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APPARATUS FOR OPERATING ELEVATORS

The present invention relates to apparatus for controlling elevators.

An up button and a down button are normally installed in an elevator hall. A passenger who desires to go up presses the up button and a passenger who desires to go down presses the down button thereby calling a cage so that the passenger can ride in the cage. The passenger then registers a cage call by activating a destination button in the cage which causes the cage to move to desired floor.

On the other hand, an elevator in which destination buttons are provided in the hall of an elevator to register in advance a desired destination floor, wherein the operation of the destination button thereafter in the cage is not necessary, has been recently proposed, for example, in Japanese Patent Publication No. 24,310/1982. The advantages of such an elevator system are largely classified into the following two points:

(a) Only one operation is sufficient for a user who utilizes the elevator.

(b) Since the destination of a passenger who wishes to ride in a cage can be identified before the cage arrives at the floor at which the passenger is waiting, the performance of a group supervision is improved to shorten the waiting time of passengers and to reduce the bypassing of a floor due to a full passenger situation.

However, there arises a problem when utilizing the elevator of this type. Namely, when the destination floor which is registered in the hall is registered as a cage call for stopping the cage, if the call is registered for a given destination floor by a passenger who is uncertain of the floor number he wants the car to stop at, the stopping of the cage becomes wasteful. If the cage call is, on the other hand, delayed, the information of the cage call is not inputted when the hall call is assigned. Therefore, the above-described advantage (a) for improving the performance of the group supervision cannot be achieved in any case. Further, if the cage call is extremely delayed, the cage call is not yet registered when the passenger has risen in the cage. Consequently, the passenger has to press the destination button in the cage, thereby eventually obviating the advantage described in the above paragraph (a). (For this reason, the destination buttons are normally also provided in the cage for the passenger who does not press the destination button in the elevator hall.)

The present invention has been made to eliminate the above-described drawbacks and has for its object to provide an apparatus for operating an elevator in which an assigned cage call due to the operation of a destination button in an elevator hall is re-assigned according to the status of the cages, thereby allowing a passenger to operate the

elevator system without anxiety and improving the performance of a group supervision.

