

ELEVATOR GROUP MANAGEMENT CONTROL APPARATUS AND METHOD THEREOF

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an elevator group management control apparatus and a method thereof, and in particular to an improved elevator group management control apparatus and a method thereof which are capable of commonly connecting a plurality of car controllers and floor input/output terminals by using one transmission line, and transmitting/receiving signals by a serial communication method, for thus preventing any operational problems which may occur in the transmission line.

2. Description of the Conventional Art

Figure 1 is a block diagram illustrating a conventional elevator group management control apparatus.

The conventional elevator group management control apparatus includes a group management controller 1 connected to first and second car controllers 2 and 3 through transmission lines L1 and L2, through which a serial signal is transmitted, for performing an allocation operation based on a floor call, outputting an allocation information and a registration information, minimizing a waiting time of passengers, and

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allocating a car which consumes minimum electric power, first and second car controllers for controlling the operation of a car in accordance with the control of the group management controllers 2 and 3, operation display units 6 and 7 disposed in floors 4 and 5 connected with the first and second car controllers 2 and 3 through transmission lines L3 and L4 for transmitting/receiving information related to the operation of the car, and a call registration unit 8 connected with the operation display units 6 and 7 for generating a floor call and for displaying the call registration state.

The operation of the conventional elevator group management control apparatus will now be explained.

When a passenger pushes a down switch 8A or an up switch 8B of the call registration unit 8, a floor call is generated from the call registration unit 8. The thusly generated floor call is inputted to the operation display units 6 and 7, and is transmitted to the first and second car controllers 6 and 7 through the transmission lines L3 and L4, and the transmitted floor call is transmitted to the group management controller 1 through the transmission lines L1 and L2.

The group management controller 1 performs an allocation operation for designating a car among many cars with respect to the generated call. Namely, in a state that the operation states of multiple cars can be stored, the car which can be serviced at the fastest speed and consumes the least electric

power is designated. The allocation signal of allocating a car based on the operation is outputted through the transmission line L1, and the outputted allocation signal is transmitted to the first and second car controllers 2.

The first car controller 2 or the second car controller 3, which received the allocation signals, process a floor call information and a car operation information, and output the allocation signal to the car through the transmission line L3 or the transmission line L4, so the car is moved to the floor 4 or the floor 5. The floor call information and the car operation information are transmitted to the operation display unit 6 or the operation display unit 7, and the operation display units 6 and 7 display the received car operation information. In addition, the operation display units 6 and 7 output the floor call information to the call registration unit 8. Therefore, the up switch 8A or the down switch 8B are turned on, and the passenger at a floor notices that the car is registered.

However, in the conventional elevator group management elevator, when a problem occurs in the transmission lines L1 and L2 for connecting the group management controller 1 and the first and second car controllers 6 and 7, the car controllers 2 and 3 can not receive the allocation information from the group management controller 1. Therefore, the first and second controllers 2 and 3 separately operated, and when a call is

generated at a floor, more than two cars concurrently respond, for thus causing operation problems.

In addition, if a problem occurs in the transmission lines L3 and L4 which connect the first and second car controllers 2 and 3 and the operation display units 6 and 7, the information from the first and second car controllers 2 and 3 is not transmitted to the car, so that the elevator system may not be normally operated.

Here, if eight car controllers are connected to the group management controller, eight transmission lines are needed for connecting the car controllers and the group management controller, and eight transmission lines are further needed for connecting the car controllers and the operation display units, for thus causing complicated line mechanism.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide an elevator group management control apparatus and a method thereof which overcomes the aforementioned problems encountered in the conventional art.

It is another object of the present invention to provide an improved elevator group management control apparatus and a method thereof which are capable of commonly connecting a plurality of car controllers and floor input/output terminals

by using one transmission line, and transmitting/receiving signals by a serial communication method, for thus preventing any operational problems which may occur in the transmission line.

