show the cage.

[0031]

25 The entrance 60 includes a landing opening 600 provided at each of the plurality of elevator halls, and a cage opening provided at the cage. The cage opening faces the landing opening 600 when the cage moves to the position corresponding to each elevator hall.

[0032]

30 The door 61 includes a landing door 610 for closing the landing opening 600, and a cage door for closing the cage opening.

[0033]

The landing door 610 includes a pair of outer doors 610a that are arranged to align in the longitudinal direction (first direction (right and left direction)) of the guide rail 63. The pair of outer doors 610a can slide to and from each other. The cage door includes a pair of inner doors that are arranged to align in the first direction. The pair of inner doors can slide to and from each other.

[0034]

The landing door 610 and the cage door slide in association with each other. Specifically, when the pair of inner doors slide to each other, the pair of outer doors 610a also slide to each other. On the other hand, when the pair of inner doors slide from each other, the pair of pair of outer doors 610a also slide from each other. Whereby, the door 61 can close and open the entrance 60. The landing door 610 and the cage door are of a so-called center open type, in which the pair of outer doors 610a and the pair of inner doors open rightward and leftward.

[0035]

The header frame 62 is provided above the landing opening 600. The guide rail 63 is fixed to the header frame 62. The door hangers 64 are provided respectively on upper parts of the pair of outer doors 610a. That is, the landing door 610 includes a pair of door hangers 64.

[0036]

As shown in Fig. 1, the closing confirmation device 1 includes a circuit unit 2, a first switching member 3 that moves relative to the circuit unit 2 in association with the opening and closing of the landing door 610, a second switching member 4 that moves relative to the circuit unit 2 in association with the opening and closing of the landing door 610, and a restriction mechanism 5 that can restrict at least one of the movement of the first switching member 3 and the movement of the second switching member 4.

[0037]

As shown in Fig. 2, the circuit unit 2 includes a first junction part 20

and a second junction part 21 provided on a single base 22. As shown in Fig. 3 and Fig. 4, the circuit unit 2 further includes a first stay 23 that includes an attaching plate part 230 that can attach the base 22 to the first stay 23.

[0038]

5 Specifically describing, the first junction part 20 includes a pair of first terminal members 200 that have conductive properties and are longitudinal in one direction. The pair of first terminal members 200 each include a first end and a second end opposite to the first end in the longitudinal direction. The first terminal member 200 is formed to have the longitudinal direction of the first end side intersecting the longitudinal direction of the second end side. That is, each first terminal member 200 is slightly bent at its intermediate portion in the longitudinal direction.

[0039]

15 The first end of each first terminal member 200 is provided with a pair of first contact parts 200a that are spaced apart from each other in a direction orthogonal to the longitudinal direction.

[0040]

20 A first connection hole 200b is provided on the second end side of each first terminal member 200. With this, a terminal (e.g., round terminal and Y-shaped terminal) connected to a conductive wire can be screw-fastened with the second end side of the first terminal member 200.

[0041]

25 The second junction part 21 includes a pair of second terminal members 210 that have conductive properties and are longitudinal in one direction. The pair of second terminal members 210 each include a first end and a second end opposite to the first end in the longitudinal direction. The second terminal member 210 is formed to have the longitudinal direction of the first end side intersecting the longitudinal direction of the second end side. That is, the second terminal member 210 is slightly bent at its intermediate portion in the longitudinal direction.

[0042]

The first end of each second terminal member 210 is provided with a pair of second contact parts 210a that are spaced apart from each other in a direction orthogonal to the longitudinal direction.

[0043]

5 A second connection hole 210b is provided on the second end side of each second terminal member 210. With this, a terminal (e.g., round terminal and Y-shaped terminal) connected to a conductive wire can be screw-fastened with the second end side of the second terminal member 210.

[0044]

10 As shown in Fig. a first one of the pair of first terminal members 200 and a first one of the pair of second terminal members 210 are electrically connected to an electric circuit leading to a control device C for controlling the elevator 6. A second one of the pair of first terminal members 200 and a second one of the pair of second terminal members 210 are electrically
15 connected to each other.

[0045]

Returning to Fig. 3 and Fig. 4, the base 22 has electrical insulating properties. The base 22 includes a base body 220 having a rectangular solid external appearance, and a partitioning part 221 that rises from a top surface
20 of the base body 220.

[0046]

The base body 220 includes a back surface 220a opposite to the attaching plate part 230 of the first stay 23, and a front surface 220b opposed to the back surface 220a in a direction (second direction (front and back direction))
25 orthogonal to the first direction. The base body 220 includes a first side surface 220c and a second side surface 220d that are opposed to each other in the first direction. The base body 220 includes an upper surface 220e and a bottom surface 220f that are opposed to each other in a direction (third direction (up and down direction)) orthogonal to the first direction and the
30 second direction.

[0047]

The base body 220 is provided with a pair of first-base-fixing holes 220g that pass from the front surface 220b through the back surface 220a. The pair of first-base-fixing holes 220g are provided to be spaced apart from each other in the first direction.

5 [0048]

As shown in Fig. 5, the partitioning part 221 includes a plurality of first wall parts 221a (three in the present embodiment) that rise from the upper surface 220e and are provided to be spaced apart from each other in the second direction, and a plurality of second wall parts 221b (two in the present
10 embodiment) that are provided to extend between the adjacent ones of the plurality of first wall parts 221a.

[0049]

The first wall parts 221a each extend straight from a first side to a second side in the first direction of the upper surface 220e. The second wall
15 parts 221b are arranged to align in the second direction. The second wall parts 221b each are formed integrally with its adjacent first wall parts 221a.

[0050]

With the above configuration, the upper surface 220e of the base body 220 are partitioned into four sections. Describing more specifically, a first
20 arrangement section 222a and a second arrangement section 222b that are spaced apart from each other in the second direction are formed on a first side in the first direction of the upper surface 220e of the base 22. A third arrangement section 222c and a fourth arrangement section 222d that are spaced apart from each other in the second direction are formed on a second
25 side in the first direction of the upper surface 220e of the base 22.

[0051]

The first arrangement section 222a and the second arrangement section 222b are formed to be longitudinal in the first direction. The first one of the pair of first terminal members 200 is arranged at the first arrangement section
30 222a. The second one of the pair of first terminal members 200 is arranged at the second arrangement section 222b. Thus, the pair of first terminal

members 200 are arranged to align in the second direction. Each of the pair of first contact parts 200a of the first one of the pair of first terminal members 200 extends from the first arrangement section 222a in the first direction. Each of the pair of first contact parts 200a of the second one of the pair of first terminal members 200 extends from the second arrangement section 222b in the first direction.

[0052]

The third arrangement section 222c and the fourth arrangement section 222d are each formed to be longitudinal in the third direction. The second one of the pair of second terminal members 210 is arranged at the third arrangement section 222c. The first one of the pair of second terminal members 210 is arranged at the fourth arrangement section 222d. Therefore, the pair of second terminal members 210 are arranged to align in the second direction.

[0053]

The pair of second terminal members 210 are arranged to extend in the third direction. Describing more specifically, the pair of second contact parts 210a of the second one of the pair of second terminal members 210 extend from the third arrangement section 222c in the third direction. The pair of second contact parts 210a of the first one of the pair of second terminal members 210 extend outward from the fourth arrangement section 222d in the third direction.