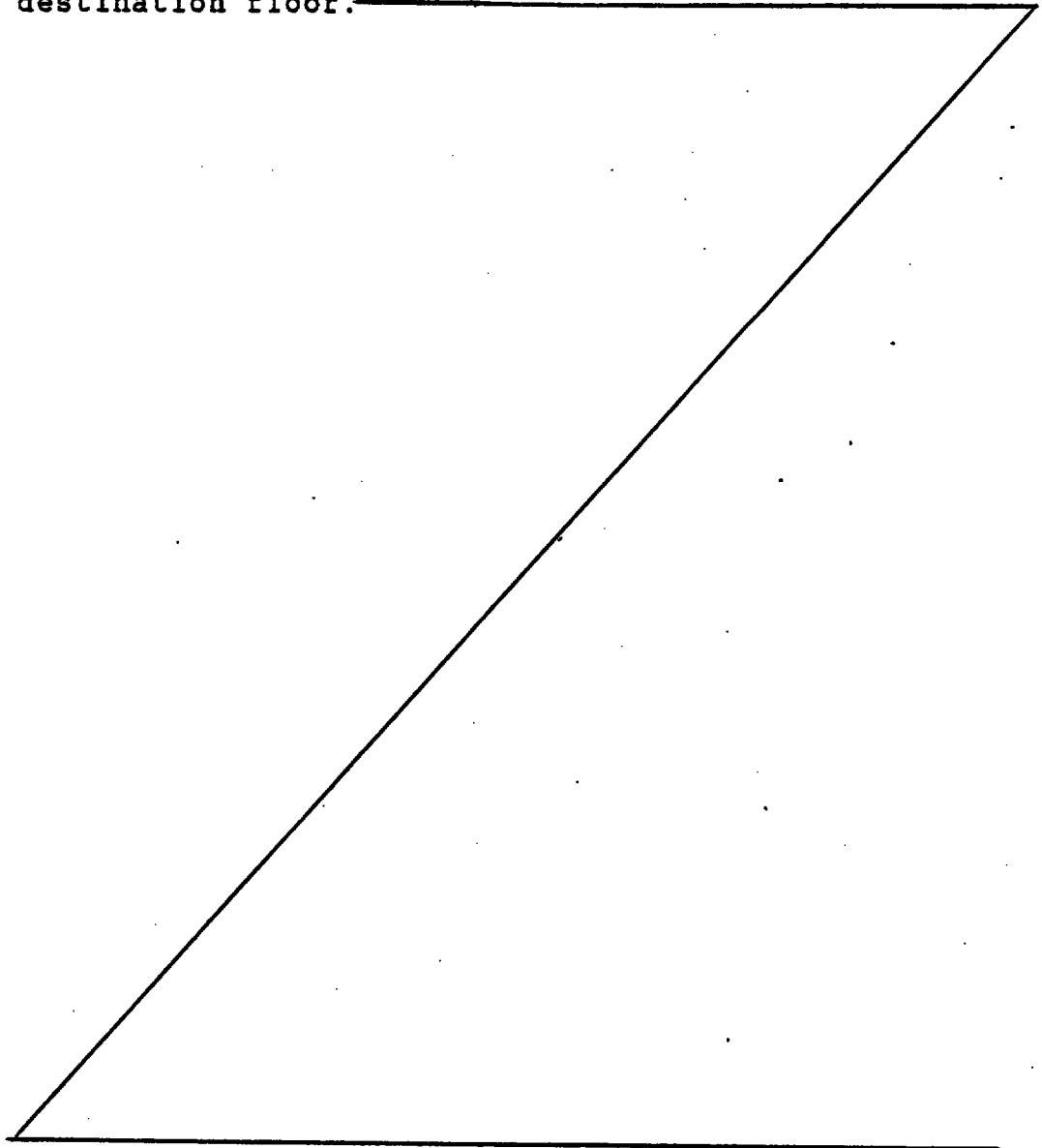
According to the present invention, there is provided an apparatus for operating a plurality of elevator cages for serving a plurality of floors on the basis of calls under group supervision comprising:

- (a) a plurality of hall buttons provided in the hall of each of a plurality of floors to be served by the cages, wherein the hall buttons are operative for signalling the presence of a call, for one of the cages, at the floor of respective hall buttons, and the hall buttons are operative also for signalling a required destination floor;
- (b) a plurality of destination buttons provided within each of the elevators for signalling a required destination floor;
- (c) assignment means for receiving signals generated by the operation of the hall buttons for assigning each call in the hall to a selected one of the plurality of cages; and
- (d) registering means for registering the required destination floor: (i) in response to a signal from one of the destination buttons; and (ii) in response to a signal from the assignment means; wherein the actual times(s) of registering the required destination floor is (are) determined according to the running state of the cages.

9A

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The "running state of the cages" is determined by whether there have been any prank calls, whether a light beam has been broken due to entry of a person into a cage, or whether another cage from the one initially assigned is to serve the passenger and the required destination floor.



BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a diagram showing the construction of an
5 apparatus for operating elevators according to an embodiment
of the present invention;

Fig. 2 is a circuit diagram of a logic circuit of
a group supervisor in Fig. 1; and

Fig. 3 is a logic circuit showing part of a
10 controller for an elevator A in Fig. 1.

An embodiment of the invention will be described
below in conjunction with Figs. 1 to 3.