To achieve the above objects, there is provided an elevator group management control apparatus which includes a group management controller for performing an allocation operation based on a floor call and for outputting an allocation information and a call registration information, a plurality of car controllers which are commonly connected with the group management controller for receiving an allocation information through the transmission line by a serial communication method and for outputting a car operation information, and a floor input/output terminal disposed in each floor for transmitting a floor call to the group management controller or the car controllers by a serial transmission method through a first transmission line which is commonly connected, receiving a call registration information, and a car operation information, and outputting the information to a floor call registration unit, and a floor operation display unit of a corresponding car.

To achieve the above objects, there is provided an elevator group management control method which includes the steps of a first step for judging that an operational problem occurred in the group management controller when a data related

to an allocation information is not transmitted to a plurality of car controllers from the group management controller for a predetermined time, a second step for determining one among the car controllers as a master car controller which performs the group control function when it is judged that the group management controller has an operational problem in the first step and determining the remaining car controllers as a slave car controller, a third step in which the determined master car controller performs an allocation operation, and a fourth step in which the slave car controllers controls a corresponding car based on the allocation operation.

Additional advantages, objects and features of the invention will become more apparent from the description which follows.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will become more fully understood from the detailed description given hereinbelow and the accompanying drawings which are given by way of illustration only, and thus are not limitative of the present invention, and wherein:

Figure 1 is a block diagram illustrating a conventional elevator group management control apparatus;

Figure 2 is a block diagram illustrating an elevator group

management control apparatus according to the present invention;

Figure 3 is a block diagram illustrating a controller having additional elements compared to the construction shown in Figure 2;

Figure 4 is a block diagram illustrating a controller having additional elements compared to the construction as shown in Figure 3;

Figure 5 is a block diagram illustrating an elevator group management control apparatus according to another embodiment of the present invention;

Figure 6 is a block diagram illustrating a controller of Figure 5;

Figure 7 is a block diagram illustrating a controller of Figure 6;

Figure 8 is a detailed block diagram illustrating a group management controller of Figure 2;

Figure 9 is a detailed block diagram illustrating a group management controller of Figure 5;

Figure 10 is a block diagram illustrating car controllers of Figure 2;

Figure 11 is a detailed block diagram illustrating a floor input/output terminal of Figure 2;

Figure 12 is a detailed block diagram illustrating a car input/output terminal of Figure 3;

Figure 13 is a detailed block diagram illustrating of an external unit input/output terminal of Figure 3;

Figure 14 is a flow chart of a group management controller according to the present invention;

Figure 15 is a flow chart of car controllers according to the present invention; and

Figure 16 is a flow chart of car controllers according to another embodiment of the present invention;

DETAILED DESCRIPTION OF THE INVENTION

Figure 2 is a block diagram illustrating an elevator group management control apparatus according to the present invention.

As shown therein, the elevator group management control apparatus according to the present invention includes a group management controller 101 for receiving a floor call, performing an allocation operation, outputting an allocation information and a call registration information, minimizing a waiting time of passengers, and allocating a car which consumes the least electric power, first and second car controllers 102A and 102B connected with the group management controller 101 through a transmission line SL1 which transmits serial signals for receiving an allocation information from the transmission line SL1 and for outputting an operation state information, and

for controlling the operation of a corresponding car, a call registration unit 105 disposed in each floor for transmitting a floor call based on the call by the passenger, first and second operation display units 104A and 104B disposed in each floor for displaying the operation state of the car, and a floor input/output terminal 106 for outputting a floor call to the transmission line SL1, receiving the call registration information and the operation state information by using the transmission line SL1, receiving the call registration information and the operation state information through the transmission line SL1, outputting the call registration information to the call registration unit 105, and outputting the operation state information to the first and second operation display units 104A and 104B.

In addition, third through eighth car controllers can be further connected by using the transmission line SL1.

In addition, the group management controller 101, as shown in Figure 8, includes an operation unit 101A and a waiting unit 101B. At usual time, the operation unit 101A controls the group management. If the operation unit 101A is not operational, the waiting unit 101B controls the group management. For the operations thereof, the operation unit 101A includes a central processing unit 11A, a memory 12A having a Read Only Memory (ROM) and a Random Access Memory (RAM), a parallel interface unit 13A for a communication with the waiting unit 101B, a

serial interface unit 14A connected with the transmission line SL1A, and a serial interface unit 14B connected with the transmission line SL1B. Here, each element is commonly connected in the circuit. In addition, the construction of the waiting unit 101B is the same as the operation unit 101A. The transmission line SL1A is connected with the first through fourth car controllers, respectively. The transmission line SL1B is connected with the fifth through eighth car controllers, respectively. The serial interface units 14A and 14B are connected for four car controllers, for thus increasing the signal transmission speed.

