

PATENT SPECIFICATION

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(54) CALL REGISTERING SYSTEM FOR AN ELEVATOR CAR

(71) We, HITACHI, LTD., a corporation organised under the laws of Japan of 5-1, 1-chome, Marunouchi, Chiyoda-Ku, Tokyo, Japan, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to an improved call registering system for an elevator car.

Elevator cars are moved upward and downward in response to calls originated by passengers. For this purpose, means for originating up and down hall calls are provided at individual floor landings of a building so that an elevator car moving in a direction desired by a passenger waiting at one of the floors can be moved to arrive at this specific floor. Means for originating car calls are further provided on a call originating board in each individual elevator car so that a passenger in the elevator car can designate his target floor. Push button switches are generally employed as these call originating means, and touch switches are also partly employed as such means.

When a call is originated by a passenger, this call must be registered in a control system in order that an elevator car can be driven in response to the call. Further, it is necessary to inform the passenger of the fact that the call has been registered.

In a prior art call registering system for an elevator car, one set of up hall call registering means and one set of down hall call registering means are provided for each of the floors intermediate between the uppermost floor and the lowermost floor so as to register an up hall call and a down hall call originated from the corresponding intermediate floor, and one set of car call registering means is provided for each intermediate floor so as to register a car call designating the corresponding intermediate floor. Therefore, three sets of call registering means are required for each of the intermediate floors, and two sets of call registering means are re-

quired for each of the uppermost and lowermost floors.

Relays or memory elements are generally employed as such call registering means. It is strongly demanded to reduce the number of the call registering means for reducing the cost as well as the space occupied by the control board.

Consider now the operation of an elevator car driven in response to hall calls. When the elevator car is moving upward, the elevator car stops at successive floors from which up hall calls are originated and registered, while when the elevator car is moving downward, it stops at successive floors from which down hall calls are originated and registered. On the other hand, the elevator car must also stop at successive floors designated by car calls registered therein regardless of the moving direction thereof.

Discussing the operation of the elevator car from another point of view, it can be said that a car call originated in the elevator car to designate a specific floor is the same as an up hall call originated from the same specific floor when the elevator car is moving upward, and such car call is the same as a down hall call originated from the same specific floor when the elevator car is moving downward.

It is therefore an important feature of the present invention that, when a car call is originated in an elevator car to designate a floor, such car call is registered in means shared by a hall call originated from the corresponding floor. Such car call may be registered in means shared by an up hall call or a down hall call depending on whether the elevator car is moving upward or downward.

In accordance with the present invention, there is provided a call registering system for an elevator car servicing a plurality of service floor landings comprising means disposed at the landing of each floor for originating up or down hall calls, means disposed in said elevator car for originating car calls designating target floors, first call registering means

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shared by said car calls and up hall calls originated from the corresponding target floors in an upward motion of said elevator car, and second call registering means shared by said car calls and down hall calls originated from the corresponding target floor in a downward motion of said elevator car.

The present invention is advantageous in that all the car calls originated in an elevator car, which moves in one direction or the other in response to calls, can be registered in means shared by corresponding hall calls and such hall calls can be registered in lieu of the car calls.

Therefore there is provided an improved call registering system in which the number of call registering means is greatly reduced so as to attain a reduction in both the cost and in the space occupied by the control board.

The method of control for the elevator car is preferably such that the elevator car returns automatically to a predetermined dispatching terminal when there are entirely no calls. According to this method, the elevator car has a tendency to move in one direction or the other at the floors except the dispatching terminal so that the shared registration of the hall calls and the car calls can be fairly attained. When the elevator car stands still at the dispatching terminal, a car call cannot be originated in the elevator car until a passenger manipulates the push button for originating an up or a down hall call and the door of the elevator car is opened to allow entry of the passenger into the elevator car. In other words, a car call can be originated after the elevator car is instructed to move in one direction by the hall call. Thus, in this case too, the car call can have shared registration with the hall call originated from the corresponding floor located in the moving direction of the elevator car.

