March 26, 1968 L. W. PORT 3,374,864

ELEVATOR CONTROL WHEREIN CAR DESTINATION IS REGISTERED BY SAME SWITCH WHICH REGISTERS CAR CALL

Filed Feb. 6, 1964 6 Sheets-Sheet 1

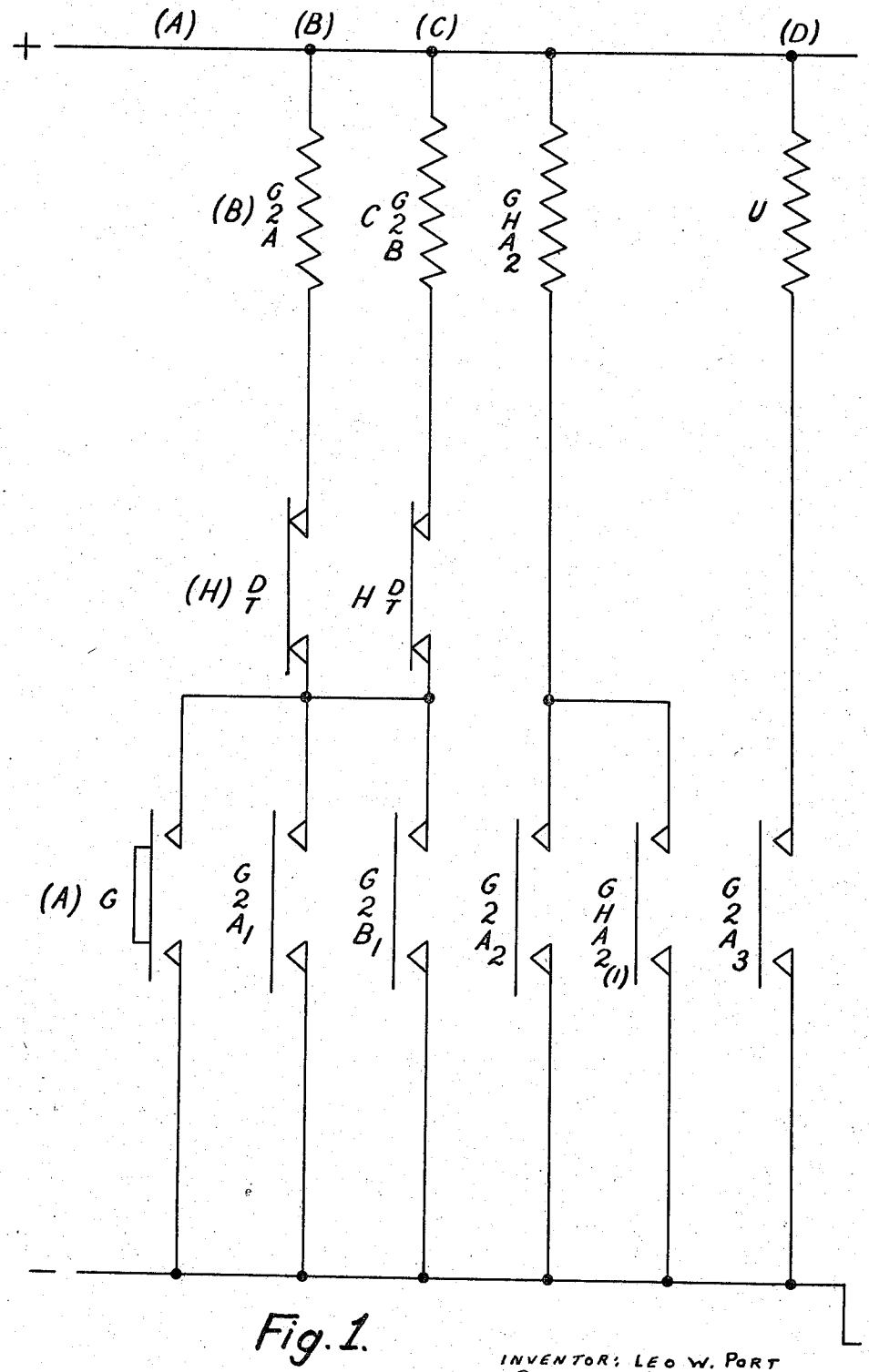



Fig. 1.