In the drawings, reference numerals 1 to 5
respectively denote first to fifth floors, numerals 1A to
15 5A respectively denote hall operation boards installed in
the halls of the first floor 1 to fifth floor 5, numerals
1A2 to 1A5 denote second to fifth floor destination buttons
provided on the operation board 1A in the hall of the first
floor, and numerals 2A1, 2A3, to 2A5, 3A1, 3A2, 3A4, 3A5,
20 4A1 to 4A3, 4A5, 5A1 to 5A4 respectively denote destination
buttons for the operation boards 2A to 5A in the halls of
the second to fifth floors (destination buttons for
corresponding floors such as, for example, a second floor
destination button for designating the second floor is not

provided in the hall operation board 2A), and which respectively generate destination button signals 1A2a to 1A5a, ... 3A1a, 3A2a, 3A4a, 3A5a... 5A1a to 5A4a (in Fig. 2) which become "H" when the destination buttons 1A2 to 1A5 for designating the second floor to the fifth floor by the operation board 1A in the hall of the first floor... the destination buttons 3A1, 3A2, 3A4, 3A5 for designating the first, second, fourth and fifth floors by the operation board 3A in the hall of the third floor... the destination buttons 5A1 to 5A4 for designating the first to fourth floors by the operation board 5A in the hall of the fifth floor are depressed. Reference numeral 6 denotes a known group supervisor, numerals 7A to 7C denote controllers for controlling cages 9A to 9C of elevator A to C, numeral 8A to 8C respectively denote winches of the cages 9A to 9C of the elevators A to C, numerals 10A to 10C respectively denote operation boards installed in the cages 9A to 9C, numerals 10A1 to 10A5, 10B1 to 10B5, 10C1 to 10C5 respectively denote cage buttons for registering cage calls to respective floors.

on the operation boards 10A to 10C in the cages. Activation of a cage button causes a high signal "H" to be generated for that cage button, thereby registering the cage call in the respective controller 7A to 7C. For example, a cage button signal 10A5a becomes "H" upon activation of the destination button 10A5 for the fifth floor of the elevator A as shown in Fig. 3. In Fig. 2, reference numerals 112 to 115 ... 131, 132, 134, 135... 151 to 154 respectively denote RS flip-flops (which are hereinafter referred to as "memories") which generate as outputs 112a to 115a... 131a, 132a, 134a,

135a...151a to 154a ^{respective} calling register signals

numerals

161U...163D, 163U...165D respectively denote OR gates, Y1U...
Y3D, Y3U...Y5D respectively denote the outputs of the OR gates
5 161U...163D, 163U...165D, and represent a first floor up calling
register signal...third floor down calling register signal,
third floor up calling register signal...fifth floor down
calling register signal, respectively. Reference numeral 17
denotes an assignment circuit for assigning calls to any
10 of the cages 9A to 9C when the calls are generated, which is
known as shown in Fig. 4 of Japanese Patent Application Laid-
open No. 55,847/1978. Reference numerals Y1UA to Y1UC...Y3DA
to Y3DC, Y3UA to Y3UC...Y5DA to Y5DC respectively denote
assignment signals which become "H" when the first up calling
15 signal Y1U...third down calling signal Y3D, third up calling
signal Y3U...fifth down calling signal Y5D are assigned to
the cages 9A to 9C, respectively, numerals 21A to 21C
respectively denote first floor cage position signal which
become "H" when the cages 9A to 9C have arrived at the first
20 floor 1, respectively, numeral 23A to 23C...25A to 25C
respectively denote similarly third floor...fifth floor cage
position signals, numerals 26A to 26C respectively denote
up direction signals which become "H" when the cages 9A to
9C move upwards, and numerals 27A to 27C respectively denote
25 down direction signals which become "H" when the cage 9A to
9C move downwards. In Fig. 3, reference numerals 28 to 31
respectively denote AND gates, numerals 32 to 35 respectively

denote OR gates, numerals 36 to 39 respectively denote AND gates, numeral 40 denotes an OR gate, numeral 41 denotes a memory similar to the above-described flip-flops, and numeral 41a denotes the output of the memory 41, ^{namely} the fifth floor cage call register signal of the cage 9A. In Fig. 2, reference numerals 42 to 47 denote AND gates, and numerals 48 to 51 denote OR gates, respectively.

The operation of this embodiment of the invention will be described hereinbelow.

