

ELEVATOR WITH INTER-FLOOR ADJUSTMENT FUNCTION

FIELD

Embodiments described herein relate generally to an elevator with an inter-floor adjustment function, comprising a car frame comprising at least two cars vertically connected and being capable of adjusting a distance between the cars in the car frame in accordance with an inter-floor distance between destination floors.

BACKGROUND

In skyscrapers, etc., in order to improve space efficiency, an elevator comprising two cars vertically connected is used as a vertical transportation means inside such buildings. This type of elevator is called a "double-deck elevator".

In the double-deck elevator, there is a type equipped with an inter-floor adjustment function, which adjusts the distance between upper and lower cars within a car frame by moving the cars relative to each other. Even when the height of each floor of the building is not constant, the upper and lower cars can stop in accordance with heights of the respective floors, by the inter-floor adjustment function.

If a failure of the inter-floor adjustment function occurs for any reasons, the distance between the upper and lower cars cannot be adjusted in accordance with the heights of the respective destination floors. In this case, a rescue operation of stopping the upper and lower cars at the floors one after one and causing the passengers to get off the elevator needs to be executed.

In general, the elevator is equipped with a "door-open run protection function" as one of safety functions. This function stops the elevator running when the doors of the upper and lower cars are open outside a door-open run protection zone. The door-open run protection zone is set relative to the level of

each floor.

When the door of one of the cars is opened to allow the passengers to get off the elevator at the rescue operation, if the other car is stopped in the vicinity of the door-open run protection zone, the other car is often outside the door-open run protection zone due to vibration generated when the passengers get off the elevator. At this time, since the door of one of the cars is opened, a detection error occurs if the elevator runs in a door-opened state. For this reason, the "door-open run protection function" is operated such that the passengers in the other car are trapped by the operation stop.

The embodiments described herein aim to provide an elevator with an inter-floor adjustment function, capable of preventing a trap accident at the rescue operation executed due to the failure of the inter-floor adjustment function and rescuing the passengers in each car in safety.

SUMMARY

In general, according to one embodiment, an elevator with an inter-floor adjustment function, including a car frame in which at least two cars are vertically connected to each other and being capable of adjusting a distance between the cars in the car frame, includes a monitoring module, a rescue operation module, and a function shutoff module.

The monitoring module monitors a landing state of each of the cars and, when the car is positioned outside a predetermined door-open run protection zone during opening a door of the car, stops an operation. The rescue operation module executes a rescue operation, lands each of the cars on a rescue floor, and opens a door of the car at occurrence of abnormal conditions in the inter-floor adjustment function. The function shutoff module shuts off a function of the monitoring module for a car other than the car having

the door opened on the rescue floor, of the cars, while the rescue operation is executed by the rescue operation module.

BRIEF DESCRIPTION OF THE DRAWINGS

5 FIG. 1 is an illustration showing a structure of an elevator with an inter-floor adjustment function according to First Embodiment.

10 FIG. 2 is a diagram showing a constitution of a memory device provided on the elevator according to First Embodiment.

 FIG. 3 is an illustration showing an inter-floor distance table provided at the elevator according to First Embodiment.

15 FIG. 4 is an illustration showing an operation speed table provided at the elevator according to First Embodiment.

20 FIG. 5 is a block diagram showing a functional configuration of an elevator controller and an inter-floor adjustment controller according to First Embodiment.

 FIG. 6 is an illustration for explanation of a door-open run protection zone of the elevator according to First Embodiment.

25 FIG. 7 is a flowchart showing processing in a rescue operation of the elevator according to First Embodiment.

 FIG. 8 is an illustration showing a shutoff timing of a car monitoring power at the rescue operation of the elevator according to First Embodiment.

30 FIG. 9 is a block diagram showing a functional constitution of an elevator controller and an inter-floor adjustment controller according to the Second Embodiment.

35 FIG. 10 is an illustration for explanation of a door-open run protection zone of the elevator according to Second Embodiment.

 FIG. 11 is a flowchart showing processing at a

rescue operation of the elevator according to Second Embodiment.

DETAILED DESCRIPTION

Embodiments will be described hereinafter with
5 reference to the accompanying drawings.
(First Embodiment)

FIG. 1 shows a structure of an elevator with an
inter-floor adjustment function according to First
Embodiment. The elevator is explained as a double-deck
10 elevator comprising two cars 2 and 3 (hereinafter
referred to as an upper car and a lower car) in a car
frame 1.