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Filed Feb. 6, 1964 6 Sheets-Sheet 2

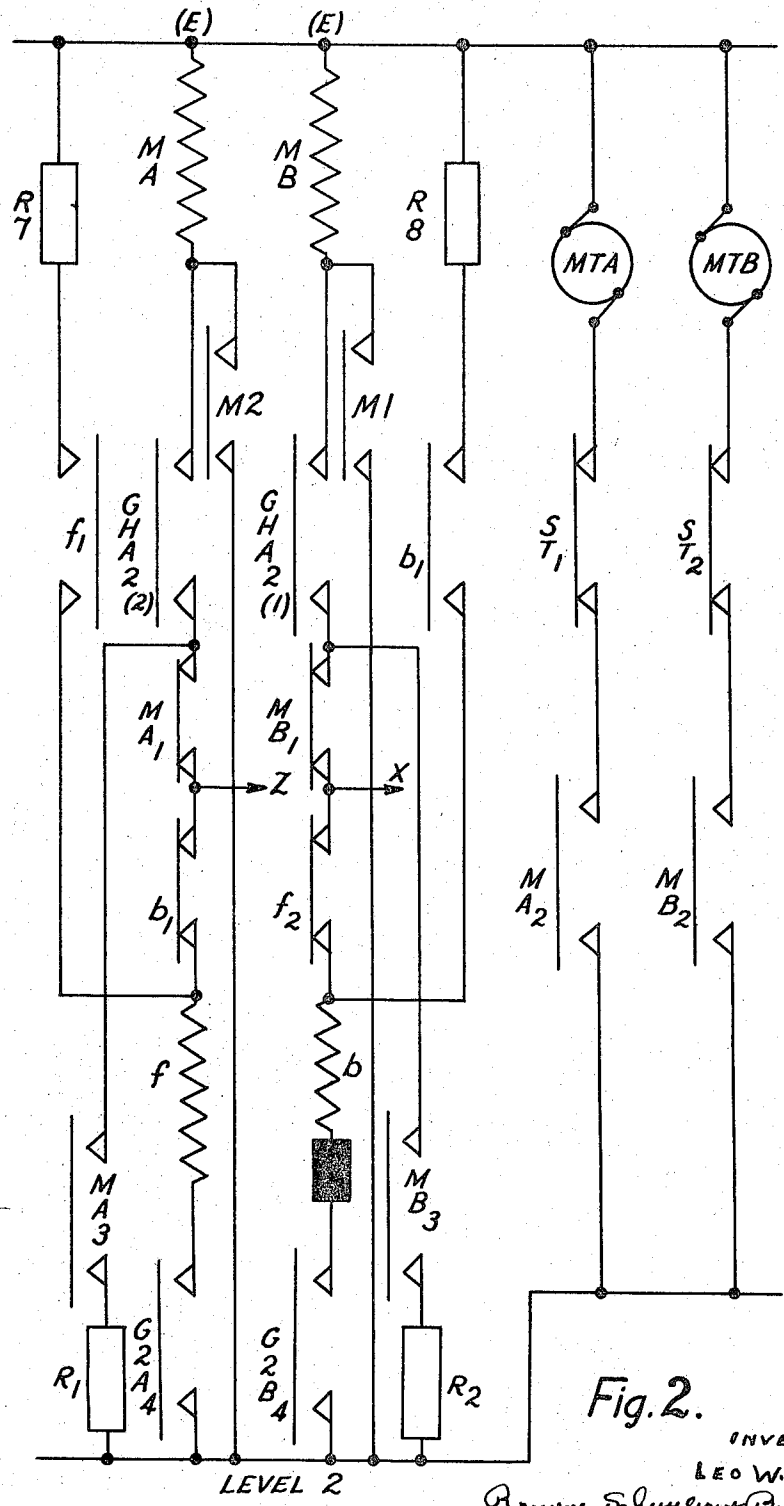



Fig. 2.