In addition, the first car controller 102A, as shown in Figure 10, includes a CPU 21, a memory 22 having a ROM and a RAM, a parallel interface unit 23 connected with an external unit, and a serial interface unit 24 connected with the transmission line SL1.

The floor input/output terminal 106, as shown in Figure 11, includes a CPU 41, a memory 42 having a ROM and a RAM, a serial interface unit 43 connected with the transmission line SL1, and a parallel interface unit 44 connected with the first and second operation display units 104A and 104B and the call registration unit 105.

The operation of the elevator group management controller apparatus according to the present invention will now be explained with reference to the accompanying drawings.

First, the group management controller 101, as shown in Figure 14, receives an operation state information from the first and second controllers 102A and 102B through the transmission line SL1 in Step S1.

When a passenger pushes one between the up switch 105A and the down switch 105B, a floor call is generated by the call registration unit 105, and the thusly generated floor call is inputted to the group management controller 101 through the floor input/output terminal 106 in Step S2.

The group management controller 101 performs an allocation operation in order to select the optimum car, edits the allocation information and registration information, and outputs the edited allocation information and call registration information in Steps S3 through S5.

The first and second car controllers 102A and 102B receive the allocation information, edit the call registration information of the car to be operated based on the car registration information a corresponding car, and output the operation state information.

The floor input/output terminal 106 receives the operation state information and the call registration information, and divides the received information by the output apparatus, and the call registration information is outputted to the floor call registration unit 105, and the operation state information is outputted to the floor operation display units 104A and

104B, respectively.

In addition, the CPU 11A performs the operation of each element, and the data processed by the CPU 11A is transferred through the serial interface units 14A and 15A by the serial communication method.

If an operational problem occurs in the group management controller 101, the data, which was being outputted from the group management controller 101 to the first and second car controllers 102A and 102B, is not inputted thereto.

If the allocation can not be performed with respect to the floor call due to the operational problem in the group management controller 101, the allocation operation is performed by one of the car controllers. It is determined that which car controller controls the allocation based on the previously set rules. In the present invention, the first car controller 102A among four car controllers of one group is designated for the allocation. Here, the first car controller 102A is called as a master car controller, and the remaining car controllers 102B are called as a slave car controller.

In addition, a predetermined car controller among the car controllers may be designated as a master car controller.

The operation of the first and second car controllers 102A and 102B will now be explained with reference to Figure 15.

It is checked whether a data is outputted from the group management controller 101 for a predetermined time. As a

result, if the data is not outputted from the group management controller 101 for a predetermined time, it is judged that an operational problem occurred in the group management controller 101 in Step S11.

If it is judged that an operational problem occurred in the group management controller 101 in Step S11, the first car controller 102A is designated as a master car controller based on the rules, and the thusly designated car controller 102A receives the floor call signal, and the allocation operation is performed, and the allocation information and call registration information are outputted, for thus performing the group management control. In addition, the other car controllers except for the first car controller 102A are determined as a slave car controller, respectively, in Step S13, and the original operations of the car controllers are performed.

The original operation of the car controllers are performed in Steps S16 through S21.

In addition, the problems of the group management controller 101 are transmitted, and each car controller includes a group management program. If a problem occurs in the first car controller 102A which was designated as the master car, and the group management function can not be performed, the second car controller 102B is designated as the master car controller. Namely, the slave car controllers check whether a data is outputted from the master car controller 102A for a

predetermined time. As a result of the checking, if the data is not outputted from the remaining slave car controller 102B for a predetermined time, it is judged that a problem occurred in the master car controller 102. The second car controller 102B is designated as a new master car controller. When the master car controller is designated, the remaining car controllers are designated as the slave car controller.

