

ELEVATOR CONTROLLER

FIELD

Embodiments described herein relate generally to an elevator controller suitable for an elevator that
5 moves up and down by vertically combining a plurality of cages.

BACKGROUND

In addition to a single-deck elevator constructed of one cage, a double-deck elevator constructed by
10 vertically combining two cages is known as an elevator. The double-deck elevator having the same installed floor area as the single-deck elevator enables more mass transportation and is mainly used as a vertical means of transportation in buildings such as super
15 high-rise buildings.

In an elevator hall where people get on or off an elevator in a building, an indicator, a so-called hall indicator that indicates the floor where the elevator is positioned at that time may be installed. Because a
20 double-deck elevator has two cars for one elevator, two hall indicators for an upper cage and a lower cage are needed per elevator.

Regarding the operation of the double-deck elevator, instead of a single operation in which only
25 one of the upper and lower cages is used for operation and a double operation in which allocated stop floors are fixed like, for example, the upper cage for even

floors and the lower cage for odd floors, an operating mode called a semi-double operation in which the operation is flexibly handled without regulating stop floors of the upper cage and the lower cage can be considered. In an elevator group management system in which a plurality of elevators are installed, when the semi-double operation is performed, the upper cage of some elevator and the lower cage of another elevator may simultaneously arrive at a certain floor and open their doors.

Incidentally, in an elevator hall in general, hall call buttons to register a hall call are installed. When a user of an elevator operates a hall call button, more specifically, an up call button or a down call button, in accordance with the direction in which the user wants to go, a car responds to the registered floor of the hall call. When the user gets on the cage and operates a destination floor call button on an operation panel inside a cage, the destination floor is registered and the car moves to the relevant floor.

In contrast to the system of elevators using the hall call button, in recent years, an elevator group management system including an operation panel (hereinafter, called a "destination floor registration unit") capable of directly specifying the destination floor in the elevator hall is in practical use. Such an elevator group management system is called a

"destination floor control system" or the like.

In the destination floor control system, however,
the destination floor registration unit needs to be
installed in each of the elevator halls of the floors
5 in a building and compared with a conventional hall
call button, unsatisfactory circumstances of increased
costs of equipment arise.

Thus, a system mixing a conventional system and a
destination floor control system like installing the
10 destination floor registration unit on floors, for
example, on the 1st floor as a lobby floor and floors
where shops and the like are concentrated or in
elevator halls in regular intervals of floors such as
every five floors and installing the hall call button
15 in elevator halls of other floors as in the past can be
considered.

Also when the double-deck elevator is run in a
semi-double operation in the above system in which a
conventional system and a destination floor control
20 system are mixed, as described above, there may be a
case in which a plurality of elevators arrive at the
floor simultaneously and opens the doors.

Particularly when a plurality of elevators open
the doors simultaneously on a floor where the
25 destination control device is installed, the user
should get on the elevator by confirming the elevator
on the side allocated by a group management system

after registering the destination floor with the destination floor control system, but due to insufficient confirmation, the possibility of getting a wrong elevator by mistake can also be considered.

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SUMMARY

Accordingly, it is an object of the present invention to provide an elevator controller capable of preventing a user from getting on a wrong elevator in the operation of a destination floor control system in which a plurality of elevators each vertically combining a plurality of cages is installed.

According to one embodiment, there is provided an elevator controller for a system including an elevator car combining a plurality of cages in an up and down direction, and a destination floor registration unit which is installed on at least one of floors where a cage of the elevator car can stop and is configured to register a destination floor. The elevator controller comprises a display controller that i) determines whether a cage will arrive on the floor where the destination floor registration unit is installed when, among a plurality of operating modes differing in sets of the cages and floors where the cages can stop, an operating mode in which the floors where each of the cages stops are not restricted is being set, and ii) displays, on a display unit in the floor where the destination floor registration unit is installed,

information indicating a destination floor of the cage which will arrive on the destination floor which has been registered by the destination floor registration unit, so as to be distinguished from information

5 indicating a destination floor of another cage, when it is determined that the cage will arrive on the floor where the destination floor registration unit is installed.

With the above configuration, it is possible to
10 prevent a user from getting on a wrong elevator in the operation of a destination floor control system in which a plurality of elevators each vertically combining a plurality of cages is installed.