[0054]

As described above, in the circuit unit 2, the first junction part 20 and the second junction part 21 are arranged to align in the first direction. Describing more specifically, in the circuit unit 2, the first one of the pair of first terminal members 200 and the second one of the pair of second terminal members 210 are arranged to align in the first direction.

[0055]

Returning to Fig. 4, the first stay 23 includes a base fixing part 231 provided at the attaching plate part 230, and a mounting plate part 232

provided orthogonal to the attaching plate part 230.

[0056]

The attaching plate part 230 is provided with a pair of first adjusting holes 230a being longitudinal in the third direction. The pair of first adjusting
5 holes 230a are provided to be spaced apart from each other in the first direction.

[0057]

The circuit unit 2 is screw-fastened to the guide rail 63 by the attaching plate part 230. Therefore, the first junction part 20 and the second junction
10 part 21 of the circuit unit 2 align in the first direction.

[0058]

The base fixing part 231 includes a first plate part 231a opposed to the attaching plate part 230, and a pair of second plate parts 231b that connect the first plate part 231a and the attaching plate part 230. The first plate part 231a
15 is provided with a pair of second-base fixing holes 231c. The pair of second-base fixing holes 231c are provided to be spaced apart from each other in the first direction. The distance between the pair of second-base fixing holes 231c is set to be equal to the distance between the pair of first-base-fixing holes 220g. The pair of second-base fixing holes 231c are screw holes.

20 [0059]

With the above configuration, the circuit unit 2 can be fixed to the first stay 23 by bringing bolts passing through the pair of first-base-fixing holes 220g into threaded engagement with the pair of second-base fixing holes 231c.

[0060]

25 The mounting plate part 232 is provided with a pair of first-restriction-mechanism fixing holes 232a. The first-restriction-mechanism fixing holes 232a are provided to be spaced apart from each other in the first direction.

[0061]

30 As shown in Fig. 7A, the first switching member 3 includes a first arm 30 having a plate shape being longitudinal in the first direction, the first arm

30 having a first end and a second end opposite to the first end in the longitudinal direction, and a first connection part 31 that is provided at the first end of the first arm 30 and is electrically connectable to each of the pair of first terminal members 200. The first switching member 3 includes a second stay 32 to which the first arm is rotatably provided. The first switching member 3 includes a pressure receiving part 33 provided at the first arm 30, an urging unit 34 that urges the pressure receiving part 33, and a posture changing mechanism 35 for changing the posture of the first arm 30.

[0062]

The first arm 30 is formed into a flat plate shape. A shaft hole (not shown) is provided on the second end side of the first arm 30. A pair of first holder fixing holes 300 are provided on the first end side of the first arm 30. The pair of first holder fixing holes 300 are provided to be spaced apart from each other in the first direction.

[0063]

As shown in Fig. 7B and Fig. 8, the first connection part 31 includes a first conductive plate 310 having conductive properties, and a first holder 311 having electrical insulating properties and being configured to fix the first conductive plate 310 to the first end of the first arm 30. The first conductive plate 310 has a first surface and a second surface opposite to the first surface in a direction orthogonal to the plane.

[0064]

The first holder 311 includes a pair of first fixing parts 311a that are longitudinal in the first direction and each have a first end and a second end opposite to the first end in the longitudinal direction, and a first attaching part 311b that is provided at the first ends of the pair of first fixing parts 311a to extend therebetween and are configured to attach the first conductive plate 310.

[0065]

The pair of first fixing parts 311a are provided to be spaced apart from each other. The distance between a first one and a second one of the pair of

first fixing parts 311a is set to be equal or substantially equal to the thickness of the first arm 30. With this configuration, the first end side of the first arm 30 can be interposed between the pair of first fixing parts 311a.

[0066]

5 As shown in Fig. 7B, each of the pair of first fixing parts 311a is provided with a pair of second holder fixing holes 311c. The pair of second holder fixing holes 311c are provided to be spaced apart from each other in the first direction.

[0067]

10 The distance between the pair of second holder fixing holes 311c is set to be equal to the distance between the pair of first holder fixing holes 300. With this configuration, the first holder 311 can be fixed to the first end side of the first arm 30 by bringing bolts passing through the pair of first holder fixing holes 300 into threaded engagement with the pair of second holder fixing holes
15 311c.

[0068]

As shown in Fig. 8, the first attaching part 311b is configured to enable a first surface of the first conductive plate 310 attached to the first attaching part 311b to be directed in the third direction.

20 [0069]

The second stay 32 is provided with a rotational shaft 320 extending in the second direction. The second stay 32 is provided with a pair of second adjusting holes 321 each being longitudinal in the first direction. The pair of second adjusting holes 321 are provided to be spaced apart from each other in
25 the first direction.

[0070]

The rotational shaft 320 passes through a shaft hole of the first arm 30 so that the first arm 30 is rotatable around the axis of the rotational shaft 320.

[0071]

30 The first switching member 3 is fixed to a first one of the door hangers 64 with the second stay 32. With this configuration, the first switching

member 3 moves relative to the circuit unit 2 in association with the sliding of a first one of the pair of outer doors 610a of the landing door 610. Whereby, the first switching member 3 is switchable between a mode with the first conductive plate 310 held in abutting contact with the first junction part 20 (the first contact parts 200a of the pair of first terminal members 200) and a mode with the first conductive plate 310 held in non-abutting contact with the first junction part 20 (the first contact parts 200a of the pair of first terminal members 200). Thus, the first switching member 3 is switchable between a mode with the first junction part 20 of the circuit unit 2 held in conductive state and a mode with the first junction part 20 held in non-conductive state in association with the opening and closing of the landing door 610.

[0072]

Returning to Fig. 7A, the pressure receiving part 33 extends from the first arm 30 to the second stay 32. The pressure receiving part 33 is provided with an insertion hole 330.

[0073]

The urging unit 34 includes a fixing block part 340 that extends out from the second stay 32 to the first arm 30, a support shaft 341 that has a first end and a second end opposite to the first end in the axial direction, the first end being fixed to the fixing block part 340 while the support shaft 341 is inserted in the insertion hole 330, a bushing 342 that is arranged closer to the second end of the support shaft 341 than the pressure receiving part 33 while the support shaft 341 is inserted in the insertion hole 330, an urging spring 343 that is arranged closer to the second end of the support shaft 341 than the bushing 342 while the support shaft is inserted in the insertion hole 330, and a retaining member 344 that prevents the bushing 342 and the urging spring 343 from coming out of the second end of the support shaft 341.

[0074]

The fixing block part 340 is provided to be opposed to the pressure receiving part 33 in the third direction. The support shaft 341 is longitudinal in the third direction. An external thread portion 341a is formed on the

second end side of the support shaft 341.

[0075]

The bushing 342 is provided with a shaft insertion hole 342a. The bushing 342 has a first end and a second end opposite to the first end in a direction in which the shaft insertion hole 342a extends. The outer diameter of the bushing 342 on the first end side is set to be larger than the outer diameter thereof on the second end side.

[0076]

The support shaft 341 is inserted through the shaft insertion hole 342a of the bushing 342. The support shaft 341 is inserted through the bushing 342 from the shaft insertion hole 342a on the first end side. Thus, the first end of the bushing 342 is held in abutting contact with the pressure receiving part 33.