A main rope 13 is wound around a traction machine
11 via a deflector sheave 12, etc. A car frame 1
15 ascends and descends in a hoistway via the main rope
13, by the drive of the traction machine 11. The upper
car 2 and the lower car 3 are connected to the car
frame 1 by means of ball screws 5a, 5b, 6a and 6b so as
to be freely movable in a vertical direction. The ball
20 screws 5a, 5b, 6a and 6b are supported by an upper beam
1a and an intermediate beam 7, and move the upper car 2
and the lower car 3 in the upper and lower directions,
by driving motors 4a and 4b.

In addition, an inter-floor adjustment controller
25 20, a door controller (not shown), etc., are mounted in
the car frame 1. These devices are connected to an
elevator controller 10 via a tail cord 14 arranged on a
duct-under-car 15.

The elevator controller 10 is a so-called "control
30 panel", which is installed in a machine room, etc. of a
building. The elevator controller 10 executes overall
control of the elevator including the drive control of
the traction machine 11. A seismic sensor 16 is
connected to the elevator controller 10. When an
35 earthquake of a predetermined level or higher is
detected by the earthquake sensor 16, the elevator
controller 10 stops the running car frame 1 on a

nearest floor, allows the passengers to get off and stands by. Such an operation is called "earthquake emergency operation".

On the other hand, the inter-floor adjustment
5 controller 20 drives the motors 4a and 4b and adjusts a distance between the upper car 2 and the lower car 3 in accordance with instructions from the elevator controller 10. The inter-floor adjustment controller 20 comprises an exchangeable memory device 30. As the
10 memory device 30, for example, an EEPROM, a memory card or a USB memory can be used.

At the memory device 30, an inter-floor distance table 31 (FIG. 3) corresponding to a destination floor under control and an operation speed table 32 (FIG. 4)
15 corresponding to a departure floor and a destination floor are provided as shown in FIG. 2.

FIG. 3 shows an example of the inter-floor distance table 31. In this example, an inter-floor distance between destination floors under control as
20 designated by a floor command signal output from the elevator controller 10 is indicated.

FIG. 4 shows an example of the operation speed table 32. A speed at an inter-floor adjustment operation is set in the operation speed table 32. For
25 example, a parameter which allows the upper car 2 and the lower car 3 to move at a speed of 45 mm/s, for running from 1F to 3F, is set. In the figure, a symbol "-" (minus) indicates reducing the distance between the upper car 2 and the lower car 3 at the speed.

30 A landing control of the double-deck elevator will be described briefly.

In the double-deck elevator, when the elevator stops at destination floors, the car frame 1 is positioned and stopped by a landing vane 21 for the car
35 frame. More specifically, the elevator stops when a landing switch 24 provided at the car frame 1 enters a range of the landing vane 21. In the double-deck

elevator with the inter-floor adjustment function, a position of the landing vane 21 is determined such that a center of the car frame 1 is set to be a center of the inter-floor interval between the upper car 2 and the lower car 3.

In addition, when the destination floors are determined, the inter-floor adjustment is started by the driving of the motors 4a and 4b and the interval between the upper car 2 and the lower car 3 in the car frame 1 is adjusted in accordance with an inter-floor distance between the destination floors. Landing switches 25 and 26 are also provided for the upper car 2 the lower car 3, respectively, similarly to the car frame 1. Positioning (level adjustment) of the upper car 2 and the lower car 3 can be confirmed, based on a positional relationship between the landing switches 25 and 26 and landing vanes 22 and 23. The landing vanes 21 to 23 are arranged on a hoistway wall. In the figure, 27a and 27b denote landing halls of the respective floors.

In the figure, 40 to 42 denote pulse generators (PGs). The PG 40 is mounted on a rotary shaft of the traction machine 11 and configured to output a pulse signal synchronously with the rotation of the traction machine 11. The PGs 41 and 42 are mounted on rotary shafts of the motors 4a and 4b for inter-floor adjustment, respectively, and configured to output pulse signals synchronously with rotations of the motors 4a and 4b, respectively. The pulse signals are supplied to the elevator controller 10.

The elevator controller 10 and the inter-floor adjustment controller 20 are functionally separated in FIG. 1. However physically, drive control portions of the motors 4a and 4b alone may be mounted on the car frame 1 and the other portions may be provided on the elevator controller.