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Filed Feb. 6, 1964 6 Sheets-Sheet 3

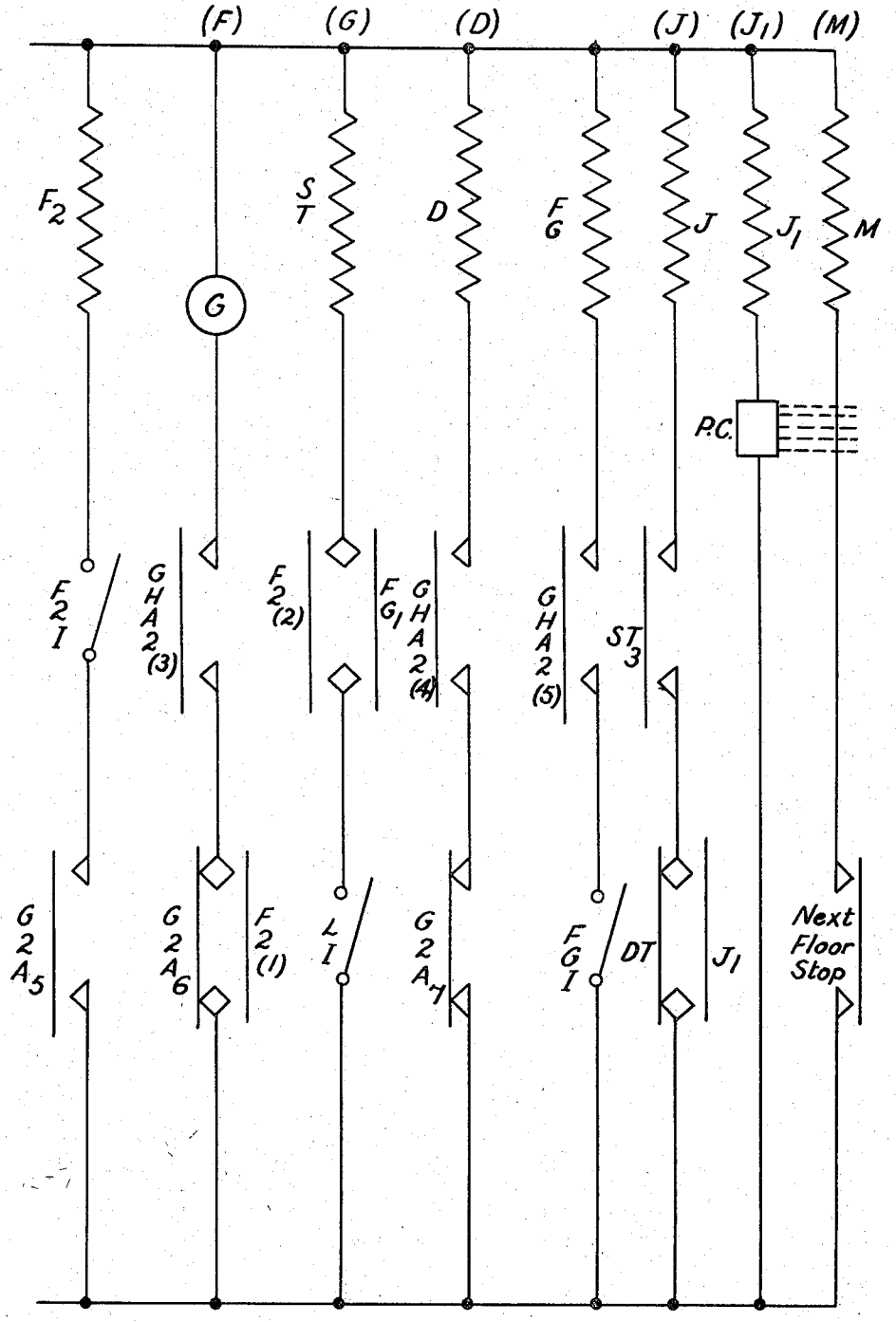



Fig. 3.