Further, in the case in which such a car call is originated in the elevator car standing still at the dispatching terminal without tending to move in any direction, this car call can have shared registration with a corresponding up hall call when the target floor designated by the car call lies above the dispatching terminal, while the car call can have shared registration with a corresponding down hall call when the target floor designated by the car call lies beneath the dispatching terminal.

Therefore, the elevator car can be controlled in the usual manner in spite of the reduction of the number of call registering means to about 1/3 of the number required in the prior art system, and the cost can be remarkably reduced.

An embodiment of the present invention will now be described by way of example with reference to the accompanying drawing, in which the sole figure is an electrical circuit diagram of a call registering system for an

elevator car embodying the present invention.

In the figure, the following symbols are used to denote various parts in the system:

P1, P2: Positive d.c. power supply terminals

N: Negative d.c. power supply terminal

U2: Relay for registering up hall call originated from 2nd floor

D2: Relay for registering down hall call originated from 2nd floor

UB1: Relay for registering up hall call originated from 1st basement floor

DB1: Relay for registering down hall call originated from 1st basement floor

H2U: Up hall call button disposed at 2nd floor landing for originating up hall call

H2D: Down hall call button disposed at 2nd floor landing for originating down hall call

C2: Car call button disposed in elevator car for originating car call demanding stoppage of elevator car at 2nd floor

HB1U: Up hall call button disposed at 1st basement floor landing for originating up hall call

HB1D: Down hall call button disposed at first basement floor landing for originating down hall call

CB1: Car call button disposed in elevator car for originating car call demanding stoppage of elevator car at 1st basement floor

F2_{u1}, F2_{u2}: Contacts opened in response to stoppage of elevator car at 2nd floor

FB1_{u1}, FB1_{u2}: Contacts opened in response to stoppage of elevator car at 1st basement floor

L2U: Lamp disposed at 2nd floor landing to indicate registration of up hall call originated from 2nd floor

L2D: Lamp disposed at 2nd floor landing to indicate registration of down hall call originated from 2nd floor

L2C: Lamp disposed in elevator car to indicate registration of car call demanding stoppage of elevator car at 2nd floor

LB1U: Lamp disposed at 1st basement floor landing to indicate registration of up hall call originated from 1st basement floor

LB1D: Lamp disposed at 1st basement floor landing to indicate registration of down hall call originated from 1st basement floor

LB1C: Lamp disposed in elevator car to indicate registration of car call demanding stoppage of elevator car at 1st basement floor

DN: Transfer contact of down relay

UP: Transfer contact of up relay

R1—R6: Diodes

W1—W8: Wires in tower for connecting a control board located in a machine room and having contacts such as contact F2_{u1} to hall call buttons disposed on each floor landing

TC1—TC4: Tail cords, that is trailing wires in the hoistway.

The figure shows only the call registering circuit portions corresponding to the 2nd floor and 1st basement floor of a building.

Suppose that the up hall call button H2U is depressed by a passenger at the 2nd floor landing. Then, the up hall call registering relay U2 corresponding to the 2nd floor is energized by the circuit which is traced from P1 — U2 — F2_{u1} — W1 — H2U — W2 to N, and this relay U2 holds itself by the circuit which is traced from P1 — U2 — F2_{u1} — U2_a to N. As a result of the energization and self-holding of the relay U2, an elevator car moving upward toward the 2nd floor is called to stop at the 2nd floor by the operation of a control circuit (not shown). Further, in response to the depression of the push button H2U, the up hall call registration indicating lamp L2U is lit at the 2nd floor landing by the circuit which is traced from P2 — W3 — L2U — R1 — H2U — W2 to N. Then, the circuit which is traced from P2 — W3 — L2U — R1 — W1 — U2_a to N is immediately established to maintain the lamp L2U in the energized state even after the passenger releases his finger from the push button H2U, so that the passenger can be informed of the fact that the up hall call originated from the 2nd floor has been registered.

