

DESCRIPTION
DOOR APPARATUS AND ELEVATOR APPARATUS

TECHNICAL FIELD

[0001]

The present invention relates to door apparatus or door devices and elevator
5 apparatus or elevator devices, and more particularly relates to door devices of a center-opening
door type or a single door type and elevator devices that are configured to control a space
between a fixation vane and a moving vane of a gripper provided at a car door of the elevator.

BACKGROUND ART

10 [0002]

In high-rise buildings, especially when there is a temperature difference between
indoors and outdoors in winter season, for example, an ascending current of air tends to be
strong in a shaft of an elevator so that air flows to enter the shaft through around a lower-level
hall door and leak through around an upper-level hall door. Thereby, the wind pressure to a hall
15 door face becomes strong, and the hall door cannot close completely in some cases at a region
just before door closing where a self-closing force by a closer spring provided at the hall door
only acts on the door.

[0003]

In order to cope with this, a conventionally proposed elevator is configured to
20 mechanically control the open/close operation of a gripper provided at a car door of the elevator
in accordance with an open/close position of the door, i.e., is configured to control a gap
dimension between a moving vane and a fixation vane of the gripper so that a driving force for
the car door can act on the hall door just before the hall door closes completely (see Patent
Literatures 1 and 2, for example).

25

CITATION LIST

PATENT LITERATURE

[0004]

Patent Literature 1: JP-A-2006-290566

30 Patent Literature 2: JP-A-2005-280854

SUMMARY OF INVENTION

TECHNICAL PROBLEM

[0005]

The aforementioned elevator, however, has to be provided with a position control
5 cam mechanism for a vane activation roller at the entire door open/close area so as to control the
gap dimension between the moving vane and the fixation vane of the gripper, thus making it
difficult to save space for the device.

[0006]

In view of the aforementioned conventional state, it is an object of the present
10 invention to provide a door device and an elevator device capable of controlling the operation of
a moving vane without necessity of a special cam mechanism.

SOLUTION TO PROBLEM

[0007]

15 In order to fulfill the object, a door device of the present invention includes: a car
door of a sliding type to open and close an entrance of a car; a hall door of a sliding type to open
and close an entrance of an elevator hall; driving means to drive the car door; a door lock to lock
the hall door at a closing state; and gripping means to, when the car reaches the elevator hall, let
the car door engage with the hall door through an operation by the car door to transmit a driving
20 force of the car door to the hall door and to activate the door lock in response to cancellation of
the engagement. When the car door and the hall door move in a ganged fashion in a door-
closing direction, a leading edge on a doorstep side of the hall door precedes a leading edge on a
doorstop side of the car door. The gripping means includes: a fixation vane located on the
doorstop side of the car door, a moving vane fixed to a door pocket side of the car door via a
25 linkwork while being kept in parallel with the fixation vane and a moving vane open/close
mechanism to change a distance between the fixation vane and the moving vane, and the moving
vane open/close mechanism controls an operation of the moving vane on a basis of electrical
door positional information.

[0008]

30 In the thus configured door device of the present invention, when the door
traveling resistance becomes large due to the wind pressure to the hall door during closing of the
hall door, the hall door cannot close completely just by the force of the closer spring. In this
state, the moving vane open/close mechanism changes the distance between the fixation vane
and the moving vane in accordance with the electrical door positional information to push the

hall door in the closing direction to close the hall door completely and let the door lock at a lock state. In this way, the operation of the moving vane can be controlled on the basis of the electrical door positional information without necessity of a conventional special cam mechanism.