FIG. 5 is a block diagram illustrating a

functional configuration of the elevator controller 10 and the inter-floor adjustment controller 20 in the First Embodiment.

Each of the elevator controller 10 and the inter-floor adjustment controller 20 is equipped with an input-output device (not shown) and various signals are handled via the input-output device. More specifically, when the destination floors (also called target floors) of the car frame 1 are determined, signals indicating the destination floors and an adjustment command are output from the elevator controller 10 to the inter-floor adjustment controller 20. The inter-floor adjustment controller 20 thereby reads inter-floor distance data corresponding to the destination floors from the memory device 30 and adjusts the interval between the upper car 2 and the lower car 3 in the car frame 1 in accordance with the inter-floor distance between the destination floors. The destination floors of the car frame 1 include the floor corresponding to the upper car 2 and the floor corresponding to the lower car 3.

Landing door switches 50 of respective floors, an upper car door switch 51 and a lower car door switch 52 are connected to the elevator controller 10. The landing door switches 50 of the respective floors are connected serially. Signals of the landing door switches 50 are input to the elevator controller 10 via a door-open/close signal relay of the upper car door switch 51 and a door-open/close signal relay of the lower car door switch 52. In addition, the landing switch 24 for the car frame, the landing switch 25 for the upper car, and the landing switch 26 for the lower car are connected to the elevator controller 10.

The elevator controller 10 is equipped with an upper car monitoring device 53, a lower car monitoring device 54 and an operation controller 55.

The upper car monitoring device 53 is provided as

a unit for monitoring the upper car, independently of the operation controller 55. The upper car monitoring device 53 comprises a door-open run protection function of monitoring a landing state of the upper car 2, based on the door-open/close signal of the upper car 2 and a landing signal of the landing switch 25, and of stopping the operation when the upper car 2 in the door-opened state is positioned outside the door-open run protection zone set on each floor. 53a denotes a power supply of the upper car monitoring device 53.

The lower car monitoring device 54 is provided as a unit for monitoring the lower car, independently of the operation controller 55. The lower car monitoring device 54 has a door-open run protection function of monitoring a landing state of the lower car 3, based on the door-open/close signal of the lower car 3 and a landing signal of the landing switch 26, and of stopping the operation when the lower car 3 in the door-opened state is positioned outside the door-open run protection zone set on each floor. 54a denotes a power supply of the lower car monitoring device 54.

The "door-open run protection zone" indicates a range in which the door is openable as determined by the landing vanes 22 and 23 for the cars. When the upper car 2 and the lower car 3 land in the door-open run protection zone, opening the door is permitted. When the door is opened outside the door-open run protection zone, running is prohibited.

If the upper car 2 and the lower car 3 land correctly on the landing halls 27a and 27b of the respective floors, the landing switches 25 and 26 are in the ranges of the landing vanes 22 and 23, i.e., the door-open permission zones, as shown in FIG. 6. 2a and 3a denote car doors, which are opened and closed in association with landing hall doors (not shown) at the landing.

When the upper car 2 and the lower car 3 land on

arbitrary floors, if the landing switches 25 and 26 are positioned in the ranges of the landing vanes 22 and 23, opening the doors of the upper car 2 the lower car 3 is permitted. It is desirable that the upper car 2
5 and the lower car 3 should land such that, ideally, the landing switches 25 and 26 are at central positions of the landing vanes 22 and 23, respectively.

The operation controller 55 controls all operations of the double-deck elevator, based on
10 various signals including the landing signal of the landing switch 24 for the car frame. In the present embodiment, the operation controller 55 is equipped with a rescue operation module 55a and a function shutoff module 55b as functions relating to the inter-
15 floor adjustment of the double-deck elevator.

The rescue operation module 55a executes a rescue operation, urges the upper car 2 and the lower car 3 in the car frame 1 to land on rescue floors, respectively, and open the doors of the cars, when abnormal
20 conditions occur in the inter-floor adjustment controller 20. The function shutoff module 55b shuts off a monitoring function corresponding to a car other than the car having the door opened on the rescue floor during the rescue operation.

25 In other words, if the door of the upper car 2 is opened on the rescue floor during the rescue operation, the monitoring function of the lower car 3 is shut off by shutting down the power supply 54a of the lower car monitoring device 54. The door-open run protection
30 function therefore does not work even if the lower car 3 is positioned outside the door-open permission zone while the door of the upper car 2 is opened. On the other hand, if the door of the lower car 3 is opened on the rescue floor during the rescue operation, the
35 monitoring function of the upper car 2 is shut off by shutting down the power supply 53a of the upper car monitoring device 53. The door-open run protection

function therefore does not work even if the upper car 2 is positioned outside the door-open permission zone while the door of the lower car 3 is opened.