BRIEF DESCRIPTION OF THE DRAWINGS

15 FIG. 1 is a block diagram showing the configuration of an overall group management system of an elevator according to an embodiment;

FIG. 2 is an external view showing a configuration example of a destination registered floor display unit
20 and a lantern installed for each elevator numbered machine in an elevator hall according to the embodiment;

FIG. 3 is a flow chart showing the content of processing performed by a display controller in a semi-
25 double operating mode according to the embodiment; and

FIGS. 4A and 4B are diagrams showing a display example of the destination registered floor display

unit and the lantern.

DETAILED DESCRIPTION

Hereinafter, an embodiment will be described in detail with reference to the drawings.

5 FIG. 1 is a diagram showing the configuration of an overall group management system of an elevator in a building according to an embodiment. The "elevator" here is basically a "car" and an expression of "numbered machine" is also used when there is a
10 plurality of "cars" like in the present embodiment.

 In FIG. 1, reference numeral 1 is a group management controller and reference numerals 2-1, 2-2, ... are elevator controllers that individually control each elevator numbered machine under the
15 control of the group management controller 1. Each of the elevator controllers 2-1, 2-2, ... exercises control of cars 3-1, 3-2, ... in a vertical double-deck structure in accordance with the allocation by the group management controller 1. The cars 3-1, 3-2, ...
20 travel vertically in elevator shafts S1, S-2, ... respectively.

 It is assumed here that each numbered machine has basically the same configuration and the configuration of, for example, the first machine will be described.

25 The elevator controller 2-1 includes a travel controller 2-1A and a display controller 2-1B. The travel controller 2-1A controls the travel in a

vertical direction of the car 3-1 and the stop thereof.

The travel controller 2-1A also provides with information indicating a state of the travel control with respect to the car 3-1 to display controller 2-1B.

5 The display controller 2-1B controls the indicator inside the car 3-1 and the indicator installed for the car 3-1 as the first machine in the elevator hall of each floor, based on the information provided from the group management controller 1 and the travel controller
10 2-1A.

More specifically, if the upper car of the car 3-1 of the first machine is denoted as an upper cage 3-1U and the lower car thereof is denoted as a lower cage 3-1D, operation panels 4-1U, 4-1D inside cages are
15 provided in the upper cage 3-1U and the lower cage 3-1D respectively.

The operation panels 4-1U, 4-1D inside cages include a cage call button for a user who has gotten on the elevator to register the destination floor, a door
20 open button, a door close button, and a cage internal display unit indicating a traveling state of the car 3-1 and the display controller 2-1B controls the display of the cage internal display unit.

If the floor of the building is denoted from the
25 top floor as the a-th floor, the b-th floor, ..., destination registered floor display units 5-1a, 5-1b, ... and lanterns 6-1a, 6-1b, ... are provided on

each floor for the car 3-1 of the first machine in the elevator hall. The display controller 2-1B controls the display of the destination registered floor display units 5-1a, 5-1b, ... and the lanterns 6-1a, 6-1b,

5 FIG. 2 is an external view of a configuration example of the destination registered floor display units 5-1a, 5-1b, ... , 5-2a, 5-2b, ... (hereinafter, the "destination registered floor display unit 5") and the lanterns 6-1a, 6-1b, ..., 6-2a, 6-2b, ...

10 (hereinafter, the "lantern 6") provided for each numbered machine of the cars 3-1, 3-2, ... in the elevator hall of each floor of the building.

 It is assumed here that, for example, the elevator in the building is operated from the 1st floor to the
15 15th floor. The destination registered floor display unit 5 is configured to allocate a descent display unit 5A to the left end thereof, an ascent display unit 5B to the right end thereof, an upper cage destination registered floor display unit 5C to an upper half
20 excluding the descent display unit 5A and the ascent display unit 5B, and a lower cage destination registered floor display unit 5D to a lower half thereof.

 In FIG. 2, a state in which the "1st" floor to the
25 "15th" floor are all displayed for both of the upper cage destination registered floor display unit 5C and the lower cage destination registered floor display

unit 5D, that is, is shown, but in reality, only the destination registered floor of the user is displayed in the upper cage destination registered floor display unit 5C or the lower cage destination registered floor display unit 5D.

The lantern 6 is an indicator that selectively lights up or flashes in an upper portion or a lower portion thereof in accordance with the traveling direction when determined that the corresponding car 3 will arrive at the relevant floor.