[0077]

For the urging spring 343, a compression coil spring is used. The urging spring 343 is configured to be in abutting contact with the first end side of the bushing 342 while it has the support shaft 341 inserted thereinto.

[0078]

The retaining member 344 includes a retaining member body 344a through which the support shaft 341 is inserted, and an internal thread member 344b that is held in threaded engagement with the external thread portion 341a of the support shaft 341. The retaining member body 344a is in abutting contact with the urging spring 343 while it has the support shaft 341 inserted thereinto. Therefore, the retaining member 344 can compress the urging spring 343 while preventing the bushing 342 and the urging spring 343 from coming out of the support shaft 341 by fastening the internal thread member 344b.

[0079]

The posture changing mechanism 35 includes a first sandwiched part 350 provided coaxially to the rotational shaft 320, and a second sandwiched part 351 provided at a position displaced from the first sandwiched part 350 in the first direction and the third direction.

[0080]

When an external force of a magnitude greater than the urging force of the urging spring 343 is made to act on a first side in the first direction of the second sandwiched part 351, the first arm 30 rotates to the first side around the axis of the rotational shaft 320. When the external force acting on the second sandwiched part 351 becomes smaller than the urging force of the urging spring 343, the first arm 30 rotates to the second side around the axis of the rotational shaft 320.

[0081]

As shown in Fig. 9A, Fig. 9B and Fig. 10, the second switching member 4 includes a second arm 40 that is longitudinal in the first direction and has a first end and a second end opposite to the first end in the longitudinal direction, and a second connection part 41 that is provided at the first end of the second arm 40 and enables each of the pair of second terminal members 210 to be electrically connected to the second connection part 41. The second switching member 4 includes a third stay 42 provided at the second end of the second arm 40.

[0082]

The second arm 40 is provided on its first end side with a pair of first fixing holes 400. The pair of first fixing holes 400 are provided to be spaced apart from each other in the first direction. The pair of first fixing holes 400 are threaded holes.

[0083]

As shown in Fig. 9B, the second connection part 41 includes a second conductive plate 410 having conductive properties, and a second holder 411 having electrical insulating properties and being configured to fix the second conductive plate 410 to the first end of the second arm 40. The second conductive plate 410 has a first surface and a second surface opposite to the first surface in a direction orthogonal to the plane.

[0084]

The second holder 411 includes a second fixing part 411a that is fixed to

the first end of the second arm 40 and is longitudinal in the first direction, and a second attaching part 411b that is provided at the second fixing part 411a and is longitudinal in the second direction.

[0085]

5 The second fixing part 411a is provided with a pair of second fixing holes 411c. The pair of second fixing holes 411c are provided to be spaced apart from each other in the first direction. The distance between the pair of second fixing holes 411c is set to be equal to the distance between the pair of first fixing holes 400. With this configuration, the second holder 411 is fixed to
10 the first end side of the second arm 40 by bringing bolts passing through the pair of second fixing holes 411c into threaded engagement with the pair of first fixing holes 400.

[0086]

 The second attaching part 411b is configured to enable a first surface of
15 the second conductive plate 410 attached to the second attaching part 411b to be directed in the first direction.

[0087]

 As shown in Fig. 9A, the third stay 42 has a plate shape being longitudinal in the first direction. The third stay 42 has a first end and a
20 second end opposite to the first end in the longitudinal direction. The third stay 42 is provided with a plurality of third adjusting holes 420 (two in the present embodiment) each being longitudinal in the longitudinal direction of the third stay 42. The pair of third adjusting holes 420 are provided to be spaced apart from each other.

25 [0088]

 The third stay 42 is fixed to a second one of the door hangers 64. With this configuration, the second switching member 4 moves relative to the circuit unit 2 in association with the sliding of a second one of the pair of outer doors 610a of the landing door 610. Whereby, the second switching member 4 is
30 switchable between a mode with the second conductive plate 410 held in abutting contact with the second junction part 21 of the circuit unit 2 (the

second contact parts 210a of the pair of second terminal members 210) and a mode with second conductive plate 410 held in non-abutting contact with the second junction part 21 (the second contact parts 210a of the pair of second terminal members 210). Thus, the second switching member 4 is switchable
5 between a mode with the second junction part 21 of the circuit unit 2 held in conductive state and a mode with the same held in non-conductive state in association with the opening and closing of the landing door 610.

[0089]

The restriction mechanism 5 can restrict the movement of the first
10 switching member 3 with the first junction part 20 held in conductive state, on the premise that the pair of outer doors 610a slide in association with each other. More specifically, as shown in Fig. 4 and Fig. 7A, the restriction mechanism 5 includes a hooked part 50 provided at the circuit unit 2, and a hooking part 51 that is provided in the first switching member 3 and can come
15 into locking engagement with the hooked part 50.

[0090]

The hooked part 50 includes a fixing plate part 500 that is longitudinal in the first direction and has a first end and a second end opposite to the first end in the longitudinal direction, and a bent part 501 that is provided at the
20 first end of the fixing plate part 500.

[0091]

The fixing plate part 500 is provided with a pair of second-restriction-mechanism fixing holes 500a. The second-restriction-mechanism fixing holes 500a are provided to be spaced apart
25 from each other in the first direction. The distance between the pair of second-restriction-mechanism fixing holes 500a is set to be equal to the distance between pair of the first-restriction-mechanism fixing holes 232a.

[0092]

The pair of first-restriction-mechanism fixing holes 232a are threaded
30 holes. With this configuration, the hooked part 50 can be attached to the mounting plate part 232 by bringing bolts passing through the pair of

first-restriction-mechanism fixing holes 232a into threaded engagement with the pair of second-restriction-mechanism fixing holes 500a.

[0093]

The bent part 501 is provided at the first end of the fixing plate part 500.

5 The bent part 501 is bent back toward the second end side of the fixing plate part 500.

[0094]

The hooking part 51 is provided on the first end side of the first arm 30.

The hooking part 51 extends from the first end side of the first arm 30 in the
10 third direction.

[0095]

The closing confirmation device 1 according to the present embodiment is as described above. Next, the description is made for the operation of attaching the closing confirmation device to the elevator hall and the action of
15 the closing confirmation device 1 with reference to the attached drawings.

[0096]

In the attaching operation for the closing confirmation device 1, the first stay 23 is attached to the elevator hall. Whereby, the circuit unit 2 is fixed to the elevator hall.

20 [0097]

Then, the installation position of the first switching member 3 is adjusted. Describing more specifically, the installation position of the first switching member 3 is set so as to allow the first conductive plate 310 to align with the first contact parts 200a of the pair of first terminal members 200 in
25 the third direction when the landing door 610 is closed. Also, the installation position of the first switching member 3 is set so as to allow the first conductive plate 310 to be pressed to the first contact parts 200a of the pair of first terminal members 200 when the landing door 610 is closed.