Initially, it is assumed that the fifth floor destination button 3A5 of the operation board 3A in the hall of the third floor 3 is now depressed, i.e., a passenger who desires to go from the third floor 3 to the fifth floor 5 activates the button 3A5.

Since the fifth floor destination button signal 3A5a of the third floor thus becomes "H", the memory 135 is set as long as the output of the OR gate 50 is "L", i.e., as long as the cage travelling in the up direction does not arrive at the third floor. Accordingly, the fifth floor calling register signal 135a of the third floor on the output of the memory 135 becomes "H". Thus, the call is registered, and a call register lamp (not shown) contained in the destination button (3A5) is energized. Further, since the third up calling register signal Y3U on the output of the OR gate 163U becomes "H", the assignment circuit 17 allocates a cage to service the call. Assuming that this call is allocated to the car of the elevator A,

the third up calling assignment signal Y3UA of the elevator

A becomes "H". Thus, the memory 41 is set through the OR gate 34, the AND gate 38 and the OR gate 40, the fifth cage calling register signal 41a becomes "H", with the result
5 that a call register lamp (not shown) contained in the cage button 10A5 is energized. In other words, when a fifth floor destination call is registered on the third floor 3, the cage call to the fifth floor is substantially simultaneously registered ^{for the assigned cage} The controller
10 7A for the elevator A allows the winch 8A to run the cage 9A and to stop the cage 9A at the third floor 3 (omitted in the ^{illustrated} circuit). When the cage 9A arrives at the third floor 3 and is assigned in the up direction, both the cage position signal 23A and the up direction signal 26A are "H". Accordingly, the output of the OR gate 50 becomes "H" due to the output of the AND gate 42, the memory 135 is reset, the fifth calling register signal 135a of the third floor becomes "L", and the above-described call register lamp of the fifth floor destination button 3A5 at the third
20 floor is deenergized.

Since the cage call to the fifth floor is already registered, the cage 9A starts at the third floor 3 and runs to the fifth floor 5, and when the cage 9A has arrived at the fifth floor 5, the cage position signal 25A becomes "H".
25 Thus, the memory 41 is reset, the cage calling register signal 41a of the fifth floor becomes "L", and the above-described calling register lamp of the cage button 10A5 of the fifth floor is deenergized.

Now let us assume that the call for the fifth floor destination is assigned to the cage 9B when the fifth destination button 3A5 of the third floor is depressed. Since the third up calling assignment signal Y3UA is "L", the fifth cage calling register signal 41a of the cage 9A does not become "H", with the result that a cage call is not registered for elevator A. However, if the cage 9A is travelling in the up direction and has arrived at the third floor 3 earlier than the assigned cage 9B (due to a call at the third floor or the like), both the cage position signal 23A and the up direction signal 26A become "H" when the cage 9A has arrived at the third floor 3. Thus, the output of the AND gate 30 becomes "H". In this manner, the memory 41 is set through the OR gate 34, the AND gate 38 and the OR gate 40, the fifth cage calling register signal 41a of the cage 9A becomes "H", with the result that the cage call to the fifth floor is registered. At this time, the assignment of the cage 9B to the fifth floor due to the destination button 3A5 may be arranged to be cancelled.

It should be noted that, since the fifth calling register signal 135a of the third floor becomes "L" as soon as the cage arrives at the fifth floor, it is necessary to provide a time delay so that the signal 135a which is inputted to the AND gate 38 becomes "L" at a slight delay in an actual case, but since this circuit is already known, it is omitted from the description.

Cage buttons are provided in each cage so that, in the case where a passenger enters the cage when

another gets out and does not press a hall button, the passenger can still signal his required destination floor. When such a passenger rises in the case 9A without depression of the destination buttons 3A1, 3A2, 3A4, 3A5 and desires to register a cage call to the fifth floor, the cage button signal 10A5a becomes "H" when the passenger presses the cage button 10A5 of the fifth floor, the output of the OR gate 40 becomes "H", the memory 41 is set, and the cage calling register signal 41A becomes "H".

