

ELEVATOR SYSTEM

FIELD

Embodiments described herein relate generally to an elevator system comprising a hall destination controller.

BACKGROUND

Generally, in the elevator hall of each floor of a building, call buttons for use in registering a hall call are installed. When a call button is operated by a user (passenger) at a given floor to register a hall call, a car is moved to the floor. When the user enters the car and operates a destination floor button of a car operation panel, a destination floor is registered and the car is moved to the destination floor.

In recent years, an elevator system comprising a hall destination controller (HDC) in place of the hall call buttons has been put to practical use. The HDC enables a user at an elevator hall to specify a destination floor directly at the hall. Such an elevator system is referred to as a destination control system (DCS). The DCS is configured to select an optimal car from two or more cars based on the destination floor registered by the user at the hall, and cause the optimal car to respond to the hall. In this case, users of the same destination floor are invited to get on the same car to improve transportation efficiency.

It should be noted that a DCS in which a hall destination controller is installed in every floor, i.e., hall destination controllers are installed in respective floors, is referred to as a full DCS. In the full DCS, a destination floor can be registered at the hall of any floor, and the cars do not need to have destination floor buttons.

Usually, during the installation of an elevator, operators move from one floor to another with equipment

placed on the car in many cases. However, with the DCS, since the ordinary destination floor button is not installed in the car, the operator cannot move the car to the desired floor.

5 Here, during maintenance service, associated equipment (including HDC) relevant to the DCS is not installed in many cases in order to prevent possibilities of damaging the associated equipment, if installed, accidentally with tools and the like carried
10 by the operators. During maintenance service, it is common that even the control panel itself to which the equipment associated with the DCS is connected, is not started. Note that if, here, some sort of instruction to drive a car is entered by the operator while DCS is
15 not in operation, it will be detected as an abnormal DCS operation. The maintenance service includes all kinds of service during installation of elevator.

SUMMARY

20 In general, according to one embodiment, an elevator system which manages operation of cars in group and control operation of each of the cars based on a destination floor registered by a hall destination controller installed in a hall of each floor, includes: an instruction unit configured to instruct that an
25 arbitrary one of the cars should be used during maintenance service; an operation mode switching unit configured to, when instructed to use an arbitrary car during maintenance service by the instruction unit, detach the car being serviced among the cars from group
30 control and switch an operation mode of the car to a maintenance service mode; and an drive control unit configured to, when switched to the maintenance service mode by the operation mode switch unit, control operation of the car being serviced according to
35 operation of an operation button while disregarding an abnormality related to the operation control using the hall destination controller.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a diagram showing the structure of an elevator hall according to an embodiment.

5 FIG. 2 is a diagram showing the structure of the car of an elevator according to the embodiment.

FIG. 3 is a diagram showing an example of the operation button of an inspection box provided in the car of the elevator according to the embodiment.

10 FIG. 4 is a diagram showing the configuration of the elevator system according to the embodiment.

FIG. 5 is a diagram showing the functional configuration of a group controller according to the embodiment.

15 FIG. 6 is a flowchart illustrating an operation of the group controller in the embodiment when an elevator is operated during maintenance service.

FIG. 7 is a diagram showing an example of indication when the operation of the car in the embodiment is inhibited.

20 FIG. 8 is a diagram of another embodiment, illustrating how to instruct to use an arbitrary car during being serviced by using a switch of the car controller.

25 FIG. 9 is a diagram of another embodiment, illustrating how to instruct to use an arbitrary car during being serviced by using a terminal unit for maintenance service.

30 FIG. 10 is a diagram of another embodiment, illustrating how to instruct to use an arbitrary car during being serviced by using a call button installed in the hall destination controller.

DETAILED DESCRIPTION

Embodiments will now be described with reference to drawings.

35 FIG. 1 is a diagram showing the structure of an elevator hall according to an embodiment. The term "elevator" used here refers basically to the car of an

elevator.