[0098]

30 The second stay 32 is fixed to the first one of the pair of outer doors 610a by bringing bolts passing through the pair of second adjusting holes 321

into threaded engagement with the first one of the door hangers 64. The installation position of the first switching member 3 can be adjusted to such an extent corresponding to the length of the pair of second adjusting holes 321 without removing the second stay 32 from the door hanger 64 by slightly
5 loosening the threaded engagement of the bolts relative to the door hanger 64.
[0099]

In the above state, the bolts are tightened so that the second stay 32 is fixed to the first one of the door hangers 64. Whereby, the first switching member 3 is installed at the first one of the door hangers 64 (the first one of the
10 pair of outer doors 610a).
[0100]

Next, the installation position of the second switching member 4 is adjusted. Describing more specifically, the installation position of the second switching member 4 is set so as to allow the second conductive plate 410 to
15 align with the second contact parts 210a of the pair of second terminal members 210 in the first direction. The installation position of the second switching member 4 is set so that, when the landing door 610 is closed, the second conductive plate 410 is pressed to the second contact parts 210a of the pair of second terminal members 210.
20 [0101]

The third stay 42 is fixed to the second one of the pair of outer doors 610a by bringing bolts passing through the pair of third adjusting holes 420 into threaded engagement with the second one of the door hangers 64. The installation position of the second switching member 4 can be adjusted to such
25 an extent corresponding to the length of the pair of third adjusting holes 420 by slightly loosening threaded engagement of the bolts relative to the door hanger 64.
[0102]

In the above state, the bolts are tightened so that the third stay 42 is
30 fixed to the second one of the door hangers 64. Whereby, the second switching member 4 is installed at the second one of the door hangers 64 (the second one

of the pair of outer doors 610a).

[0103]

The closing confirmation device 1 is attached to the elevator 6 in the manner mentioned above.

5 [0104]

Next, the description is made for the action of the closing confirmation device 1. As shown in Fig. 11A and Fig. 11B, in the closing confirmation device 1, when the pair of inner doors and the pair of outer doors 610a slide to each other, the first switching member 3 moves close to the circuit unit 2. The
10 second switching member 4 also moves close to the circuit unit 2.

[0105]

As shown in Fig. 12A and Fig. 12B, when the landing door 610 close the landing opening 600, the first conductive plate 310 comes into abutting contact with the first contact parts 200a of the pair of first terminal members 200, and
15 the second conductive plate 410 comes into abutting contact with the second contact parts 210a of the pair of second terminal members 210. Whereby, the first junction part 20 is brought into conductive state. The second junction part 21 is also brought into conductive state.

[0106]

20 Accordingly, through confirmation that the first junction part 20 and the second junction part 21 each are held in conductive state, it is possible to confirm that the landing opening 600 has been completely closed by the landing doors 610 and hence the entrance 60 of the elevator 6 has been completely closed by the door 61.

25 [0107]

When the door 61 is opened, the sandwiching device of the elevator 6 sandwiches the first sandwiched part 350 and the second sandwiched part 351 of the first switching member 3. Accordingly, the second sandwiched part 351 moves toward the first sandwiched part 350 side. Thus, as shown in Fig. 13A
30 and Fig. 13B, the first arm 30 rotates around the axis of the rotational shaft 320 so that the posture of the first arm 30 is changed.

[0108]

As the result of the above, the first conductive plate 310 moves away from the first contact parts 200a of the pair of first terminal members 200. Thus, the first junction part 20 is brought into non-conductive state. The hooked part 50 is also released from the locking engagement with the hooking part 51. Thus, the sliding of the pair of outer doors 610a and the pair of inner doors in the first direction is possible to be made.

[0109]

As described above, the closing confirmation device 1 according to the present embodiment can produce an excellent effect of making it possible to securely confirm that the entrance 60 has been completely closed by the doors 61 of the elevator 6.

[0110]

In the closing confirmation device 1 according to the present embodiment, the pair of second terminal members 210 are arranged to extend along the third direction. Whereby, the second conductive plate 410 can be pressed to the second contact parts 210a of the pair of second terminal members 210 by the second switching member 4 moving close to the circuit unit 2.

[0111]

In the closing confirmation device 1 according to the present embodiment, the pair of first terminal members 200 each are provided with the pair of first contact parts 200a. With this configuration, even if part of the pair of first contact parts 200a is damaged, it is possible to prevent an event where the first junction part 20 is not brought into conductive state, or other events. Also, in the closing confirmation device 1 according to the present embodiment, the pair of second terminal members 210 each are provided with the pair of second contact parts 210a. With this configuration, even if part of the pair of second contact parts 210a is damaged, it is possible to prevent an event where the second junction part 21 is not brought into conductive state.

[0112]

In the closing confirmation device 1 according to the present embodiment, the first one of the pair of first terminal members 200 and the first one of the pair of second terminal members 210 are electrically connected to the electric circuit leading to the control device C. With this configuration,
5 it is possible to prevent an event where the cage moves to another elevator hall while the entrance 60 is not completely closed by the door 61.

[0113]

Furthermore, in the closing confirmation device 1 according to the present embodiment, two junction parts (the first junction part 20 and the
10 second junction part 21) are provided on the single base 22. With this configuration, it is possible to adjust the positions of the first junction part 20 and the second junction part 21 by adjusting the position of the circuit unit 2 in attaching work. Accordingly, the closing confirmation device 1 according to the present embodiment makes it possible to reduce the number of operation
15 steps required for attaching work, as compared with a closing confirmation device having a configuration in which a first junction part and a second junction part are respectively provided on separate bases.

[0114]

The closing confirmation device 1 according to the first embodiment of
20 the present invention is as described above. Next, the description is made for the closing confirmation device according to the second embodiment of the present invention with reference to the attached drawings. The components identical or corresponding to those of the closing confirmation device and the elevator according to the first embodiment are denoted by the same reference
25 numerals. Also, for the identical or corresponding components, the description in the first embodiment may be used.

[0115]

As shown in Fig. 14, the closing confirmation device 1 includes a circuit unit 2, a first switching member 3 that moves relative to the circuit unit 2 in
30 association with the opening and closing of the landing door 610, a second switching member 4 that moves relative to the circuit unit 2 in association with

the opening and closing of the landing door 610, and a restriction mechanism 5 that can restrict at least one of the movement of the first switching member 3 and the movement of the second switching member 4.

[0116]

5 As shown in Fig. 15 and Fig. 16, a first junction part 20 includes a pair of first terminal members 200 having conductive properties. The pair of first terminal members 200 each are formed by bending a plate-shaped member being longitudinal in one direction (by bending the member at an intermediate position in the longitudinal direction).

10 [0117]

More specifically, the pair of first terminal members 200 each have a first surface and a second surface opposite to the first surface in a direction orthogonal to the plane. The pair of first terminal members 200 each have a first end and a second end opposite to the first end in the circumferential
15 direction.

[0118]

The pair of first terminal members 200 each are convex toward the first surface side at an intermediate position in the longitudinal direction. Accordingly, the direction in which the first end side of each first terminal
20 member 200 intersects with the direction in which the second end side of each first terminal member 200.

[0119]

A pair of first contact parts 200a are provided on the first end side of each first terminal member 200 so as to be spaced apart from each other in a
25 direction orthogonal to the longitudinal direction.

[0120]

A first connection hole (not shown) is provided on the second end side of each first terminal member 200. With this configuration, a terminal (e.g., round terminal and Y-shaped terminal) connected to a conductive wire can be
30 screw-fastened with the second end side of the first terminal member 200.

[0121]

Each second terminal member 210 has the same configuration as that of each first terminal member 200.