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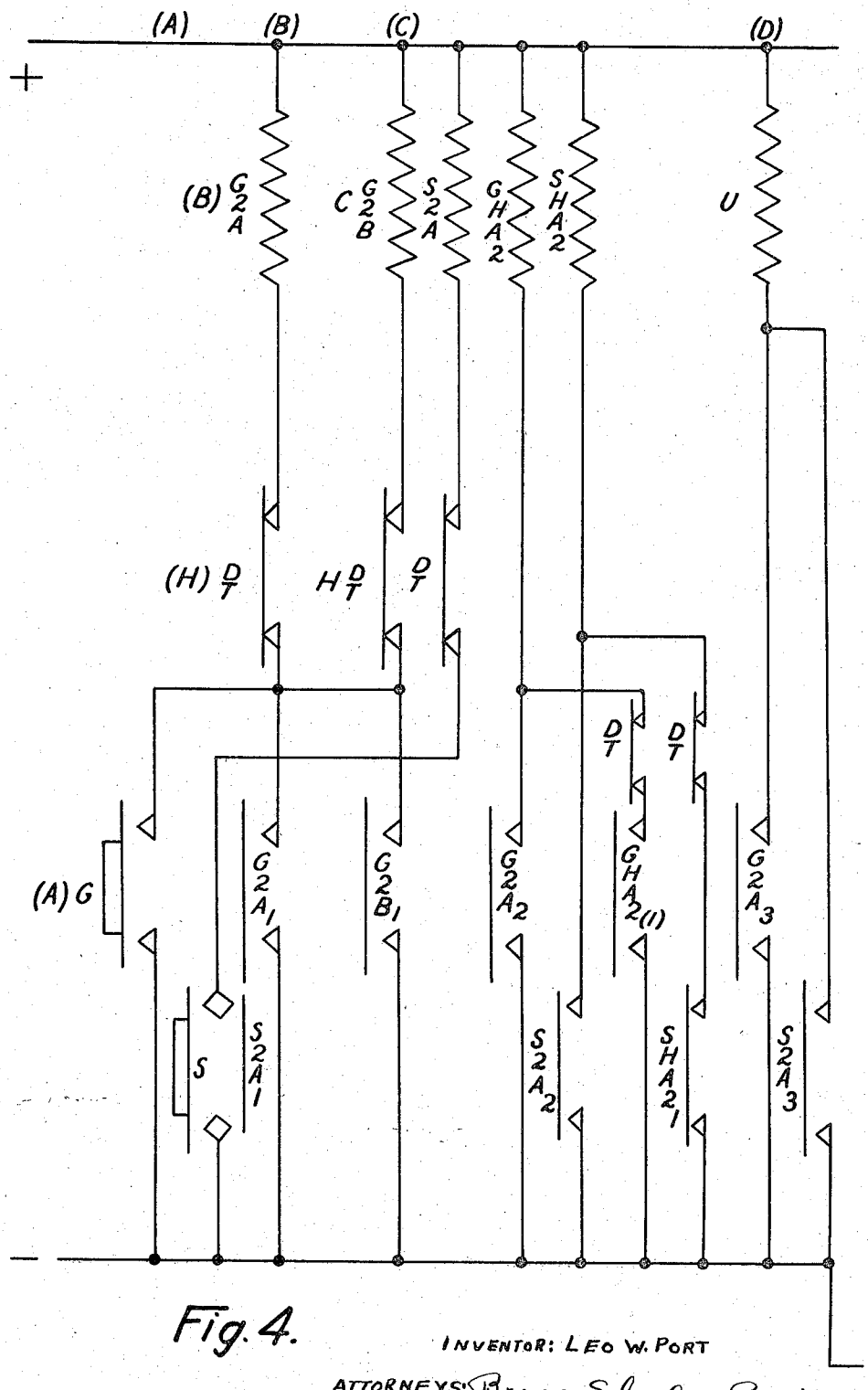



Fig. 4.