5 [0009]

In the door device of the present invention, the door positional information may include an output signal from a close limit switch to detect a close limit position of the hall door.
[0010]

10 In the thus configured door device of the present invention, the door positional information can be acquired from already-existing door positional information.
[0011]

In the door device of the present invention, the moving vane open/close mechanism may include an elastic body to always urge the moving vane in a direction away from the fixation vane and a power body to displace the moving vane to a side of the fixation
15 vane while overcoming an urging force of the elastic body.
[0012]

In the thus configured door device of the present invention, when power feeding to the power body is stopped, the elastic body forcibly displaces the moving vane in the direction away from the fixation vane. Thereby, the car moves in the state where the moving vane is
20 displaced to the fixation vane side, thus preventing the moving vane from colliding with door lock at another floor with reliability.
[0013]

An elevator device of the present invention includes: a car and a balance weight moving up and down along a shaft provided in a building; a rope hanging the car and the balance
25 weight and a sheave around which the rope is hung; a traction machine that drives the rope so that the car and the balance weight move up and down; a car door of a sliding type to open and close an entrance of the car; a hall door of a sliding type to open and close an entrance of an elevator hall; driving means to drive the car door; a door lock to lock the hall door at a closing state; and gripping means to, when the car reaches the elevator hall, let the car door engage with
30 the hall door through an operation by the car door to transmit a driving force of the car door to the hall door and to activate the door lock in response to cancellation of the engagement. When the car door and the hall door move in a ganged fashion in a door-closing direction, a leading edge on a doorstep side of the hall door precedes a leading edge on a doorstep side of the car door. The gripping means includes: a fixation vane located on the doorstep side of the car door,

a moving vane fixed to a door pocket side of the car door via a linkwork while being kept in parallel with the fixation vane and a moving vane open/close mechanism to change a distance between the fixation vane and the moving vane, and the moving vane open/close mechanism controls an operation of the moving vane on a basis of electrical door positional information.

5 [0014]

In the thus configured elevator device of the present invention, when the door traveling resistance becomes large due to the wind pressure to the hall door during closing of the hall door, the hall door cannot close completely just by the force of the closer spring. In this state, the moving vane open/close mechanism changes the distance between the fixation vane and the moving vane in accordance with the electrical door positional information to push the hall door in the closing direction to close the hall door completely and let the door lock at a lock state. In this way, the operation of the moving vane can be controlled on the basis of the electrical door positional information without necessity of a conventional special cam mechanism.

10 15 [0015]

In the elevator device of the present invention, the door positional information may include an output signal from a close limit switch to detect a close limit position of the hall door.

[0016]

20 In the thus configured elevator device of the present invention, the door positional information can be acquired from already-existing door positional information.

In the elevator device of the present invention, the moving vane open/close mechanism may include an elastic body to always urge the moving vane in a direction away from the fixation vane and a power body to displace the moving vane to a side of the fixation vane while overcoming an urging force of the elastic body.

25 [0017]

In the thus configured elevator device of the present invention, when power feeding to the power body is stopped, the elastic body forcibly displaces the moving vane in the direction away from the fixation vane. Thereby, the car moves in the state where the moving vane is displaced to the fixation vane side, thus preventing the moving vane from colliding with door lock at another floor with reliability.

30 ADVANTAGEOUS EFFECTS OF INVENTION

[0018]

According to the present invention, the operation of the moving vane can be controlled on the basis of electrical door positional information without necessity of a special cam mechanism. Thereby space can be saved and the flexibility of device arrangement can be increased. During car movement, the moving vane is displaced in the direction away from the fixation vane with reliability, whereby even in case of abnormality of the power body driving the moving vane, the moving vane can be prevented from colliding with a door lock at another floor, while enabling continuous operation of the elevator.

Other objects, features and advantages of the invention will become apparent from the following description of the embodiments of the invention taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF DRAWINGS

[0019]

[Fig. 1] Fig. 1 schematically illustrates the configuration of an elevator device to which the present invention is applied.

[Fig. 2] Fig. 2 is a front view of a door device on a car side that is one embodiment of the present invention.

[Fig. 3] Fig. 3 is a front view of a door device on a hall side.

[Fig. 4] Fig. 4 is a side view illustrating the state where a car door and a hall door are opposed.

[Fig. 5] Fig. 5 is a front view of gripping means illustrated in part A of Fig. 2, where a moving vane is in a stand-by state.

[Fig. 6] Fig. 6 is a front view in the state where the moving vane is in a movable state.

[Fig. 7] Fig. 7 is a front view of a door lock illustrated at part B of Fig. 3.

[Fig. 8] Fig. 8 is a front view illustrating the state where hall doors cannot close completely.