[0122]

As shown in Fig. 18, a first one of the pair of first terminal members 200 and a first one of the pair of second terminal members 210 are electrically connected to a power line leading to a control device C for controlling the elevator 6. A second one of the pair of first terminal members 200 and a second one of the pair of second terminal members 210 are electrically connected to each other.

10 [0123]

Returning to Fig. 15 and Fig. 16, the base 22 is configured to enable the pair of first terminal members 200 and the pair of second terminal members 210 to align in the second direction.

[0124]

Describing more specifically, the base 22 includes a first arrangement section 222a that is provided on a first side (front side) of the base 22 in the second direction and that has the first one of the pair of first terminal members 200 arranged therein, and a second arrangement section 222b that is adjacent to the first arrangement section 222a and that has the second one of the pair of first terminal members 200 arranged therein.

20 [0125]

The base 22 includes a third arrangement section 222c that is provided on a second side (rear side) in the second direction and that has the second one of the pair of second terminal members 210 arranged therein, and a fourth arrangement section 222d that is adjacent to the third arrangement section 222c in the first direction and that has the first one of the pair of second terminal members 210 arranged therein.

25 [0126]

The base 22 includes a first cover part 223a that is opposed to and spaced apart from the first arrangement section 222a, a second cover part 223b that is opposed to and spaced apart from the second arrangement section 222b,

30

a third cover part 223c that is opposed to and spaced apart from the third arrangement section 222c, and a fourth cover part 223d that is opposed to and spaced apart from the fourth arrangement section 222d.

[0127]

5 The first arrangement section 222a and the second arrangement section 222b respectively have surface parts (no reference number allocated) that are curved to be convex in the direction away from each other in the first direction.

[0128]

10 Part of the second surface of the first one of the pair of first terminal members 200 is in abutting contact with and fixed to the surface part of the first arrangement section 222a. The first end side of the first terminal members 200 which is fixed to the surface part of the first arrangement section 222a is spaced apart from the surface part of the first arrangement section 222a. Part of the first surface of the first terminal member which is fixed to
15 the surface part of the first arrangement section 222a is in abutting contact with the first cover part 223a.

[0129]

20 Part of the second surface of the second one of the pair of first terminal members 200 is in abutting contact with and fixed to the surface part of the second arrangement section 222b. The first end side of the first terminal member 200 which is fixed to the surface part of the second arrangement section 222b is placed separately from the surface part of the second arrangement section 222b. Part of the first surface of the first terminal member 200 which is fixed to the surface part of the second arrangement
25 section 222b is in abutting contact with the second cover part 223b.

[0130]

30 With the above configuration, in the circuit unit 2, the first end side of the first one of the pair of first terminal members 200 and the first end side of the second one of the pair of first terminal members 200 extend close to each other.

[0131]

The third arrangement section 222c and the fourth arrangement section 222d respectively have surface parts (no reference number allocated) that are curved to be convex in the direction away from each other in the first direction.

5 [0132]

Part of the second surface of the second one of the pair of second terminal members 210 is in abutting contact with and fixed to the surface part of the third arrangement section 222c. The first end side of the second terminal member 210 which is fixed to the surface part of the third arrangement section 222c is placed separately from the surface part of the third arrangement section 222c. Part of the first surface of the second terminal member 210 which is fixed to the surface part of the third arrangement section 222c is in abutting contact with the third cover part 223c.

[0133]

15 Part of the second surface of the first one of the pair of second terminal members 210 is in abutting contact with and fixed to the surface part of the fourth arrangement section 222d. The first end side of the second terminal member 210 which is fixed to the surface part of the fourth arrangement section 222d is placed separately from the surface part of the fourth arrangement section 222d. Part of the first surface of the second terminal member 210 which is fixed to the surface part of the fourth arrangement section 222d is in abutting contact with the fourth cover part 223d.

[0134]

25 With the above configuration, in the circuit unit 2, the first end side of the first one of the pair of second terminal members 210 and the first end side of the second one of the pair of second terminal members 210 extend close to each other.

[0135]

30 As described above, in the circuit unit 2, the first junction part 20 and the second junction part 21 are arranged to align in the second direction. Describing more specifically, in the circuit unit 2, the first one of the pair of first

terminal members 200 and the second one of the pair of second terminal members 210 are arranged to align in the second direction, and the second one of the pair of first terminal members 200 and the first one of the pair of second terminal members 210 are arranged to align in the second direction.

5 [0136]

As shown in Fig. 16 and Fig. 17, the first stay 23 includes a base fixing part 231 provided at the attaching plate part 230, and a base plate part 232 provided orthogonal to the attaching plate part 230.

[0137]

10 The attaching plate part 230 is provided with a pair of first attaching holes 230a. The pair of first attaching holes 230a are provided to be spaced apart from each other in the first direction.

[0138]

The base fixing part 231 includes a first plate part 231a that is opposed to the attaching plate part 230, and a pair of second plate parts 231b that connect the first plate part 231a and the attaching plate part 230. The base 22 is attached to the attaching plate part 230 of the base fixing part 231.

15 [0139]

As shown in Fig. 19A, Fig. 19B and Fig. 20, the first switching member 3 has substantially the same configuration as that of the first switching member 3 of the first embodiment. A difference lies in that the first conductive plate 310 of the first embodiment is longitudinal in the second direction, while the first conductive plate 310 of the second embodiment is longitudinal in the first direction. Thus, the first attaching part 311b of the second embodiment is formed to be longitudinal in the first direction.

20 [0140]

As shown in Fig. 21A and 21B, the second switching member 4 includes a second arm 40 that is longitudinal in the first direction and has a first end and a second end opposite to the first end in the longitudinal direction, and a second connection part 41 that is provided at the first end of the second arm 40 and enables each of the pair of second terminal members 210 to be connected to

25 30

the second connection part 41. The second switching member 4 includes a third stay 42 to which the second arm 40 is rotatably provided. The second switching member 4 includes a second urging unit 44 that urges the second arm 40, and a second posture changing mechanism 45 that can change the posture of the second arm 40.

[0141]

The second arm 40 is formed into a flat plate shape. A shaft hole (not shown) is provided on the second end side of the second arm 40. A pair of first fixing holes 400 are provided on the first end side of the second arm 40. The pair of first fixing holes 400 are provided to be spaced apart from each other in the first direction. An extension part 401 that extends in the third direction is provided on the first end side of the second arm 40. The extension part 401 has a taper shape.

[0142]

The second connection part 41 includes a second conductive plate 410 having conductive properties, and a second holder 411 having electrical insulating properties and being configured to fix the second conductive plate 410 to the first end of the second arm 40.

[0143]

The second conductive plate 410 has a first surface and a second surface opposite to the first surface in a direction orthogonal to the plane. The second conductive plate 410 is longitudinal in the first direction.

[0144]

The second holder 411 includes a pair of second fixing parts 411a that each are longitudinal in the first direction and each have a first end and a second end opposite to the first end in the longitudinal direction, and a second attaching part 411b that is provide to extend between the first ends of the pair of second fixing parts 411a and that is configured to attach the second conductive plate 410 thereto.

[0145]

The pair of second fixing parts 411a are provided to be spaced apart

from each other. The distance between a first one and a second one of the pair of second fixing parts 411a is set to be equal or substantially equal to the thickness of the second arm 40. With this configuration, the first end side of the second arm 40 can be interposed between the pair of second fixing parts

5 411a.