As described above, in the present invention, the group management controller 101, a plurality of the car controllers 102A, 102B, ..., and the floor input/output terminal 108 are commonly connected by the transmission line, and if an operation problem occurs in the group management controller 101, another group management controller is designated for the group management control. In addition, even when an operation problem occurs in the group management controller, the car controllers can be normally operated, for thus stably performing the operation of the system.

As shown in Figure 3, in another embodiment of the present invention, a first car input/output terminal 107A and an external unit input/output terminal 108B are provided in the car and are controlled by the first car controller 102A. The first car input/output terminal 107A and the external unit input/output terminal 108B are commonly connected by a transmission line SL4, and the transmission line SL4 is connected with the second car controller 102B.

Figure 12 is a detailed block diagram illustrating a car input/output terminal of Figure 3.

As shown therein, there are provided a CPU 31, a memory 32 having a ROM and a RAM, a serial interface unit 33 connected with the transmission line SL3, and a parallel interface unit 34 connected with a car operation unit 111, and the car operation unit 111 is disposed in the car and includes a car operation display unit 111A and a car call registration unit 111B.

The first car input/output terminal 107A transmits a car call from the car call registration unit 111B through the transmission line SL3, and the call registration information and operation state information from the first car controller 102A are outputted to the car operation display unit 111A and the car call registration unit 111B.

In addition, the construction and operation of the second car input/output terminal 107B is the same as the first car input/output terminal 107A.

Figure 13 is a detailed block diagram illustrating of an external unit input/output terminal of Figure 3.

As shown therein, there are provided a CPU 51, a memory 52 having a ROM and a RAM, a serial interface unit 53 connected with the transmission line SL3, and serial interface units 54 and 55 connected with an external unit 112, respectively. The external unit 112 is disposed in the car and includes an audio

information unit 112A and an information display unit 112B.

The external unit input/output terminal 108A receives an operation information from the first car controller 102A through the transmission line SL3 and provides the passenger in the car with audio information, time information, car operation information, etc.

In addition, the construction and operation of the external input/output terminal 108B connected with the second car controller 102B is the same as the external unit input/output terminal 108A.

The operation of an external unit input/output terminal 110 connected with the transmission line SL1 is the same as the external unit input/output terminal 108A. An external unit 109 is disposed in the floor for providing waiting passengers with various operation information.

In another embodiment of the present invention, a CRT checking unit 120 may be provided as an external checking unit as shown in Figure 4.

The CRT checking unit 120, the group management controller 101, and car controllers 102A and 102B are connected by the transmission line LS2 for transmitting information which is necessary for the operation and checking of the car.

Figure 9 is a detailed block diagram illustrating a group management controller of Figure 5.

As shown therein, serial interface units 16A and 16B are

further connected with the transmission line LS2 compared to the construction as shown in Figure 8.

The CRT checking unit 120 receives an operation information, control information, car failure information, etc. from the car controllers 102A and 102B and displays the operation state on a screen. Namely, a floor call registration state, a call registration state of each car, an operation direction, position, load, and door operation state of each car are displayed.

In addition, various command and information are received for controlling the operation of the car, and the control state is checked.

Figure 5 is a block diagram illustrating an elevator group management control apparatus according to another embodiment of the present invention.

As shown therein, in this embodiment of the present invention, the group management is controlled by using only the first and second car controllers 102A and 102B without using the group management controller 101. The operation thereof will now be explained with reference to Figure 16.

More than two cars are grouped as one group. A master car controller is necessary for controlling a group management based on the parallel operation. One car controller is selected from car controllers as a master car controller for a parallel operation.

For example, the first car controller 202A is selected as the master car controller. The thusly selected first car controller 202A receives a floor call and performs an allocation operation. The allocation information and call registration information are transmitted to the car controllers 202B through 202D and a floor input/output terminal 206, respectively.

The first car controller 202A and the car controllers 202B through 202D which received the allocation call control the operation of the car, and the operation state information is transmitted to the first car controller 202A and the floor input/output terminal 206, respectively.

Here, the floor input/output terminal 206 outputs the received call registration information to a floor call registration unit 205, and the operation state information of each car is outputted to the operation display units 204A and 204B.