The figure illustrates an arbitrary elevator hall 10 and hall doors 11a and 11b. Hall door 11a opens and closes as being interlocked with a car door when the
5 car of elevator A arrives. Hall door 11b opens and closes as being interlocked with a car door when the car of elevator B arrives.

Between hall doors 11a and 11b, a hall destination controller 12 is installed for passengers to register a
10 destination floor. The hall destination controller 12 comprises an operation unit 12a configured to enter a destination floor and a indicator 12b configured to indicate a car (designated car) and the like for a passenger to ride.

15 As the destination floor registration method, generally, a numeric (10-digit) key unit is used, but a method of using, for example, an IC card may be employed. Further, the hall destination controller 12 may be installed at a place distant from the hall 10.

20 An indicator 13a is provided near the top of hall door 11a. Indicator 13a indicates the destination floor, travelling direction and the like of the car of elevator A. Similarly, an indicator 13b is provided near the top of hall door 11b. Indicator 13b indicates
25 the destination floor, travelling direction and the like of the car of elevator B.

Note that this embodiment is described on the assumption of the full DCS and the hall destination controller is installed in the hall of each floor.
30 That is, the destination floor button is not installed in the car.

FIG. 2 shows the structure of the car of an elevator.

The car door 22 is installed to be
35 openable/closable in the doorway of the car 21. An indicator 23, a door open button 24a and a door close button 24b are provided near the car door 22. The

indicator 23 indicates the information regarding the operational status of the cars 21, such as a current location and a traveling direction. The door open button 24a is an operation switch configured to
5 instruct opening of the car door 22. The door close button 24b is an operation switch configured to instruct closing of the car door 22.

An inspection box 25 with a lock is installed at an arbitrary location in the car 21. The inspection
10 box 25 accommodates a console panel 27 as shown in FIG. 3. Specific operation buttons 26 configured to instruct operations are provided in the console panel 27. The specific operation buttons 26 include destination floor buttons configured to designate a
15 destination floor. Usually, the inspection box 25 is locked, and the key to the inspection box 25 is managed by, for example, the manager of the building. Therefore, unauthorized users cannot open the inspection box 25 to operate the specific operation
20 buttons 26.

Moreover, a maintenance service switch 28 is provided on the console panel 27. The maintenance service switch 28 is used as an instruction unit configured for the operator to instruct that the car 21
25 is used during being serviced. When the maintenance service switch 28 is turned on, the mode of the car 21 is switched to a maintenance service mode, and the car 21 can be operated during maintenance service. For operation during maintenance service, the specific
30 operation buttons 26 are used.

FIG. 4 shows the structure of an elevator system, in which three elevators (cars) are controlled in group. The same structural elements as those shown in FIG. 1 are designated by the same reference symbols in
35 the following descriptions.

The elevator system in this embodiment comprises car controllers 31a, 31b, and 31c and a group

controller 32. Car controllers 31a, 31b and 31c are associated with Cars 21a, 21b and 21c, respectively. Car controllers 31a, 31b, and 31c are each connected to the group controller 32, and control the respective
5 associated cars independently, such as driving of the hoist (not shown) and opening/closing of the door.

Indicator 13a is connected to car controller 31a. Indicator 13a is provided near the hall door of car 21a, and indicates a destination floor, an travelling
10 direction, etc., of car 21a. Similarly, indicator 13b is connected to car controller 31b and indicator 13c is connected to car controller 31c. Indicator 13b is provided near the hall door of car 21b and indicates a destination floor, a travelling direction, etc., of car
15 21b. Indicator 13c is provided near the hall door of car 21c and indicates a destination floor, a travelling direction, etc., of car 21c.

Note that in the example of FIG. 1, not all of indicators 13a, 13b and 13c are shown for convenience
20 of illustration, but in reality, there are indicators 13a, 13b and 13c in the hall of each floor.

At least one hall destination controller 12 is provided in the hall of each floor. As described in connection with FIG. 1, the hall destination controller
25 12 is a device configured for a user to register a destination floor in the user's hall. When the destination floor is registered with the hall destination controller 12, hall call information comprising a set of two information items, the
30 destination floor and the registration floor (where the destination floor was registered) is sent to the group controller 32.