[0146]

As shown in Fig. 21B, each of the pair of second fixing parts 411a is provided with a pair of second fixing holes 411c. The pair of second fixing holes 411c are provided to be spaced apart from each other in the first direction.

10 [0147]

The distance between the pair of second fixing holes 411c is set to be equal to the distance between the pair of first fixing holes 400. Although not shown in Fig. 21B, the second connection part 41 is attached to the second arm 40 by bringing nuts into threaded engagement with bolts passing through the pair of first fixing holes 400 and the pair of second fixing holes 411c.

15

[0148]

The second attaching part 411b is formed to be longitudinal in the first direction. The second attaching part 411b is configured to enable a first surface of the second conductive plate 410 attached to the second attaching part 411b to be directed in the third direction.

20

[0149]

Returning to Fig. 21A, the third stay 42 is provided with a rotational shaft 420 extending in the second direction. The third stay 42 is provided with a pair of third adjusting holes 421 each being longitudinal in the first direction. The pair of third adjusting holes 421 are provided to be spaced apart from each other in the first direction.

25

[0150]

The rotational shaft 420 passes through a shaft hole of the second arm 40 so that the second arm 40 is rotatable around the axis of the rotational shaft 420.

30

[0151]

As shown in Fig. 21A, Fig. 21B and Fig. 22, the second urging unit 44 includes a base part 440 that is provided orthogonal to the third stay 42, a pressed part 441 that is provided orthogonal to the second arm 40 to be opposed to the base part 440, a shaft member 442 that passes through the base part 440 and the pressed part 441, a plate member 443 that is arranged between the base part 440 and the pressed part 441, and a second urging spring 444 that is arranged at a position closer to the pressed part 441 than the plate member 443. The second urging unit 44 includes a retaining member 445 that keeps the shaft member 442 passing through the base part 440 and the pressed part 441.

[0152]

The base part 440 has an elongated hole 440a being longitudinal in the third direction. The pressed part 441 is provided with a round hole (not shown).

[0153]

The shaft member 442 has a first end and a second end opposite to the first end in the axial direction. An external thread 442a is formed on the first end side of the shaft member 442. An external thread 442a is also formed on the second end side of the shaft member 442. The shaft member 442 passes through the elongated hole 440a of the base part 440 and the round hole of the pressed part 441.

[0154]

The plate member 443 has a circular ring shape. For the second urging spring 444, a compression coil spring is used. Accordingly, in the second urging unit 44, the shaft member 442 also passes through a center portion of the plate member 443 and a center portion of the second urging spring 444.

[0155]

The retaining member 445 includes a first retaining member 445a to be brought into threaded engagement with the first end side of the shaft member 442, and a second retaining member 445b to be brought into threaded engagement with the second end side of the shaft member 442.

[0156]

The second posture changing mechanism 45 includes a third sandwiched part 450 provided coaxially to the rotational shaft 420, and a fourth sandwiched part 451 provided at a position displaced from the third sandwiched part 450 in the first direction and the third direction.

[0157]

The restriction mechanism 5 can restrict the movement of the first switching member 3 with the first junction part 20 held in conductive state, on the premise that the pair of outer doors 610a slide in association with the pair of outer doors 610a. More specifically, as shown in Fig. 16 and Fig. 19A, the restriction mechanism 5 includes a pair of hooked parts 50 that are arranged to be spaced apart from each other in the first direction and rise from the base plate part 232, and a hooking part 51 that can come into locking engagement with a first one of the pair of hooked parts 50.

[0158]

The first one of the pair of hooked parts 50 is provided at the first end of the base plate part 232. A second one of the pair of hooked parts 50 is provided at the second end of the base plate part 232. That is, each hooked part 50 is provided at each of both ends of the base plate part 232.

[0159]

The hooking part 51 is provided on the first end side of the first arm 30. The hooking part 51 extends from the first end side of the first arm 30 in the third direction.

[0160]

The closing confirmation device 1 of the present embodiment is as described above. Next, the description is made for the operation of attaching the closing confirmation device to the elevator hall and the action of the closing confirmation device 1 with reference to the attached drawings.

[0161]

In the attaching operation for the closing confirmation device 1, the first stay 23 is attached to the elevator hall. The circuit unit 2 is attached to the

elevator hall (header frame 62) so that the first junction part 20 of the circuit unit 2 and the second junction part 21 of the circuit unit 2 align in the second direction. With this configuration, in the circuit unit 2 attached to the elevator hall, the pair of first terminal members 200 align in the first direction, while the pair of second terminal members 210 align in the first direction.
[0162]

Then, the installation position of the first switching member 3 is adjusted. Describing more specifically, the installation position of the first switching member 3 is set so as to allow the first conductive plate 310 to align with the first contact parts 200a of the pair of first terminal members 200 in the third direction when the landing door 610 is closed. Also, the first switching member 3 is positioned so that, when the posture is not changed, the first conductive plate 310 is pressed to the first contact parts 200a of the pair of first terminal members 200.

[0163]

In the above state, the second stay 32 is fixed to the first one of the door hangers 64 (the first one of the pair of outer doors 610a). With this configuration, the first switching member 3 can move relative to the circuit unit 2 in association with the sliding of the first one of the pair of outer doors 610a of the landing door 610. Whereby, the first switching member 3 is switchable between a mode with the first conductive plate 310 held in abutting contact with the first junction part 20 (the first contact parts 200a of the pair of first terminal members 200) and a mode with the first conductive plate 310 held in non-abutting contact with the first junction part 20 (the first contact parts 200a of the pair of first terminal members 200). Thus, the first switching member 3 is switchable between a mode with the first junction part 20 of the circuit unit 2 held in conductive state and a mode with the first junction part 20 held in non-conductive state in association with the opening and closing of the landing door 610.

[0164]

Next, the installation position of the second switching member 4 is

adjusted. Describing more specifically, the installation position of the second switching member 4 is set so as to allow the second conductive plate 410 to align with the second contact parts 210a of the pair of second terminal members 210 in the third direction. The installation position of the second switching member 4 is set so that, when the posture is not changed, the second conductive plate 410 is pressed to the second contact parts 210a of the pair of second terminal members 210. In this state, the third stay 42 is fixed to the second one of the door hangers 64 (the second one of the pair of outer doors 610a). Thus, the closing confirmation device 1 is attached to the elevator 6.

10 [0165]

Next, the description is made for the action of the closing confirmation device 1. As shown in Fig. 23A and Fig. 23B, in the closing confirmation device 1, when the pair of inner doors and the pair of outer doors 610a slide to each other, the first switching member 3 moves close to the circuit unit 2. The second switching member 4 also moves close to the circuit unit 2.

15 [0166]

As shown in Fig. 24A and Fig. 24B, when the landing door 610 closes the landing opening 600, the first conductive plate 310 is pressed to the first contact parts 200a of the pair of first terminal members 200, and the second conductive plate 410 is pressed to the second contact parts 210a of the pair of second terminal members 210. Whereby, the first junction part 20 and the second junction part 21 are brought into conductive state.