[Fig. 9] Fig. 9 is a front view illustrating the state where the gripping means and the door lock are opposed.

[Fig. 10] Fig. 10 is a front view illustrating the state where the moving vane is operated so as to come into contact with the door lock.

[Fig. 11] Fig. 11 explains a speed curve during car door closing operation.

[Fig. 12] Fig. 12 is a flowchart illustrating the operational procedure of the present embodiment.

DESCRIPTION OF EMBODIMENTS

[0020]

The following describes one embodiment of an elevator device and a door device

of an elevator according to the present invention, with reference to the drawings.

[0021]

As illustrated in Fig. 1, an elevator device includes a car 2 and a balance weight 3 moving up and down along a shaft 1 provided in a building, a rope 4 for hanging the car 2 and the balance weight 3 and a sheave 5a around which the rope 4 is hung. The elevator device is provided with a traction machine 5 that drives the rope 4 so that the car 2 and the balance weight 3 move up and down.

[0022]

As illustrated in Fig. 2 and Fig. 4, a door device on the car 2 side includes: an upper frame 2a, vertical frames 2b, a lower frame 2c and a car chamber 2d; car doors 6a, 6b disposed at an entrance of the car chamber 2d; a rail frame 7 attached to the vertical frames 2b and disposed above the entrance; a door rail 8 extending along the rail frame 7; door hangers 9a, 9b disposed rollably along the door rail 8, while hanging the car doors 6a, 6b; a car door sill 11 attached at the lower frame 2c and engaging with door shoes 10a, 10b provided at a lower end of the car doors 6a, 6b so as to guide the movement of the car doors 6a, 6b; a door motor 12 that drives the doors; a deceleration pulley 13 attached to the rail frame 7; a deceleration belt 14 hanging around the door motor 12 and the deceleration pulley 13; a door driving belt 15 having one end hung around the deceleration pulley 13 and disposed along the rail frame 7; coupling parts 16a, 16b to couple the door hanger 9a, 9b with the door driving belt 15; a close limit switch 17 that detects a close limit position of the car doors 6a, 6b; a position detector or a rotary encoder 18 provided at the door motor 12 to control the positions of the car doors 6a, 6b and gripping means 19 to let the car doors 6a, 6b engage with hall doors described later when the car 2 reaches a hall so that the driving force of the car doors 6a, 6b can be transmitted to the hall doors through the engagement.

[0023]

As illustrated in Fig. 3 and Fig. 4, the door device on a hall side includes: hall doors 20a, 20b disposed at an entrance of a hall; a rail frame 21 disposed above the entrance; a door rail 22 extending along the rail frame 21; door hangers 23a, 23b disposed rollably along the door rail 22, while hanging the hall doors 20a, 20b; a hall door sill 25 engaging with door shoes 24a, 24b provided at a lower end of the hall doors 20a, 20b so as to guide the movement of the hall doors 20a, 20b; a door rope 26 disposed along the rail frame 21 to be coupled to the door hangers 23a, 23b; a closer spring 27 to urge the hall doors 20a, 20b always to the door-closing directions and a door lock 28 that locks the hall doors 20a, 20b to a close state.

[0024]

As illustrated in Fig. 5 and Fig. 6, the gripping means 19 includes: a fixation vane 19a positioned on a doorstep side of the car door 6a; a moving vane 19c fixed on a door pocket side of the car door 6a via a linkwork, i.e., a moving vane activation link 19b while being kept in parallel with the fixation vane 19a and a moving vane open/close mechanism that changes a distance between the fixation vane 19a and the moving vane 19c. The moving vane open/close mechanism includes: an elastic body 19d that always urges the moving vane 19c in the direction away from the fixation vane 19a, a power body (motor) 19e configured to displace the moving vane 19c to the fixation vane 19a side while overcoming the urging force of the elastic body 19d, a driving belt 19f that transmits a driving force of the power body 19e, a stopper 19g attached to the fixation vane 19a to be abutable with a side face of the moving vane 19c, a stopper 19h provided at a mid position in the height direction of the fixation vane, and a stopper 19i attached to the moving vane 19c to be abutable with the stopper 19g during moving. Then, the moving vane open/close mechanism in the present embodiment is configured to control the operation of the moving vane 19c in accordance with electrical door positional information. Fig. 5 illustrates the moving vane 19c in a stand-by state, and the power body 19e is activated from this state so as to displace the moving vane 19c to the fixation vane 19a side in the clockwise direction by the moving vane activation link 19b via the driving belt 19f as illustrated in Fig. 6.