Upon receipt of hall call information, the group controller 32 assigns the hall call information to the
35 optimal one of cars 21a, 21b and 21c. Here, the car to which hall call information has been assigned is called a designated car. When a designated car is determined,

the elevator number of the designated car is indicated on indicator 12b of the hall destination controller 12 operated by the user. In the DCS, the operation of cars 21a, 21b and 21c are controlled (group control) using the hall destination controller 12.

The group controller 32 is a device configured to control the overall operation of cars 21a, 21b and 21c. The group controller 32 comprises the functions of the DCS described above. Further, the group controller 32 comprises an operation mode switching unit 32a and a drive controller 32b, configured to achieve the operations during maintenance service, as shown in FIG. 5.

When a service instruction is made by operation of the maintenance service switch 28, the operation mode switching unit 32a detaches the car being serviced from the group control of the cars 21a, 21b and 21c and switches it to the maintenance service operation mode.

When switched to the maintenance service mode, the drive controller 32b disregards the abnormality (DCS abnormality) related to the operation control carried out using the hall destination controller 12 of each floor, and controls operation of the car according to the operations on the specific operation buttons 26 provided in the car being serviced.

Next, the operation of the embodiment will now be described.

Here, processing shown in the flowchart described below is executed when the group controller 32, which is a computer, reads a predetermined program.

FIG. 6 is a flowchart illustrating the operation the group controller 32 during maintenance service.

Let us suppose a case of installation of elevators being serviced, and now, cars 21a, 21b and 21c stop at, for example, a reference floor with their doors open. An operator enters a predetermined car (let us suppose car 21a of elevator A), and unlocks the inspection box

25 shown in FIGS. 2 and 3. In the inspection box 25, the specific operation buttons 26 and the maintenance service switch 28 are provided.

5 If the maintenance service switch 28 is turned on (Yes in Step S101), the operation mode switching unit 32a of the group controller 32 selects the car for which the maintenance service switch 28 has been turned on as a car being serviced (Step S102). Here, the maintenance service switch 28 in car 21a of elevator A
10 was operated, and thus car 21a is selected as a car being serviced.

The operation mode switching unit 32a detaches car 21a selected as a car being serviced from group control, and switches it to the maintenance service
15 mode (Step S103). Here, detaching from group control means that a car is excluded from the group under the operation control of the DCS executed by the group controller.

20 When switched to maintenance service mode, the drive controller 32b checks whether the general equipment other than the DCS-associated devices is in a normal state (Step S104).

The DCS-associated devices are those devices required for the operation control of the DCS, that is,
25 for example, the hall destination controller 12. The group controller 32 is able to determine whether the DCS-associated devices are in the normal state based on the presence/absence or the like of signals output from these devices.

30 The general equipment other than the DCS-associated devices is that equipment required for the usual operation, but not directly related to the operation control of the DCS, examples of which are the indicator 23, the door open button 24a, the door close
35 button 24b, the various manual specific operation buttons 26 and 28 on the console panel 27 provided in the inspection box 25 in the car 21. The group

controller 32 is able to determine whether the general equipment is in a normal state based on the presence/absence or the like of signals output from this equipment.

5 If the general equipment is in the normal state, car 21a selected as a car being serviced can be operated independently. However, during maintenance service, the hall destination controller 12 required for the DCS is not provided in a hall in many cases, or
10 if provided, the hall destination controller 12 is not connected to the group controller 32. Therefore, the DCS is not in operation. Under these circumstances, any driving operation is detected as an abnormality of the DCS.

15 In order to avoid this, if the general equipment is in the normal state (Yes of Step S104), the drive controller 32b disregards the abnormality of the DCS and controls the operation of car 21a according to operation of the specific operation buttons 26 (Step
20 S105). In other words, usually, if a driving operation is instructed while the DCS is not in operation, such an operation is detected as abnormality of the DCS. However, when each car is driven independently in the maintenance service mode, the abnormality of the DCS is
25 disregarded.