5 Processing of the rescue operation will be hereinafter described in detail.

FIG. 7 is a flowchart showing the processing of the rescue operation of the elevator according to the First Embodiment.

10 If abnormal conditions occur at the inter-floor adjustment controller 20 (Yes in step A11), the elevator controller 10 executes rescue operation processing described below. The elevator controller 10 monitors an operated state of the inter-floor adjustment controller 20 at any time. When a response
15 to the command is not made or when the motors 4a and 4b do not work normally, the elevator controller 10 determines that the abnormal conditions have occurred and stops the operation of the inter-floor adjustment controller 20.

20 When the operation of the inter-floor adjustment controller 20 is stopped, the interval between the upper car 2 and the lower car 3 in the car frame 1 cannot be adjusted in accordance with each inter-floor distance. To avoid this, the elevator controller 10
25 lands either of the upper car 2 and the lower car 3 (in the present embodiment, lower car 3) on the rescue floor (step A12). Then, the elevator controller 10 opens the door of the lower car 3 and allows the passengers to get off (step A13).

30 More specifically, for example, a floor which the lower car can reach most quickly from a current position is determined as a rescue floor. First, the car frame 1 is moved to the rescue floor by the landing switch 24 for the car frame. Then, the lower car 3 in
35 the car frame 1 is stopped on the floor level of the rescue floor by the landing switch 26 for the lower car. At this time, since the inter-floor adjustment

controller 20 is failed, the upper car 2 is often displaced from a level of a floor upper than the rescue floor.

5 When the door of the lower car 3 is opened to allow the passengers to get off, the elevator controller 10 preliminarily shuts off the monitoring function of the upper car 2 (step A14). More specifically, the elevator controller 10 inactivates the door-open run protection function by shutting down
10 the power supply 53a of the upper car monitoring device 53 as shown in FIG. 5. Thus, if vibration generated when the passengers get off the lower car 3 causes the upper car 2 to be positioned outside the door-open run protection zone shown in FIG. 6, occurrence of a
15 detection error of the door-open run can be prevented.

Since the landing door switches 50 of the respective floors are serially connected as shown in FIG. 5, it cannot be recognized at the elevator controller 10 side on which floor the door is open.
20 For this reason, when the door of the lower car 3 is opened, if the upper car 2 is positioned outside the door-open run protection zone, a detection error that the elevator is running with the door opened occurs. To prevent such a detection error, the monitoring
25 function of the upper car 2 is preliminarily shut off.

When the passengers get off the lower car 3, then the elevator controller 10 moves the upper car 2 to the rescue floor (step A15). The elevator controller 10 opens the door of the upper car 2 and allows the
30 passengers to get off the upper car 2 (step A16). In this case, when the lower car 3 is landed on the rescue floor, if the upper car 2 is near the landing level of the floor upper than the rescue floor, the upper car 2 may be landed by making fine adjustment of the position
35 of the upper car 2 by the landing switch 25. If the upper car 2 is stopped at a position remarkably separated from the landing level of the floor, the car

frame 1 is moved to the other floor to land the upper car 2.

When the door of the upper car 2 is opened to allow the passengers get off, similarly to the
5 operation executed when the door of the lower car 3 is opened, the elevator controller 10 preliminarily shuts off the monitoring function of the lower car 3 (step A17). More specifically, the door-open run protection function is preliminarily inactivated by shutting down
10 the power supply 54a of the lower car monitoring device 54 shown in FIG. 5. The detection error of the door-open run can be thereby prevented when the lower car 3 is positioned outside the door-open run protection zone while the door of the upper car 2 is opened.

15 When the passengers have got off the upper car 2, the entire operation of the elevator including the upper car 2 and the lower car 3 is stopped (step A18). After this operation, the operation is stopped until a maintenance person receiving an abnormality alarm of
20 inter-floor adjustment visits a site and checks the elevator.

The lower car 3 is first landed on the rescue floor and then the upper car 2 is landed on the rescue floor in FIG. 7, but the upper car 2 may be first
25 landed on the rescue floor.

FIG. 8 shows a shutdown timing of a car monitoring power at the rescue operation.