[0025]

As illustrated in Fig. 7, the door lock 28 includes a moving roller 28a, a fixation roller 28b, a hook 28c and a door lock switch 28d. The operation of the fixation vane 19a of the gripping means 19 pushes the moving roller 28a up counterclockwise and releases the hook 28c to let the hall doors 20a, 20b open. When the hall doors 20a, 20b close completely, the hook 28c engages with the door lock switch 28d for mechanically lock as well as for electrical lock checking.

[0026]

With this configuration, when the car doors 6a, 6b and the hall doors 20a, 20b move in a ganged fashion in the door-closing directions, leading edges on the doorstep side of the hall doors 20a, 20b precedes leading edges on the doorstep side of the car doors 6a, 6b. Any one of the car doors 6a and 6b may be provided with a safety shoe for safety purpose. In the case of a safety shoe provided in this way, a leading end of the safety shoe is provided to precede the leading end on the doorstep side of the hall door, and in this case also the car doors 6a, 6b and the hall doors 20a, 20b have the aforementioned positional relationship when they move in a ganged fashion in the door-closing directions.

[0027]

As illustrated in Fig. 8, when the wind pressure to the faces of the hall doors 20a, 20b becomes strong during closing operation of the hall doors 20a, 20b and so the door traveling resistance becomes large, the hall doors 20a, 20b cannot close completely by the force of the closer spring 27, and accordingly the hook 28c of the door lock 28 cannot engage with the door lock switch 28d. As a result, the device fails in locking detection and cannot respond to a car call. To cope with this, in the present embodiment, the distance between the fixation vane 19a and the moving vane 19c is changed in accordance with electrical door positional information so as to push the hall doors 20a, 20b in the closing directions to close the hall doors 20a, 20b completely for locking state of the door lock 28.

10 [0028]

That is, as illustrated in Fig. 11 and Fig. 12, when a controller not illustrated of the elevator device issues a closing instruction, at Step S1, slow-speed acceleration is performed to an operational position of an open limit switch. Then at Step S2, acceleration is performed to a predetermined distance, at Step S3 a constant-speed operation is performed to a predetermined next set distance, at Step S4 deceleration is performed to a predetermined next set distance and at Step S5 a constant-speed operation is performed to an operational position of a close limit switch. When the car doors 6a, 6b are at the operation position of the close limit switch, as illustrated as Step S6, the close limit switch 17 detects the state. At this time, when the door traveling resistance is large because of the wind pressure to the faces of the hall doors 20a, 20b and so the hall doors 20a, 20b cannot close completely by the force of the closer spring 27, then the door lock switch 28d does not turn on at Step S7. Fig. 9 illustrates the positional relationship between the locking means 19 and the door lock 28 at this time. Then, as illustrated as Step S8, if the door lock switch 28d does not turn on even after a lapse of a predetermined time from the operation of the close limit switch 17, at Step S9 the power body 19e of the gripping means 19 is activated so as to displace the moving vane 19c to the fixation vane 19a side in the clockwise direction by the moving vane activation link 19b via the driving belt 19f, and as illustrated in Fig. 10, the fixation roller 28b of the door lock 28 is pushed in the door-closing direction so as to push the hall doors 20a, 20b for complete closing. In response to this, the hook 28c engages with the door lock switch 28d for mechanical locking, and the locking is detected electrically. Thereafter at Step S10, power feeding to the power body 19e is stopped, the elastic force of the elastic body 19d displaces the moving vane 19c in the direction away from the fixation vane 19a to return to the stand-by state. In this state, the device responds to the next car call.