 On the other hand, if an abnormality is detected by the general equipment in the above-described Step S104, the drive controller 32b inhibits the operation of car 21a selected as a car being serviced (Step
30 S106). At this time, indicator 13a of the hall, which corresponds to car 21a, or the indicator 23 in car 21a indicates that the car cannot be operated due to occurrence of abnormality (Step S107).

 FIG. 7 shows an example of indication for the case
35 where the operation of car 21a is inhibited. When such an abnormality is indicated, an abnormal part needs to be inspected immediately. If the maintenance service

switch 28 is once again operated after restoration to be the normal state, the processing from Step S101 is repeated.

5 As described above, according to this embodiment, the car for which the maintenance service switch 28 is operated is selected as a car being serviced, to be detached from group control, and is switched to the maintenance service mode. In the maintenance service mode, the abnormalities of the DCS are disregarded, and
10 therefore even if the DCS is not in operation, the car can be moved freely from one floor to another by operating the specific operation buttons 26.

Further, in case where the general equipment other than the DCS-associated devices is detected to be
15 abnormal, the operation of the car is inhibited even if the abnormalities of the DCS are disregarded. Thus, the safety of the operator can be secured.

(Other Embodiments)

In the above-described embodiment, the maintenance service switch 28 is provided in the inspection box 25
20 in the car 21, but it is also possible to install in a place other than the inspection box 25 in the car 21. However, the operation of the maintenance service switch 28 is usually locked in order to avoid an
25 ordinary passenger riding on the car 21 from accidentally operating the switch, and here it is preferable to have such a configuration that the locked state can be released by, for example, entering a personal identification number.

30 Or it is also possible to instruct that an arbitrary car should be used during maintenance service by another method as follows.

(a) Method Using Switch of Car Controller

35 As shown FIG. 8, a switch unit 41 configured for an operator to perform various setting operations is provided in the car controller 31 (31a, 31b, 31c). In this case, when, for example, the switch unit 41 of car

controller 31a corresponding to car 21a of elevator A is operated, car 21a is selected as a car being serviced to be detached from group control and is switched to the maintenance service mode.

5 Note that the car controller 31 (31a, 31b, 31c) is installed in the machine room of the building together with the group controller 32. With this structure, the operator operates the switch unit 41 in the machine room of the building.

10 On the other hand, with a machine-roomless type elevator system, which is not provided with a machine room, the car controller 31 (31a, 31b, 31c) and the group controller 32 are installed in an elevator shaft. In this case, the operator enters the elevator shaft
15 from the door installed in a preset floor, and operates on the switch unit 41 of the car controller 31.

(b) Method Using Terminal Unit for Maintenance and Inspection

20 As shown in FIG. 9, the operator uses a terminal unit 42 for maintenance and inspection. The terminal unit 42 comprises various functions required for maintenance and inspection and also a function of wirelessly connecting the unit to the control device 31 (31a, 31b, 31c) and the group controller 32.

25 With use of the terminal unit 42, an arbitrary car can be selected as a car being serviced and used during maintenance service even from a location distant from the car controller 31 by wirelessly connecting thereto.

(c) Method Using Door Open and Door Close Buttons

30 As shown in FIG. 2, a door open button 24a and a door close button 24b are provided in the car 21 (21a, 21b, 21c). For example, it can be set to instruct that a car should be used during maintenance service by pressing the door open button 24a and the door close
35 button 24b several seconds or more simultaneously on a reference floor. In this case, when the door open button 24a and the door close button 24b in, for

example, car 21a of elevator A are operated, car 21a is selected as a car being serviced to be detached from group control, and is switched to the maintenance service mode.

5 (d) Method Using Call Button Installed in Hall Destination Controller

 The hall destination controller 12 is installed in the hall of each floor. As shown in FIG. 1, the hall destination controller 12 is provided with the
10 operation unit 12a, which is, for example, a numeric (10-digit) key unit. A destination floor is registered by operating the operation unit 12a.