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ELEVATOR CONTROL WHEREIN CAR DESTINATION IS REGISTERED BY SAME SWITCH WHICH REGISTERS CAR CALL

Filed Feb. 6, 1964 6 Sheets-Sheet 5

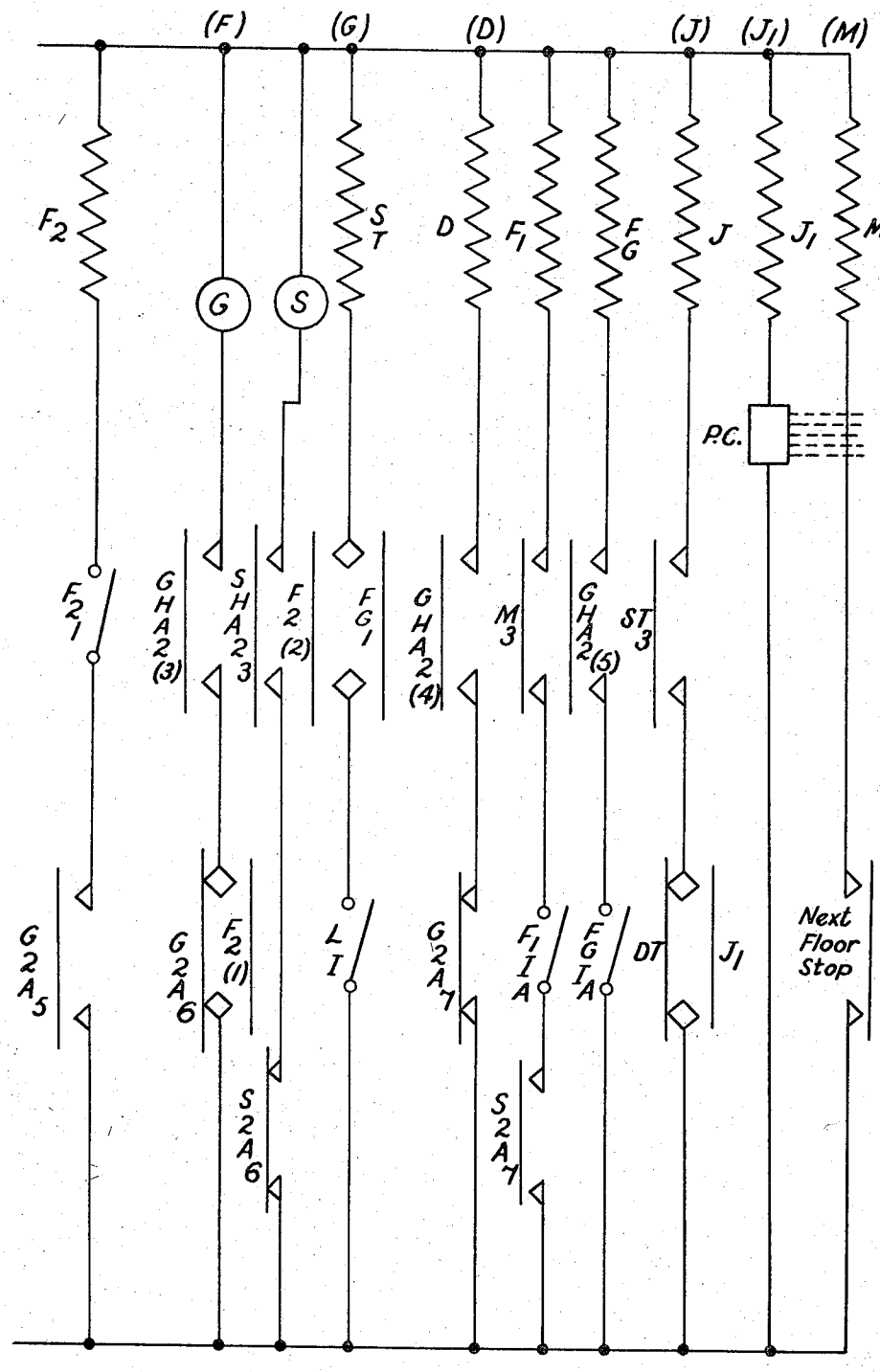



Fig. 5.

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ELEVATOR