The transfer contact DN is closed at the contact b since the elevator car is moving upward. Thus, the car call registration indicating lamp L2C in the elevator car is also energized by the circuit which is traced from P2 — TC3 — L2C — R3 — TC1 — DN(b) — U2_a to N. Therefore, passengers in the elevator car can be informed of the fact that the elevator car is instructed to stop at the 2nd floor, and those who want to be conveyed to the 2nd floor can know that such car call need not be originated anew.

As soon as the elevator car moving upward arrives at the 2nd floor, the contact F2_{u1} is opened to de-energize the relay U2. As a result, the contact U2_a of the relay U2 is opened and the lamps L2U and L2C belonging to the call registering circuit portion corresponding to the 2nd floor are de-energized from the energized state.

Suppose then that the elevator car is moving downward and the push button H2D is depressed by a passenger at the 2nd floor landing to originate a down hall call from the 2nd floor. In this case, the down hall call registering relay D2 corresponding to the 2nd floor is energized by the circuit which is traced from P1 — D2 — F2_{d1} — W4 — H2D — W2 to N, and this relay D2 holds itself. Therefore, the elevator car moving downward is instructed to stop at the 2nd floor, and the down hall call registration indicating lamp L2D is lit at the 2nd floor landing by the circuit which is traced from P2 — W3 — L2D — R2 — W4 — D2_a

to N. The transfer contact DN is closed at the contact a since the elevator car is moving downward. Thus, the car call registration indicating lamp L2C in the elevator car is also energized by the circuit which is traced from P2 — TC3 — L2C — R3 — TC1 — DN(a) — D2_a to N.

The call registering system above described is not substantially different from the prior art one except that the car call registration indicating lamps in the elevator car are energized in response to the depression of the corresponding hall call buttons.

The operation of the call registering system of the present invention will be described with reference to the case in which the car call button C2 in the elevator car is depressed by a passenger who wants to be conveyed to the 2nd floor when the elevator car is moving upward or downward.

When the car call button C2 is depressed in the elevator car which is moving upward, the up hall call registering relay U2 is energized by the circuit which is traced from P1 — U2 — F2_{u1} — DN(b) — TC1 — C2 — TC2 to N. In other words, the car call C2 originated in the elevator car by a passenger who wants to be conveyed to the 2nd floor has registration shared with the up hall call H2U originated from the 2nd floor and the relay U2 is energized when the elevator car is moving upward. As a result of the energization of the relay U2, the up hall call registration indicating lamp L2U is lit at the 2nd floor landing and the car call registration indicating lamp L2C in the elevator car informing stoppage of the elevator car at the 2nd floor is also lit in the manner above described.

When the elevator car is moving downward, the transfer contact DN is closed at the contact a, and the down hall call registering relay D2 corresponding to the 2nd floor is energized by the circuit which is traced from P1 — D2 — F2_{d1} — DN(a) — TC1 — C2 — TC2 to N. In other words, the car call C2 originated in the elevator car by a passenger who wants to be conveyed to the 2nd floor has registration shared with the down hall call H2D originated from the 2nd floor and the relay D2 is energized. In this case too, the down hall call registration indicating lamp L2D is lit at the 2nd floor landing and the car call registration indicating lamp L2C in the elevator car informing stoppage of the elevator car at the 2nd floor is also lit.

It will thus be seen that only two sets of call registering means are required for each of the intermediate floors so that all the calls can be registered without any trouble.

The lower half of the figure shows the call registering circuit portion corresponding to the 1st basement floor, and this call registering circuit portion operates in entirely the same manner as the call registering circuit portion

corresponding to the 2nd floor when the elevator car is moving in either direction.

When the elevator car is not moving in either direction, that is, when there are entirely no calls and the elevator car stands still at one of the floors, car calls are registered in a manner as described below.