 Here, the operating panel of the hall destination controller 12 installed, for example in the reference
15 floor are made into a double-faced structure, which should be configured to switch over between a first operation face 43 comprising the operation unit 12a and a second operation face 45 comprising call buttons 44a, 44b and 44c, as shown in FIG. 10.

20 To switch the operation face, for example, the second operation face 45 may be formed in the rear of the first operation face 43, and thus the first operation face 43 and the second operation face 45 may be switched mechanically. Or the operation face may be
25 formed of a touch panel, and thus the first operation face 43 and the second operation face 45 may be switched by software.

 During maintenance service, the second operation face 45 is presented front, and one of call buttons
30 44a, 44b and 44c provided on the second operation face 45 is pressed to select a car being serviced. Call buttons 44a, 44b and 44c shown in this figure correspond to cars 21a, 21b and 21c, respectively.

 For example, when call button 44a corresponding to
35 car 21a of elevator A is pressed, car 21a is selected as a car being serviced to be detached from group control, and is switched to the maintenance service

mode. Note that, after the completion of maintenance service, the operation face is switched to the first operation face 43, and the hall destination controller 12 is used as an exclusive device for the DCS.

5 According to at least one embodiment described above, such an elevator system can be provided that a car can be driven as a usual operation during maintenance service or the like even while the DCS is not in operation.

10 In addition, the above-mentioned embodiments have been described on the assumption of installation of elevators, but these embodiments are also applicable to such cases where, for example, the DCS breaks down due to an accident and for repair, a car needs to be
15 independently driven.

 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
20 herein may be embodied in a variety of other forms; furthermore, various omissions, substitutions and changes in the form of the embodiments described herein may be made without departing from the spirit of the inventions. The accompanying claims and their
25 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 system which manages operation of cars in group and control operation of each of the cars based on a destination floor registered by a hall
5 destination controller installed in a hall of each floor, the elevator system comprising:

an instruction unit configured to instruct that an arbitrary one of the cars should be used during maintenance service;

10 an operation mode switching unit configured to, when instructed to use an arbitrary car during maintenance service by the instruction unit, detach the car being serviced among the cars from group control and switch an operation mode of the car to a
15 maintenance service mode; and

an drive control unit configured to, when switched to the maintenance service mode by the operation mode switch unit, control operation of the car being serviced according to operation of an operation button
20 while disregarding an abnormality related to the operation control using the hall destination controller.

2. The elevator system of Claim 1, wherein the drive control unit, when switched to the
25 maintenance service mode, confirms whether a general equipment other than equipment related to the operation control using the hall destination controller is in a normal state, and if the general equipment is in the normal state, controls the operation of the car being
30 serviced according to the operation of the operation button while disregarding an abnormality of the operation control using the hall destination controller.

3. The elevator system of Claim 2, wherein
35 the drive control unit, when the general equipment is detected to be an abnormal state, inhibits the operation of the car being serviced.

4. The elevator system of Claim 3, further comprising an indicator configured to indicate that the operation of the car being serviced is inhibited.

5 5. The elevator system of Claim 1, wherein the operation button is provided at a predetermined location of each of the cars.

10 6. The elevator system of Claim 1, wherein the instruction unit selects the car being serviced and instructs to use the car during maintenance service by operation of a maintenance service switch provided in each of the cars.

15 7. The elevator system of Claim 1, wherein the instruction unit selects the car being serviced and instructs to use the car during maintenance service by operation of a switch provided in a control device assigned to each of the cars.

20 8. The elevator system of Claim 1, wherein the instruction unit selects the car being serviced and instructs to use the car during maintenance service by wirelessly connecting a terminal unit for maintenance and inspection services handled by an operator to a control device assigned to each of the cars.

25 9. The elevator system of Claim 1, wherein the instruction unit selects the car being serviced and instructs to use the car during maintenance service by operating a door open button and a door close button provided in each of the cars.

30 10. The elevator system of Claim 1, wherein the instruction unit selects the car being serviced and instructs to use the car during maintenance service by operating a call button provided in the hall destination controller installed in the hall of an arbitrary floor.