It is further assumed that corresponding to a plurality of the cars 3-1, 3-2, ..., a destination floor registration unit 7 or a hall call button 8 is installed on each floor in the elevator hall. In FIG. 1, for example, destination floor registration units 7a, 7b are installed on the a-th floor and the b-th floor in an upper portion of the building and hall call buttons 8c to 8e are installed on the c-th floor to the e-th floor thereunder.

That is, on the a-th floor and the b-th floor where the destination floor registration units 7a, 7b are installed, the user can directly executes a registration of a destination floor simultaneously with a registration of a hall call from the a-th floor and the b-th floor, by operating the destination floor registration units 7a, 7b.

On the c-th floor to the e-th floor where the hall

call buttons 8c to 8e are installed, after getting on
one of the cars 3-1, 3-2, ... arriving at the floor in
response to the hall call, the user operates the
operation panel 4 (4-1U, 4-1D) inside the cage to
5 register the destination floor.

An operation signal in the destination floor
registration units 7a, 7b and an operation signal in
the hall call buttons 8c to 8e are directly sent out to
the group management controller 1. Further, if it is
10 configured to display numbered machine information as
an allocation result after an input operation in the
destination floor registration units 7a, 7b, display
data for the display is directly provided from the
group management controller 1.

15 The present embodiment is, as described above, a
system in which one of the destination floor
registration unit 7 and the hall call button 8 is
installed. In FIG. 1, each floor is assumed to have
one unit of one of the destination floor registration
unit 7 and the hall call button 8, but the number of
20 the destination floor registration units 7 or the hall
call buttons 8 on each floor is not one and, for
example, as many units as the number of elevators may
be installed.

25 Each of the group management controller 1 and the
elevator controllers 2-1, 2-2, ... for each elevator is
constructed by a computer and an input/output mechanism

thereof. In the computer, the CPU reads necessary programs and data from a program memory in which operation programs and various kinds of fixed data are stored and expands and stores the programs and data in a work memory and then sequentially executes the programs in the work memory to perform various control operations.

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

FIG. 3 is a flow chart showing content of display processing of the destination registered floor display units 5-1a, 5-1b, ... performed by the display controllers 2-1B, 2-2B, ... of the elevator controllers 2-1, 2-2, ... in parallel with operation control of the cars 3-1, 3-2, ... by the travel controllers 2-1A, 2-2A, ... in a state in which the "semi-double operating mode" that causes the upper cage and the lower cage to arrive at any floors appropriately at that time is set.

Hereinafter, a case when the display controller 2-1B of the elevator controller 2-1 performs processing is taken as an example.

At the start of processing, the display controller 2-1B acquires, from the group management controller 1, an allocation result including information indicating planned destination floors of the upper cage 3-1U and the lower cage 3-1D of the car 3-1 of the relevant first machine (step S101).

Further, the display controller 2-1B acquires,
from the travel controller 2-1A, information indicating
floor positions at the present time of the upper cage
3-1U and the lower cage 3-1D of the car 3-1 (step
5 S102).

Thereafter, the display controller 2-1B acquires,
from the travel controller 2-1A, information indicating
the traveling pattern and acceleration/deceleration of
the car 3-1 at that time, that is, whether ascending,
10 stopped, or descending and if ascending or descending,
whether accelerating/decelerating or traveling at a
constant speed (step S103).

If the frequency of acquisitions of the allocation
result including information indicating the planned
15 destination floor in step S101 described above is f_1 ,
the frequency of acquisitions of position information
of the upper cage 3-1U and the lower cage 3-1D in step
S102 described above is f_2 , and the frequency of
acquisitions of information indicating the traveling
20 pattern and traveling state in step S103 described
above is f_3 , " $f_2 > f_3 > f_1$ " applies, instead of " $f_1 =$
 $f_2 = f_3$ ".

Regarding information whose frequency of
acquisitions is lower, content acquired last may be
25 held in the display controller 2-1B to be invoked.

Based on each piece of information acquired in
steps S101 to S103 described above, the display

controller 2-1B determines whether timing to update display content of the destination registered floor display units 5-1a, 5-1b, ... has come (step S104).