20 [0167]

At this time, the first end side of the first one of the pair of first terminal members 200 is warped or bent toward the surface part of the first arrangement section 222a, and the first end side of the second one of the pair of first terminal members 200 is warped or bent toward the surface part of the second arrangement section 222b. Because of this, an elastic force acting in a direction opposite to the direction in which the first contact parts 200a of the pair of first terminal members 200 are pressed to the first conductive plate 310 is caused in the first contact parts 200a of the pair of first terminal members

25 30

200. The closing confirmation device 1 is thus configured so that the first conductive plate 310 can be more securely brought into abutting contact with the pair of first terminal members 200.

[0168]

5 Also, the first end side of the second one of the pair of second terminal members 210 is warped or bent toward the surface part of the third arrangement section 222c, and the second end side of the first one of the pair of second terminal members 210 is warped or bent toward the surface part of the fourth arrangement section 222d. Because of this, an elastic force acting in a
10 direction opposite to the direction in which the second contact parts 210a of the pair of second terminal members 210 are pressed to the second conductive plate 410 is caused in the second contact parts 210a of the pair of second terminal members 210. The closing confirmation device 1 is thus configured so that the second conductive plate 410 can be more securely brought into abutting contact
15 with the pair of second terminal members 210.

[0169]

 It is possible to confirm the complete closing of the landing opening 600 by the landing door 610 and hence the complete closing of the entrance 60 of the elevator 6 by the door 61 through the confirmation of the state that the first
20 junction part 20 and the second junction part 21 each are held in conductive state.

[0170]

 When the door 61 is opened, the sandwiching device of the elevator 6 sandwiches the first sandwiched part 350 and the second sandwiched part 351
25 of the first switching member 3. In this way, a force acts on a first side in the first direction of the second sandwiched part 351. When the force becomes stronger than the urging force of the urging spring 343 acting on the second sandwiched part 351, the second sandwiched part 351 moves toward the first sandwiched part 350. As a result, the first arm 30 rotates toward one side
30 around the axis of the rotational shaft 320. Whereby, as shown in Fig. 25A and Fig. 25B, the posture of the first arm 30 is changed.

[0171]

In association with the above, the first conductive plate 310 moves away from the first contact parts 200a of the pair of first terminal members 200.

Accordingly, the first junction part 20 is brought into the non-conductive state.

5 The hooked parts 50 are then released from the locking engagement with the hooking part 51. As a result, the pair of outer doors 610a and the pair of inner doors are allowed to slide in the first direction.

[0172]

As described above, the closing confirmation device 1 according to the present embodiment produces an excellent effect of making it possible to
10 securely confirm that the entrance 60 has been completely closed by the door 61 of the elevator 6.

[0173]

In the closing confirmation device 1 according to the present embodiment, each of the pair of first terminal members 200 is provided with
15 the pair of first contact parts 200a. Thus, even if part of the first contact parts 200a is broken, it is possible to prevent such an event in which the first junction part 20 is not brought into conductive state. In the closing confirmation device 1 according to the present embodiment, each of the pair of second terminal
20 members 210 is provided with the pair of second contact parts 210a. Thus, even if part of the second contact parts 210a is broken, it is possible to prevent such an event in which the second junction part 21 is not brought into conductive state.

[0174]

25 In the closing confirmation device 1 according to the present embodiment, the first one of the pair of first terminal members 200 and the first one of the pair of second terminal members 210 are electrically connected to the electric system leading to the control device C. Thus, it is possible to prevent the cage from moving to a different elevator hall in the state where the
30 entrance 60 has not been completely closed by the door 61.

[0175]

Further, the first end side of the second arm 40 is provided with the extension part 401. Thus, even when the door is made to slide without sandwiching the third sandwiched part 450 and the fourth sandwiched part 451 by the second sandwiching device, the extension part 401 can come into abutting contact with the hooked parts 50. Thus, the posture of the second arm 40 is changed. Accordingly, even when the landing door 610 is made to slide without sandwiching the third sandwiched part 450 and the fourth sandwiched part 451, it is possible to prevent the second conductive plate 410 from slidingly moving to the second contact parts 210a of the pair of second terminal members 210.

[0176]

Further, in the closing confirmation device 1 according to the present embodiment, the single base 22 is provided with two junction parts (the first junction part 20 and the second junction part 21). Thus, in attaching work, it is possible to adjust the position of each of the first junction part 20 and the second junction part 21 by adjusting the position of the circuit unit 2. Accordingly, the closing confirmation device 1 according to the present embodiment makes it possible to reduce the number of the steps required for attaching work compared with a closing confirmation device having a configuration in which the first junction part and the second junction part are provided on separate bases.

[0177]

The closing confirmation device according to the present invention is not necessarily limited to the first embodiment and the second embodiment. It is a matter of course that various changes or modifications can be made without departing the gist of the present invention.

[0178]

In the first embodiment and the second embodiment, the first end of each of the pair of first terminal members 200 is provided with the pair of first contact parts 200a. However, there is no limitation thereto. The first end of each of the pair of first terminal members 200 may be provided with one first

contact part 200a only, or a plurality of first contact parts 200a, such as three first contact parts 200a.

[0179]

In the first embodiment and the second embodiment, the first end of each of the pair of second terminal members 210 is provided with the pair of second contact parts 210a. However, there is no limitation thereto. The first end of each of the pair of second terminal members 210 may be provided with one second contact part 210a only, or a plurality of second contact parts 210a, such as three first contact parts 210a.

[0180]

In the first embodiment and the second embodiment, the restriction mechanism 5 is configured to restrict the movement of the first switching member 3 with the first junction part 20 held in conductive state. However, there is no limitation thereto. For example, the restriction mechanism 5 may be configured to restrict the movement of the second switching member 4 with the second junction part 21 held in conductive state.

[0181]

Alternatively, the restriction mechanism 5 may be configured to restrict both the movement of the first switching member 3 with the first junction part 20 held in conductive state, and the movement of the second switching member 4 with the second junction part 21 held in conductive state.

[0182]

More specifically, in the first embodiment, in the case where the movement of the first switching member 3 with the first junction part 20 held in conductive state and the movement of the second switching member 4 with the second junction part 21 held in conductive state are restricted, the restriction mechanism 5 may further include a second bent part 502 provided at the second end of the fixing plate part 500 of the hooked part 50, and a second hooking part 52 provided on the first end side of the second arm 40. In this case, the second switching member 4 employs substantially the same configuration as that of the first switching member 3. Each second terminal

member 210 employs the same configuration as that of each first terminal member 200, and is attached to the base 22 in the same manner as the first terminal member 200.

[0183]

5 In the second embodiment, in the case where the movement of the first switching member 3 with the first junction part 20 held in conductive state and the movement of the second switching member 4 with the second junction part 21 held in conductive state are respectively restricted, the configuration may be such that a second hooking part is provided on the first end side of the second arm 40 so as to bring the second hooking part into locking engagement with the hooked part 50 on the second switching member 4 side.

[0184]

 In the first embodiment and the second embodiment, the closing confirmation device 1 is attached to the elevator hall. However, there is no limitation thereto. The closing confirmation device 1 may be attached to the cage so as to confirm complete closing of the cage opening by the cage door.