CONTROL WHEREIN CAR DESTINATION IS REGISTERED BY SAME SWITCH WHICH REGISTERS CAR CALL

Filed Feb. 6, 1964 6 Sheets-Sheet 6

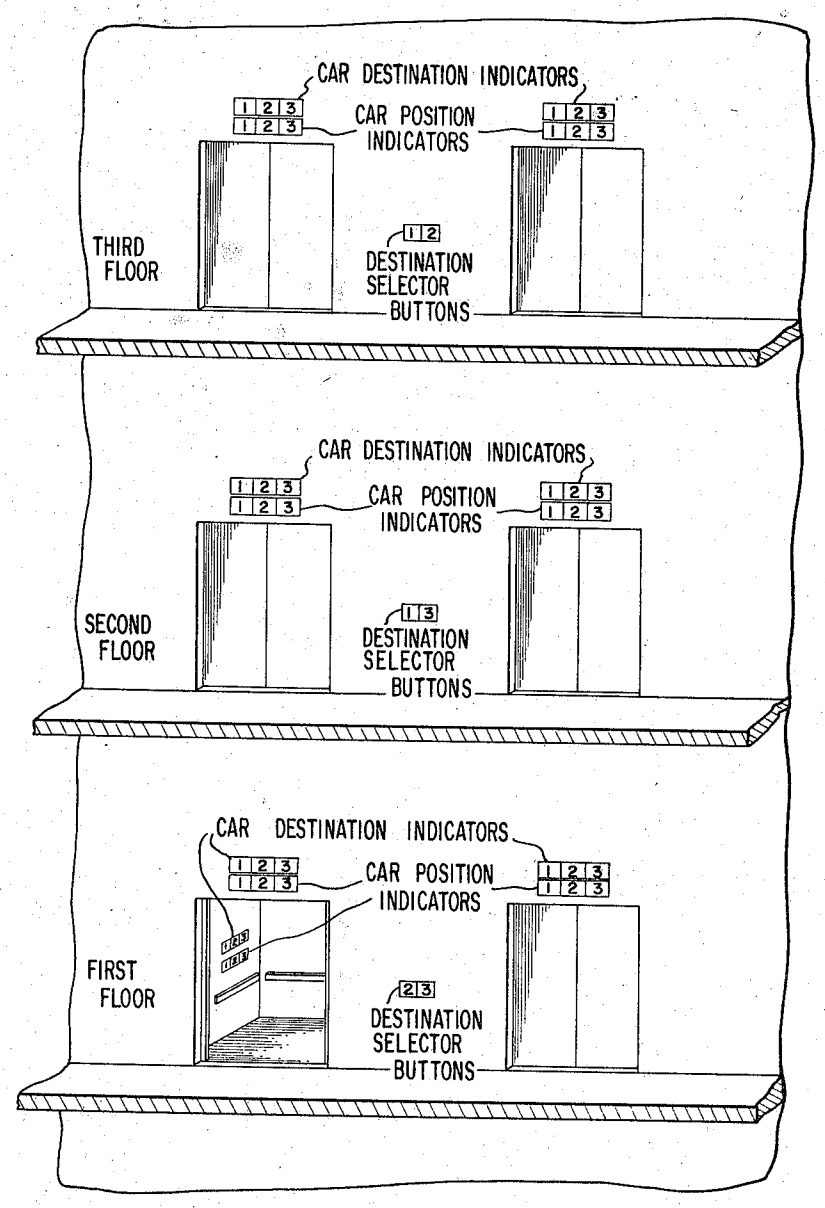



FIG. 6

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United States Patent Office 3,374,864 Patented Mar. 26, 1968