As described above, the cage call is immediately registered for the cage which is assigned to the call, thereby considering in advance the register in the later assignment, and the assignment thus becomes accurate.

In the embodiment described above, the circuits for the second floor 2 and the fourth floor 4 were omitted for the convenience of simplicity, and only the fifth floor cage calling register circuit of the cage 9A is shown in Fig. 3. However, the omitted circuits may be similarly constructed in the same manner.

In the embodiment described above, a cage call was registered at the assigning point in time for the cage that was assigned, and a cage call was registered at the cage arrival time for the cage that was not assigned.

Alternatively, the cage call may be registered when the cage is assigned or on detection of the fact that a cage approaching the desired floor in advance of the assigned cage is within a predetermined distance from the desired floor.

The present invention is not limited to the particular embodiment described above. For example, means may be provided for reducing disturbances due to prank calls. For example means may be provided for reducing disturbances due to prank calls. For example, if the probability of stopping the cage, due to the likelihood of prank calls, becomes higher than a predetermined value corresponding to the likely number of genuine calls, the cage call may be registered at the time when a passenger has entered the cage for certain, thereby avoiding disturbances due to prank hall calls. In the latter case, the cage call may be registered upon detection of the fact that light rays located at the periphery of the cage door are interrupted and that the load in the cage is increased. In summary, the cage calling may be registered at the point in time when the number of passengers who have entered the cage is substantially the same number as the passengers who have registered for destination floors in the hall.

In the embodiment described above, three cages 9A to 9C have been controlled under group supervision. However, the present invention is not limited to the particular number of the cages.

The actual time of registration may be different according to the running state of the cages. In embodiments of the invention, the actual registration of the required destination floor may, for example, be : a) immediately on assignment when a hall button is pressed; b) not at all owing to nobody entering the lift (determination of prank calls); c) when another cage arrives at the desired floor or within a predetermined distance from that floor; d) on determination of the fact that a passenger has entered the lift for certain; or e) on determination of the fact that the number of passengers who have entered the cage is substantially equal to the number who have registered for destination floors in the hall.

The "running state of the cages" is determined by whether there have been any prank calls, whether a light beam has been broken due to entry of a person into a cage, or whether another cage from the one initially assigned is to serve the passenger and the required destination floor.

CLAIMS

1. An apparatus for operating a plurality of elevator cages for serving a plurality of floors on the basis of calls under group supervision comprising:

(a) a plurality of hall buttons provided in the hall of each of a plurality of floors to be served by the cages, wherein the hall buttons are operative for signalling the presence of a call, for one of the cages, at the floor of respective hall buttons, and the hall buttons are operative also for signalling a required destination floor;

(b) a plurality of destination buttons provided within each of the elevators for signalling a required destination floor;

(c) assignment means for receiving signals generated by the operation of the hall buttons for assigning each call in the hall to a selected one of the plurality of cages; and

(d) registering means for registering the required destination floor: (i) in response to a signal from one of the destination buttons; and (ii) in response to a signal from the assignment means; wherein the actual time(s) of registering the required destination floor is (are) determined according to the running state of the cages.



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2. An apparatus for operating a plurality of cages as set forth in claim 1, wherein the registering means is operative for registering the required destination floor in response to arrival, at a floor awaiting arrival of the assigned cage, of a non-assigned cage.

3. An apparatus for operating a plurality of cages as set forth in claim 2, wherein the registering means is operative for cancelling the registered required destination floor from the assigned cage, when the non-assigned cage arrives before the assigned cage at, or within a predetermined distance of, the floor at which a hall button has been operated.

4. An apparatus for operating a plurality of cages as set forth in claim 2 or claim 3, wherein the registration of the required destination floor is conditional upon a passenger entering the assigned or the non-assigned cage at the floor at which the hall button has been operated.

5. An apparatus for operating a plurality of cages as set forth in any one of the preceding claims, including a gating circuit to control the feeding to said assignment means of signals generated by the hall buttons.



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6. Apparatus for operating elevators, substantially as herein described with reference to the accompanying drawings.