5 The timing to update display content includes a case when the allocation result including information indicating the planned destination floor which is acquired from the group management controller 1 has changed from the last one, a case when the position information of the upper cage 3-1U and the lower cage
10 3-1D at that time, which is acquired from the travel controller 2-1A, is different from the content immediately before, a case when the traveling pattern of the car 3-1 has changed, a case when the car 2 has changed from the constant-speed traveling to
15 deceleration traveling, and a case when the car 2 has changed from the stopped state to acceleration traveling.

 It is determined in step S104 described above that the timing to update display content of the destination
20 registered floor display units 5-1a, 5-1b, ... has not yet come (NO in step S104), the display controller 2-1B maintains the content of the destination registered floor display units 5-1a, 5-1b, ... have been caused to display (step S105) before returning to the processing
25 in step S101 described above and thereafter.

 If it is determined in step S104 described above that the timing to update display content of the

destination registered floor display units 5-1a, 5-1b, ... has come (YES in step S104), next the display controller 2-1B creates display content of the destination registered floor display units 5-1a, 5-1b, ... from information indicating the planned destination floor allocated to each of the upper cage 3-1U and the lower cage 3-1D of the car 3-1 at that time (step S106).

Then, based on the created display content, the display controller 2-1B causes the destination registered floor display units 5-1a, 5-1b, ... to display or each cage on each floor (step S107).

Further, the display controller 2-1B determines whether i) the floor to be stopped next is a floor where, instead of the hall call button 8, the destination floor registration unit 7 is installed and ii) the destination floor registration unit 7 has been operated by the user (that is, a destination floor has been registered) on the relevant floor (step S108).

If it is determined that i) the floor where at least one of the upper cage 3-1U and the lower cage 3-1D of the car 3-1 stops is a floor where the destination floor registration unit 7 is installed and ii) the destination floor registration unit 7 has been operated by the user (that is, a destination floor has been registered) on the relevant floor (YES in step S108), the display controller 2-1B makes a display in

the destination registered floor display unit 5-1 of the floor so that a region on the cage side including the relevant destination floor is distinguished from a region on the cage side not including the relevant destination floor (step S109) before returning to step S101 described above.

For example, when both of the upper cage 3-1U and the lower cage 3-1D are positioned lower than the tenth floor and being ascending, and a user has registered the "15th" floor as the destination floor, on the "10th" floor, the display controller 2-1B sets the "10th" floor as the floor to be stopped next based on the operation at the "10th" floor, and makes a display in the destination registered floor display unit 5-1 of the "10th" floor so that a region on the cage side including the "15th" floor as the destination floor is distinguished from a region on the cage side not including the relevant destination floor.

FIGS. 4A and 4B shows display examples of the destination registered floor display unit 5-1b and the lantern 6-1b (in FIG. 4A) corresponding to the car 3-1 of the b-th floor (14th floor) and the destination registered floor display unit 5-2b and the lantern 6-1b (in FIG. 4B) corresponding to the car 3-2 when the building is a 15-story building.

In FIG. 4A, when the lower cage 3-1D of the car 3-1 is within the display range of the 14th floor and

will soon arrive, by displaying the destination floor
"8th (floor)" registered by the destination floor
registration unit 7b in advance large on the side of
the lower cage destination registered floor display
5 unit 5D, the arrival of the upper cage 3-1U on the "9th
(floor)" is also displayed.

By constructing the destination registered floor
display unit 5-1b of, for example, a flat panel display
such as a color liquid crystal panel with backlight,
10 the display region of the lower cage destination
registered floor display unit 5D can temporarily set
larger than the display region of the upper cage
destination registered floor display unit 5C without
fixing the display regions of the upper cage
15 destination registered floor display unit 5C and the
lower cage destination registered floor display unit
5D.

In addition, the numerical value of the "8th
(floor)" as the planned destination floor registered by
20 the destination floor registration unit 7b on the floor
is made to be displayed in a different mode (such as
the color, font, and size) from numerical values of
other floors and the side of the lower cage destination
registered floor display unit 5D is caused to display
25 by flashing.

Accordingly, the user who has operated the
destination floor registration unit 7b on the 14th

floor for the planned destination floor "8th (floor)"
can visually understand easily that the user can go to
the intended 8th floor by getting on the lower cage 3-
1D of the car 3-1 from the display content of the
5 destination registered floor display unit 5-1b.