If an operational problem occurs in the first car controller 202A, a new master car controller is designated among the remaining car controllers 202B through 202D based on the rules. The group management is continuously performed by the newly designated master car controller. The above-described processes are described in Steps 1 through 6 as shown in Figure 16.

The remaining steps S14 through S21 are related to the

normal group management.

Figure 6 is a block diagram illustrating a controller of Figure 5. As shown therein, the group management controller 101 is removed. The operation of each circuit is the same as the operation as shown in Figure 3.

Figure 7 is a block diagram illustrating a controller of Figure 6. As shown therein, the group management controller 101 is removed compared to the construction as shown in Figure 4, and the operation of each circuit is the same as the circuits as shown in Figure 4.

As described above, the elevator group management control apparatus and a method thereof according to the present invention is capable of commonly connecting a plurality of car controllers and floor input/output terminals by using one transmission line, and transmitting/receiving signals by a serial communication method, for thus preventing any operational problems which may occur in the transmission line.

In addition, if an operational problem occurs in the group management controller, and then the group management controller is not operational, a predetermined car controller among car controllers is designated as a master car controller based on a rule, and the designated master car controller allocates a proper car with respect to the call from a floor. In addition, if an operational problem occurs in the master car controller, another car controller among the remaining car controllers is

selected as a master car controller, for thus enhancing the operational efficiency of the elevator system.

Although the preferred embodiments of the present invention have been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as recited in the accompanying claims.



What is claimed is:

1. An elevator group management control apparatus, comprising:

a group management controller for performing an allocation operation based on a floor call and for outputting an allocation information and a call registration information;

a plurality of car controllers which are commonly connected with the group management controller for receiving an allocation information through the transmission line by a serial communication method and for outputting a car operation information; and

a floor input/output terminal disposed in each floor for transmitting a floor call to the group management controller or the car controllers by a serial transmission method through a first transmission line which is commonly connected, receiving a call registration information, and a car operation information, and outputting the information to a floor call registration unit, and a floor operation display unit of a corresponding car.

2. The apparatus of claim 1, further comprising external unit input/output terminals disposed in the car and commonly connected by a second transmission line, wherein the second transmission line is connected with the car controller, and the



external unit input/output terminal receives a call registration information, a car operation direction, a car position information, a floor guide information, an audio guide information, etc., which are related to the car operation information and information display, from the car controllers by a serial communication method.

3. The apparatus of claim 1, wherein said external unit input/output terminal disposed in a floor are commonly connected by the first transmission line, and the external unit input/output terminal outputs a call registration information, an operation information, a car position information, a floor guide information, an audio guide information, etc. which are related to the car operation information and information display received from the group controllers and the car controller.

4. The apparatus of claim 1, further comprising a CRT checking unit connected with the group controller, and the car controller by using a third transmission line, wherein the CRT checking unit displays a floor call registration state, a call registration state of each car, an operation direction of each car, a position, a load, a door operation state, etc., for thus checking the operation state of the elevator.



5. An elevator group management control method wherein a plurality of cars are grouped, a plurality of car controllers controls the cars, and a group management controller allocates an optimum car based on a floor call, comprising the steps of:

a first step for judging that an operational problem occurred in the group management controller when a data related to an allocation information is not transmitted to a plurality of car controllers from the group management controller for a predetermined time;

a second step for determining one among the car controllers as a master car controller which performs the group control function when it is judged that the group management controller has an operational problem in the first step and determining the remaining car controllers as a slave car controller;

a third step in which the determined master car controller performs an allocation operation; and

a fourth step in which the slave car controllers controls a corresponding car based on the allocation operation.

6. The method of claim 5, further comprising the steps of:

a fifth step for judging that the master car controller has an operational problem when a data related to the allocation information is not transmitted to the slave car



controllers from the master car controller for a predetermined time;

a sixth step for determining one among the slave car controllers as a master car controller which performs the group management function and for determining the remaining car controllers as a slave car controller when it is judged that the master car controller has an operation problem in the fifth step;

a seventh step in which the determined master car controller performs an allocation operation; and

an eighth step in which the slave car controllers controls a corresponding car based on the allocation operation.