When abnormal conditions occur in the inter-floor adjustment, the lower car monitoring power supply 54a
30 is shut down while the lower car 3 is landed on the rescue floor and the passengers are allowed to get off by opening the door. In contrast, the upper car monitoring power supply 53a is shut down while the upper car 2 is landed on the rescue floor and the
35 passengers are allowed to get off by opening the door. Accordingly, the operation cannot be stopped by the door-open run protection function even when one of the

cars is positioned outside the door-open run protection zone while the door of the other car is opened.

Therefore, both the cars can be landed on the respective floors and the passengers can be rescued safely.

5

(Second Embodiment)

Next, Second Embodiment will be described.

The First Embodiment is constituted such that when the door of one of the cars is opened, the monitoring function of the car is shut off irrespective of the position of the car, at the rescue operation. In contrast, in the Second Embodiment, the monitoring function is shut off in accordance with the position of the other car.

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FIG. 9 is a block diagram showing a functional constitution of an elevator controller 10 and an inter-floor adjustment controller 20 according to the Second Embodiment. Portions like those of the constitution of the First Embodiment in FIG. 5 are denoted by the same reference numbers and their detailed descriptions are omitted.

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In the Second Embodiment, an operation controller 55 comprises a stop position determining module 55c besides a rescue operation module 55a and a function shutoff module 55b. The stop position determining module 55c determines whether a car other than the car having the door opened on a rescue floor is stopped near a door-open run protection zone.

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The door-open run protection zone is set based on a landing level of each floor as shown in FIG. 10. For this reason, for example, when an upper car 2 is stopped near the door-open run protection zone, if a landing switch 25 which has been turned on is switched to be turned off by vibration of the upper car 2, etc., the upper car 2 may be determined to be positioned outside the door-open run protection zone and the door-open run protection may be operated. Thus, when the

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car is stopped near the door-open run protection zone, a monitoring function of the car is set to be shut off by a function shutoff module 55b.

5 Positions of the upper car 2 and a lower car 3 at the rescue operation can be detected in a manner described below.

10 Since an operation of an inter-floor adjustment controller 20 is stopped at the rescue operation, the upper car 2 and the lower car 3 are fixed. A relative distance (interval) between the upper car 2 and the lower car 3 at a current time can be estimated by referring to pulse numbers of PG41 and PG42 immediately after the operation stop. Therefore, for example, when the lower car 3 is landed on the rescue floor, if the
15 relative distance is added to the position of the lower car 3, the stop position of the upper car 2 can be detected and it can be determined whether the upper car 2 is stopped near the door-open run protection zone.

20 In addition, as an alternative manner, landing vanes 22 and 23 provided based on the landing level of each floor are preliminarily extended in a vertical direction by some centimeters. It can be thereby determined whether each car is stopped near the door-open run protection zone at the extended portion (i.e.,
25 a shaded portion in the figure).

Processing of the rescue operation will be hereinafter described.

30 FIG. 11 is a flowchart showing processing at the rescue operation of the elevator according to the Second Embodiment. Processing in steps B11 to B13 is the same as the processing in steps A11 to A13 of the First Embodiment shown in FIG. 7.

35 If abnormal conditions occur at the inter-floor adjustment controller 20 (Yes in step B11), the elevator controller 10 first lands one of the cars (e.g., the lower car 3) on the rescue floor (step B12). Then, the elevator controller 10 opens the door of the

lower car 3 and allows the passengers to get off (step B13).

5 The elevator controller 10 determines whether the other car, i.e., the upper car 2 is stopped near the door-open run protection zone (step B14). If the upper car 2 is stopped near the door-open run protection zone, the landing switch 25 which has been turned on may be turned off and the upper car 2 may be determined to be positioned outside the door-open run protection zone as described above.

10 Then, if the elevator controller 10 determines that the upper car 2 is stopped near the door-open run protection zone (Yes in step B14), the elevator controller 10 preliminarily shuts off the monitoring function of the upper car 2 (step B15). More specifically, the elevator controller 10 preliminarily inactivates the door-open run protection function by shutting down the power supply 53a of the upper car monitoring device 53 shown in FIG. 9. Thus, if

15 vibration generated when the passengers get off the lower car 3 causes the upper car 2 to be positioned outside the door-open run protection zone, occurrence of a detection error of the door-open run can be prevented.