30 [0029]

According to the present embodiment, the operation of the moving vane 19c can be controlled on the basis of electrical door positional information without necessity of a special cam mechanism. Thereby space can be saved and the flexibility of device arrangement can be increased. During car movement, the moving vane 19c is displaced in the direction away from
5 the fixation vane 19a with reliability, whereby even in case of abnormality of the power body 19e driving the moving vane 19c, the moving vane 19c forcibly is returned to the stand-by state by the elastic force of the elastic body 19d. This can prevent the moving vane 19c from colliding with a door lock at another floor, while enabling continuous operation of the elevator.

It should be further understood by those skilled in the art that although the
10 foregoing description has been made on embodiments of the invention, the invention is not limited thereto and various changes and modifications may be made without departing from the spirit of the invention and the scope of the appended claims

REFERENCE SIGNS LIST

15 [0030]

1: shaft, 2: car, 3: balance weight, 4: rope, 5: traction machine, 6a,6b: car door, 11: car door sill,
12: door motor, 17: close limit switch, 18: rotary encoder (position detector), 19: gripping means,
19a: fixation vane, 19b: moving vane activation link (linkwork), 19c: moving vane, 19d: elastic
body, 19e: power body, 20a,20b: hall door, 27: closer spring, 28: door lock, 28a: moving roller,
20 28b: fixation roller, 28c: hook, 28d: door lock switch.

CLAIMS

[Claim 1] A door device, comprising: a car door of a sliding type to open and close an entrance of a car; a hall door of a sliding type to open and close an entrance of an elevator hall; driving means to drive the car door; a door lock to lock the hall door at a closing state; and gripping means to, when the car reaches the elevator hall, let the car door engage with the hall door through an operation by the car door to transmit a driving force of the car door to the hall door and to activate the door lock in response to cancellation of the engagement, wherein when the car door and the hall door move in a ganged fashion in a door-closing direction, a leading edge on a doorstep side of the hall door precedes a leading edge on a doorstep side of the car door,

wherein the gripping means includes: a fixation vane located on the doorstep side of the car door, a moving vane fixed to a door pocket side of the car door via a linkwork while being kept in parallel with the fixation vane and a moving vane open/close mechanism to change a distance between the fixation vane and the moving vane, and the moving vane open/close mechanism controls an operation of the moving vane on a basis of electrical door positional information.

[Claim 2] The door device according to claim 1, wherein the door positional information includes an output signal from a close limit switch to detect a close limit position of the hall door.

[Claim 3] The door device according to claim 1, wherein the moving vane open/close mechanism includes an elastic body to always urge the moving vane in a direction away from the fixation vane and a power body to displace the moving vane to a side of the fixation vane while overcoming an urging force of the elastic body.

[Claim 4] An elevator device, comprising: a car and a balance weight moving up and down along a shaft provided in a building; a rope hanging the car and the balance weight and a sheave around which the rope is hung; a traction machine that drives the rope so that the car and the balance weight move up and down; a car door of a sliding type to open and close an entrance of the car; a hall door of a sliding type to open and close an entrance of an elevator hall; driving means to drive the car door; a door lock to lock the hall door at a closing state; and gripping means to, when the car reaches the elevator hall, let the car door engage with the hall door through an operation by the car door to transmit a driving force of the car door to the hall door and to activate the door lock in response to cancellation of the engagement, wherein when the car door and the hall door move in a ganged fashion in a door-closing direction, a leading edge on a doorstep side of the hall door precedes a leading edge on a doorstep side of the car door,

wherein the gripping means includes: a fixation vane located on the doorstep side of the car door, a moving vane fixed to a door pocket side of the car door via a linkwork while being kept in parallel with the fixation vane and a moving vane open/close mechanism to change a distance between the fixation vane and the moving vane, and the moving vane open/close mechanism controls an operation of the moving vane on a basis of electrical door positional information.

[Claim 5] The elevator device according to claim 4, wherein the door positional information includes an output signal from a close limit switch to detect a close limit position of the hall door.

[Claim 6] The elevator device according to claim 4, wherein the moving vane open/close mechanism includes an elastic body to always urge the moving vane in a direction away from the fixation vane and a power body to displace the moving vane to a side of the fixation vane while overcoming an urging force of the elastic body.