There are two general methods for the control of an elevator car. According to one of the methods, the elevator car is returned automatically to a predetermined dispatching terminal (for example, the lobby floor) when no calls exist. According to the other method, the elevator car stops and stands by at one of the floors when calls disappear after the movement of the elevator car to this floor. The present invention is especially suitable for the former case and will be described hereinafter with reference to the former control method.

The call registering circuit portion corresponding to the 2nd floor includes the transfer contact DN of the relay which is energized when the elevator car is moving downward, and the call registering circuit portion corresponding to the 1st basement floor includes the transfer contact UP of the relay which is energized when the elevator car is moving upward, so that the car calls C2 and CB1 can have registration shared by the corresponding up or down hall calls.

Thus, the transfer contacts DN and UP in the respective call registering circuit portions are closed at the contacts DN(b), UP(b) when the elevator has no instruction to move in either direction. Therefore, the car call C2 originated in the elevator car by a passenger who wants to be conveyed to the 2nd floor has registration shared by the up hall call originated from the 2nd floor, while the car call CB1 originated in the elevator car by a passenger who wants to be conveyed to the 1st basement floor has registration shared by the down hall call originated from the 1st basement floor. Thus, the elevator car standing by at the dispatching terminal is instructed properly to move upward in the former case or downward in the latter case.

In other words, a car call has registration shared by a corresponding up hall call in the call registering circuit portions associated with the floors lying above the dispatching terminal, while a car call has registration shared by a corresponding down hall call in the call registering circuit portions associated with the floors lying beneath the dispatching terminal. In this manner, a car call originated in the elevator car, which stands by the dispatching terminal and is thus not moving in either direction, can also be properly dealt with.

It will thus be understood that the present invention is economical over the prior art call registering system in that the number of call registering means can be considerably reduced. Especially, the space occupied by the

control board can be considerably reduced due to the fact that the number of relays is smaller than hitherto.

In the embodiment of the present invention, the power source P1—N supplying power to the call registering means and the power source P2—N supplying power to the call registration indicating lamps are connected in common to the negative terminal N, and the registering means U2a, D2a, UB1a and DB1a are used in common for the registration of hall calls and the registration indication. Thus, the number of wires W1 to W8 in the tower and the number of tail cords TC1 to TC4 can also be greatly reduced.

WHAT WE CLAIM IS:—

1. A call registering system for an elevator car servicing a plurality of service floor landings comprising means disposed at the landing of each floor for originating up or down hall calls, means disposed in said elevator car for originating car calls designating target floors, first call registering means shared by said car calls and up hall calls originated from the corresponding target floors in an upward motion of said elevator car, and second call registering means shared by said car calls and down hall calls originated from the corresponding target floor in a downward motion of said elevator car.
2. A system as claimed in Claim 1, further comprising means for holding said elevator car at a specific floor when said elevator car has no call to respond thereto, wherein the car calls designating the upper target floors above said specific floor and up hall calls originated from the corresponding target floors are registered in common when said elevator car has no directivity, and the car calls designating the lower target floors below said specific floor and down hall calls originated from the corresponding target floors are registered in common when said elevator car has no directivity.
3. A call registering system for an elevator car according to Claim 2, wherein said registration means are relay means.
4. A system as claimed in Claim 1, wherein said registering means include self-holding means, and there are further provided a first power source for supplying power to said registering means, registration indicating lamps for indicating registration of the corresponding hall calls, a second power source for supplying power to said registration indicating lamps, said second power source being connected at one terminal thereof in common to one terminal of said first power source, and circuit means for supplying power to said registration indicating lamps through said self-holding means.
5. A call registering system as claimed in Claim 3, wherein diodes are provided for preventing flow of current from one of said power sources to the other to deal with the

corresponding to the 2nd floor when the elevator car is moving in either direction.

When the elevator car is not moving in either direction, that is, when there are entirely no calls and the elevator car stands still at one of the floors, car calls are registered in a manner as described below.