20 In contrast, if the upper car 2 is not stopped near the door-open run protection zone, i.e., if the upper car 2 is stopped in the door-open run protection zone or positioned completely outside the door-open run protection zone, the landing switch 25, which has been

25 turned on, may not be switched off. In other words, the landing switch 25 is left to be turned on or turned off.

30 If the landing switch 25 is left to be turned off, the detection error of the door-open run does not occur since it can be determined that the upper car 2 is

35 stopped outside the door-open run protection zone due to a failure in the inter-floor adjustment controller

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If it is determined that the upper car 2 is not stopped near the door-open run protection zone (No in step B14), the elevator controller 10 does not shut off the monitoring function of the upper car 2 and maintains the function in an active state.

The same processing is also executed at the rescue operation of the upper car 2.

In other words, when the upper car 2 is landed on the rescue floor and the passengers are allowed to get off by opening the door (steps B15 to B17), the elevator controller 10 determines whether the lower car 3 is stopped near the door-open run protection zone (step B18).

If it is determined that the lower car 3 is stopped near the door-open run protection zone (Yes in step B18), the elevator controller 10 preliminarily shuts off the monitoring function of the lower car 3 (step B19). More specifically, the elevator controller 10 preliminarily inactivates the door-open run protection function by shutting off the power supply 54a of the lower car monitoring device 54 shown in FIG. 9. Thus, if vibration generated when the passengers get off the upper car 2 causes the lower car 3 to be positioned outside the door-open run protection zone, occurrence of a detection error of the door-open run can be prevented.

In contrast, if it is determined that the lower car 3 is not stopped near the door-open run protection zone (No in step B18), the elevator controller 10 does not shut off the monitoring function of the lower car 3 and maintains the function in an active state.

When the passengers have got off the upper car 2, the operation of the entire elevator including the upper car 2 and the lower car 3 is stopped (step B20). After this operation, the operation is stopped until a maintenance person receiving an abnormality alarm of

inter-floor adjustment visits a site and checks the elevator.

5 The lower car 3 is first landed on the rescue floor and then the upper car 2 is landed on the rescue floor in FIG. 11, but the upper car 2 may be first landed on the rescue floor.

10 As described above, only when a car is in the rescue operation and the other car is stopped substantially near the door-open run protection zone during the rescue operation, the monitoring function of the car is shut off. Thus, the detection error of the door-open run can be prevented and the passengers can be rescued in safety without unnecessarily shutting off the monitoring function at the rescue operation.

15 According to at least one of the above-described embodiment, the elevator with the inter-floor adjustment function, capable of preventing a trap accident at the rescue operation executed due to the failure of the inter-floor adjustment function and
20 rescuing the passengers in each car in safety, can be provided.

25 While certain embodiments have been described, these embodiments have been presented by way of example only, and are not intended to limit the scope of the inventions. Indeed, the novel embodiments described herein may be embodied in a variety of other forms; furthermore, various omissions, substitutions and changes in the form of the embodiment described herein may be made without departing from the spirit of the
30 invention. The accompanying claims and their equivalents are intended to cover such forms or modifications as would fall within the scope and spirit of the inventions.

WHAT IS CLAIMED IS:

1. An elevator with an inter-floor adjustment function, including a car frame in which at least two cars are vertically connected to each other and being
5 capable of adjusting a distance between the cars in the car frame,

the elevator comprising:

a monitoring module configured to monitor a landing state of each of the cars and to stop an
10 operation when the car is positioned outside a predetermined door-open run protection zone when a door of the car is open;

a rescue operation module configured to execute a rescue operation, to land each of the cars on a rescue
15 floor, and to open a door of the car at occurrence of abnormality in the inter-floor adjustment function; and

a function shutoff module configured to shut off a function of the monitoring module for a car other than the car having the door opened on the rescue floor, of
20 the cars, while the rescue operation is executed by the rescue operation module.

2. The elevator of Claim 1, further comprising a stop position determining module configured to determine whether the car other than the car having the
25 door opened on the rescue floor, of the cars, is stopped near the door-open run protection zone,

wherein if it is determined by the stop position determining module that the car is stopped near the door-open run protection zone, the function shutoff
30 module shuts off the function of the monitoring module for the car.

3. The elevator of any one of Claims 1 and 2, wherein the monitoring module comprises a plurality of units configured to monitor a landing state of each of
35 the cars independently, and the function shutoff module shuts down a power supply of a unit corresponding to the car, of the units.