In the destination registered floor display unit
5-1b corresponding to the neighboring car 3-2 as shown
in FIG. 4B, on the other hand, though the upper cage 3-
2U similarly arrives on the 14th floor, it is
10 understandable from the display of the upper cage
destination registered floor display unit 5C and the
lower cage destination registered floor display unit 5D
that the car 3-2 will not arrive at the 8th floor
registered as the destination by the destination floor
15 registration unit 7b.

In this case, the destination registered floor
display unit 5-2b adopts a display that equally handles
the floor where the upper cage 3-2U is planned to
arrive and the floor where the upper cage 3-2D is
20 planned to arrive as the region range in which the
upper cage destination registered floor display unit 5C
and the lower cage destination registered floor display
unit 5D are equally divided.

Due to the display of the destination registered
25 floor display unit 5-2b, together with the display on
the side of the destination registered floor display
unit 5-1a, though both of the lanterns 6-1b, 6-2b

display the arrivals of the cars 3-1, 3-2 traveling
downward, it is visually understandable on the side of
the car 3-2 that the car will not arrive on the 8th
floor registered as the destination by the destination
5 floor registration unit 7b on the 14th floor.

If it is determined in step S108 described above
that i) the floor where at least one of the upper cage
3-1U and the lower cage 3-1D of the car 3-1 stops is
not a floor where the destination floor registration
10 unit 7 is installed or ii) even if the destination
floor registration unit 7 is installed on the floor,
the destination floor registration unit 7 has not been
operated by the user (that is, a destination floor has
not been registered) on the relevant floor (NO in step
15 S108), the display controller 2-1B returns to the
processing in step S101 described above and thereafter
without making a distinguishing display in accordance
with the cage in step S109 described above.

According to the present embodiment, as described
20 above in detail, the user can be prevented from getting
on a wrong elevator in the operation of a destination
floor control system in which a plurality of elevators
each vertically combining a plurality of cages is
installed.

25 Also in the above embodiment, a determination of
the display is made in a timing after the floor where a
cage stops next is determined and thus, the user

waiting on the floor can be notified of the arrival without inadvertently irritating the user.

Particularly in the above embodiment, the timing when a cage starts deceleration toward the floor to
5 stop next is used as the timing when the floor where the cage stops next is determined and thus, the user waiting on the floor can be notified of the arrival in more appropriate timing.

Also in the above embodiment, information
10 indicating the destination floor of the cage, which includes information indicating the destination floor registered on the floor, is made to be displayed so as to be distinguished from information indicating a destination floor of another cage, specifically, in a
15 mode that is more perceivable for a user than the information indicating the destination floor of another cage, more specifically by flashing, the size of the display region, colors, character fonts, character size or the like and also using voice guidance, which makes
20 the information understandable to the user more easily and can prevent the user from getting on a wrong elevator.

While certain embodiments have been described, these embodiments have been presented by way of example
25 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 embodiments described herein may be made without departing from the spirit of the inventions. The accompanying claims and their
5 equivalents are intended to cover such forms or modifications as would fall within the scope and spirit of the inventions.

CLAIMS

1. An elevator controller for a system including an elevator car combining a plurality of cages in an up and down direction, and a destination floor registration unit which is installed on at least one of floors where a cage of the elevator car can stop and is configured to register a destination floor, the elevator controller comprising:

a display controller that i) determines whether a cage will arrive on the floor where the destination floor registration unit is installed when, among a plurality of operating modes differing in sets of the cages and floors where the cages can stop, an operating mode in which the floors where each of the cages stops are not restricted is being set, and ii) displays, on a display unit in the floor where the destination floor registration unit is installed, information indicating a destination floor of the cage which will arrive on the destination floor which has been registered by the destination floor registration unit, so as to be distinguished from information indicating a destination floor of another cage, when it is determined that the cage will arrive on the floor where the destination floor registration unit is installed.

2. The elevator controller according to claim 1, wherein the display controller makes a determination in a timing after the floor where a cage stops next is

determined, based on an operational state of the elevator car.

3. The elevator controller according to claim 2, wherein the display controller makes the determination in a timing when a cage starts deceleration toward the floor where the cage stops next, based on the operational state of the elevator car.

4. The elevator controller according to claim 1, wherein the display controller displays the information indicating the destination floor of the cage which will arrive on the destination floor in a mode that is more perceivable for a user than the information indicating the destination floor of the another cage.