There are two general methods for the control of an elevator car. According to one of the methods, the elevator car is returned automatically to a predetermined dispatching terminal (for example, the lobby floor) when no calls exist. According to the other method, the elevator car stops and stands by at one of the floors when calls disappear after the movement of the elevator car to this floor. The present invention is especially suitable for the former case and will be described hereinafter with reference to the former control method.

The call registering circuit portion corresponding to the 2nd floor includes the transfer contact DN of the relay which is energized when the elevator car is moving downward, and the call registering circuit portion corresponding to the 1st basement floor includes the transfer contact UP of the relay which is energized when the elevator car is moving upward, so that the car calls C2 and CB1 can have registration shared by the corresponding up or down hall calls.

Thus, the transfer contacts DN and UP in the respective call registering circuit portions are closed at the contacts DN(b), UP(b) when the elevator has no instruction to move in either direction. Therefore, the car call C2 originated in the elevator car by a passenger who wants to be conveyed to the 2nd floor has registration shared by the up hall call originated from the 2nd floor, while the car call CB1 originated in the elevator car by a passenger who wants to be conveyed to the 1st basement floor has registration shared by the down hall call originated from the 1st basement floor. Thus, the elevator car standing by at the dispatching terminal is instructed properly to move upward in the former case or downward in the latter case.

In other words, a car call has registration shared by a corresponding up hall call in the call registering circuit portions associated with the floors lying above the dispatching terminal, while a car call has registration shared by a corresponding down hall call in the call registering circuit portions associated with the floors lying beneath the dispatching terminal. In this manner, a car call originated in the elevator car, which stands by the dispatching terminal and is thus not moving in either direction, can also be properly dealt with.

It will thus be understood that the present invention is economical over the prior art call registering system in that the number of call registering means can be considerably reduced. Especially, the space occupied by the

control board can be considerably reduced due to the fact that the number of relays is smaller than hitherto.

In the embodiment of the present invention, the power source P1—N supplying power to the call registering means and the power source P2—N supplying power to the call registration indicating lamps are connected in common to the negative terminal N, and the registering means U2a, D2a, UB1a and DB1a are used in common for the registration of hall calls and the registration indication. Thus, the number of wires W1 to W8 in the tower and the number of tail cords TC1 to TC4 can also be greatly reduced.

WHAT WE CLAIM IS:—

1. A call registering system for an elevator car servicing a plurality of service floor landings comprising means disposed at the landing of each floor for originating up or down hall calls, means disposed in said elevator car for originating car calls designating target floors, first call registering means shared by said car calls and up hall calls originated from the corresponding target floors in an upward motion of said elevator car, and second call registering means shared by said car calls and down hall calls originated from the corresponding target floor in a downward motion of said elevator car.

2. A system as claimed in Claim 1, further comprising means for holding said elevator car at a specific floor when said elevator car has no call to respond thereto, wherein the car calls designating the upper target floors above said specific floor and up hall calls originated from the corresponding target floors are registered in common when said elevator car has no directivity, and the car calls designating the lower target floors below said specific floor and down hall calls originated from the corresponding target floors are registered in common when said elevator car has no directivity.

3. A call registering system for an elevator car according to Claim 2, wherein said registration means are relay means.

4. A system as claimed in Claim 1, wherein said registering means, include self-holding means, and there are further provided a first power source for supplying power to said registering means, registration indicating lamps for indicating registration of the corresponding hall calls, a second power source for supplying power to said registration indicating lamps, said second power source being connected at one terminal thereof in common to one terminal of said first power source, and circuit means for supplying power to said registration indicating lamps through said self-holding means.

5. A call registering system as claimed in Claim 3, wherein diodes are provided for preventing flow of current from one of said power sources to the other to deal with the





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difference between the voltage of said first power source and that of said second power source.

- 5 6. A call registering system for an elevator car substantially as herein described with reference to the accompanying drawings.

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