[0185]

 The circuit unit 2 of the first embodiment is configured such that: the first one of the pair of first terminal members 200 and the second one of the pair of second terminal members 210 are arranged to align in the first direction; the second one of the pair of first terminal members 200 and the first one of the pair of second terminal members 210 are arranged to align in the first direction; the first one of the pair of first terminal members 200 and the first one of the pair of second terminal members 210 are electrically connected to the electric circuit leading to the control device C; and the second one of the pair of first terminal members 200 and the second one of the pair of second terminal members 210 are electrically connected to each other. However, there is no limitation thereto. For example, as shown in Fig. 27, the circuit unit 2 may be configured such that: the first one of the pair of first terminal members 200 and the first one of the pair of second terminal members 210 are arranged to align in the first direction; the second one of the pair of first

terminal members 200 and the second one of the pair of second terminal members 210 are arranged to align in the first direction; the first one of the pair of first terminal members 200 and the first one of the pair of second terminal members 210 are electrically connected to the electric circuit leading to the control device C; and the second one of the pair of first terminal members 200 and the second one of the pair of second terminal members 210 are electrically connected to each other.

[0186]

The circuit unit 2 of the second embodiment is configured such that: the first one of the pair of first terminal members 200 and the second one of the pair of second terminal members 210 are arranged to align in the second direction; the second one of the pair of first terminal members 200 and the first one of the pair of second terminal members 210 are arranged to align in the second direction; the first one of the pair of first terminal members 200 and the first one of the pair of second terminal members 210 are electrically connected to the electric circuit leading to the control device C; and the second one of the pair of first terminal members 200 and the second one of the pair of second terminal members 210 are electrically connected to each other. However, there is no limitation thereto. For example, the circuit unit 2 may be configured such that: the first one of the pair of first terminal members 200 and the first one of the pair of second terminal members 210 are arranged to align in the second direction; the second one of the pair of first terminal members 200 and the second one of the pair of second terminal members 210 are arranged to align in the second direction; the first one of the pair of first terminal members 200 and the first one of the pair of second terminal members 210 are electrically connected to the electric circuit leading to the control device C; and the second one of the pair of first terminal members 200 and the second one of the pair of second terminal members 210 are electrically connected to each other.

[0187]

In the first embodiment and the second embodiment, the pair of first

terminal members 200 and the pair of second terminal members 210 are formed independent of each other. However, there is no limitation thereto. For example, for the configuration of Fig. 27, the second one of the pair of first terminal members 200 and the second one of the pair of second terminal members 210, which align in the first direction, may be integrally formed, as shown in Fig. 28. For the configuration of Fig. 6, the second one of the pair of first terminal members 200 and the second one of the pair of second terminal members 210, which align at an angle to the first direction, are integrally formed.

10 [0188]

In the second embodiment, the pair of second terminal members 210 may be made to extend straight in the third direction, as shown in Fig. 29 and Fig. 30A.

[0189]

15 When the above configuration is employed, the pair of second terminal members 210 are arranged to align in the second direction, as shown in Fig. 30B. Also, as shown in Fig. 31A and 31B, the second switching member 4 is configured to include a second arm 40 that is longitudinal in the first direction and has a first end and a second end opposite to the first end in the longitudinal direction, and a second connection part 41 that is provided at the first end of the second arm 40 and enables the pair of second terminal members 210 to be electrically connected to itself.

20 [0190]

With the above configuration, the second conductive plate 410 can be moved toward and away from the pair of second terminal members 210 only by sliding the second switching member 4 in the first direction. That is, the second switching member 4 can switch the circuit unit 2 between the mode with the second junction part 21 held in conductive state and the mode with the second junction part 21 held in non-conductive state even without provision of the second urging unit 44 and the second posture changing mechanism 45. Thus, it is possible to further simplify the configuration of the second switching

25
30

member 4.

REFERENCE SIGNS LIST

[0191]

5	1	Closing Confirmation Device
	2	Circuit Unit
	3	First Switching Member
	4	Second Switching Member
	5	Restriction Mechanism
10	6	Elevator
	20	First Junction Part
	21	Second Junction Part
	61	Door
	200	First Terminal Member
15	210	Second Terminal Member
	200a	First Contact Part
	210a	Second Contact Part
	C	Control Device

CLAIMS

1. A closing confirmation device for an elevator comprising: a circuit
5 unit that includes a first junction part and a second junction part; a first
switching member that moves relative to the circuit unit in association with
opening and closing of a first one of doors in a first direction, in which the doors
of an elevator slide, to thereby switch between a mode with the first junction
part held in conductive state and a mode with the first junction part held in
10 non-conductive state; and a second switching member that moves relative to
the circuit unit in association with opening and closing of the second one of the
doors in the first direction to thereby switch between a mode with the second
junction part held in conductive state and a mode with the second junction part
held in non-conductive state.

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2. The closing confirmation device for an elevator according to claim 1,
wherein the first junction part and the second junction part are arranged to
align in the first direction.

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3. The closing confirmation device for an elevator according to claim 1,
wherein the first junction part and the second junction part are arranged to
align along a plane orthogonal to the first direction.

4. The closing confirmation device for an elevator according to claim 1,
25 wherein the first junction part includes a pair of first terminal members, the
second junction part includes a pair of second terminal members, a first one of
the pair of first terminal members and a first one of the pair of second terminal
members are electrically connected to an electric circuit including a control
device for controlling the elevator, the second one of the pair of first terminal
30 members and the second one of the pair of second terminal members are
electrically connected to each other, the first one and the second one of the pair

of first terminal members are switched between conductive state and non-conductive state by the first switching member, the first one and the second one of the pair of second terminal members are switched between conductive state and non-conductive state by the second switching member.

5

5. The closing confirmation device for an elevator according to claim 4, wherein the first one of the pair of first terminal members and the second one of the pair of second terminal members are arranged to align in the first direction, and the second one of the pair of first terminal members and the first one of the pair of second terminal members are arranged to align in the first direction.

10

6. The closing confirmation device for an elevator according to claim 4, wherein the first one of the pair of first terminal members and the first one of the pair of second terminal members are arranged to align in the first direction, and the second one of the pair of first terminal members and the second one of the pair of second terminal members are arranged to align in the first direction.

15

7. The closing confirmation device for an elevator according to claim 4, wherein the first one of the pair of first terminal members and the second one of the pair of first terminal members are arranged to align in the first direction, and the first one of the pair of second terminal members and the second one of the pair of second terminal members are arranged to align in the first direction.

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8. The closing confirmation device for an elevator according to any one of claims 4 to 7, wherein at least one pair of the pair of first terminal members and the pair of second terminal members are longitudinal in the first direction.

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9. The closing confirmation device for an elevator according to any one of claims 4 to 7, wherein at least one pair of the pair of first terminal members and the pair of second terminal members are longitudinal along a plane orthogonal to the first direction.

30

10. The closing confirmation device for an elevator according to claim
5 or 6, further comprising a restriction mechanism that is capable of restricting
the movement of the first switching member with the second junction part held
5 in conductive state, the pair of first terminal members are longitudinal in the
first direction, and the pair of second terminal members are longitudinal along
a plane orthogonal to the first direction.

11. The closing confirmation device for an elevator according to any
10 one of claims 4 to 10, wherein each of the pair of first terminal members
includes a plurality of first contact parts that come into abutting contact with
the first switching member, and each of the pair of second terminal members
includes a plurality of second contact parts that come into abutting contact with
the second switching member.

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12. The closing confirmation device for an elevator according to any
one of claims 1 to 11, wherein the circuit unit includes a single base, and the
plurality of first contact parts and the plurality of second contact parts are
provided on the base.

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