3,374,864

# ELEVATOR CONTROL WHEREIN CAR DESTINATION IS REGISTERED BY SAME SWITCH WHICH REGISTERS CAR CALL

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4 Claims. (Cl. 187—29)

This invention relates to automatic passenger elevators for buildings and the like.

It is known to employ automatic passenger elevators which are operated in the following manner:

A passenger waiting to board an elevator presses a call button provided at a landing to call an elevator car to that landing. Generally two call buttons are provided and the intending passenger presses one or the other depending upon whether he wishes to travel up or down. When a car halts at the landing its doors open and the passenger steps inside to find an array of floor selector buttons, one of which must be pushed to select the floor to which the passenger desires to travel.

The foregoing operating procedure suffers from the following disadvantages:

(a) It is quite common for people either to press the wrong call button or to press both buttons, and in either case the elevator service is slowed down to a great extent because cars stop unnecessarily.

(b) Frequently the elevator commences to move in response, for example, to the operation of a call button on another floor by some other intending passenger before the passenger entering the elevator presses one of the floor selector buttons. This may take the first-mentioned passenger in the wrong direction, and leads to a feeling of insecurity sufficient for some people to avoid automatic elevators altogether.

(c) If a number of passengers enter the car together each may have to press a different floor selector button and there is some confusion which tends to slow down the elevator traffic. Also passengers tend to congregate around the selector button panel and so not make the best use of the car floor area.

(d) The elevator system control equipment receives no indication of the destination of passengers before they enter the cars. A car may therefore stop to pick up a passenger wishing to travel in the same direction as the elevator is travelling before stopping although it might be more sufficient for another car to do this particular job because the second car may already be set to stop at the traveller's destination.

It is an object of the present invention to overcome or at least ameliorate the above indicated disadvantages of conventional elevator systems.

This object is achieved by the provision of control equipment which allows the elevator system to be operated in the following manner: An array of floor selector buttons is provided at each landing outside the elevator entrance, and an intending passenger presses the button corresponding to the floor to which he desires to travel. This signal is registered by the control equipment and the car halts at the floor to allow the passenger to board it and then travels automatically to the selected floor without further action on the part of the passenger. In preferred forms of the invention floor selector panels as indicated above are associated with various indicating signs to indicate to waiting passengers the floors to which the elevator is travelling so that the passenger may determine whether he should enter a particular elevator car or wait for another. These destination signs may be mounted above or near the doors at each landing and include numbers or words which are illuminated and which indicate the floors at which the car will stop. Preferably also there



is provided inside the car a conventional indicator or set of indicators to show the passengers which floor the car has reached.

An elevator system according to the invention in one of its aspects comprises at least two elevator cars each serving at least three floors; an array of floor selector buttons adjacent to the car landings at each floor, there being at least one such array for every floor; and circuit devices which are pre-set by operation of the respective selector buttons and which then control the car driving motors in such a way as to cause a car to halt, at the floor at which a selector button was operated, long enough for the passenger to enter and then to travel to the selected floor.

To enable a particular embodiment of the invention to be more readily understood it will now be described with reference to the accompanying drawings which illustrate a portion of the control equipment of a simple two-car, three-floor elevator system according to the invention.

In the accompanying drawings, FIGS. 1, 2 and 3 and FIGS. 4, 2 and 5 respectively are intended to be arranged from left to right in that order, in the manner of two separate flow sheets. FIG. 6 shows the general exterior appearance of a three floor elevator system constructed in accordance with this invention. The references shown generally in the drawings are defined as follows:

G—Ground floor destination button, level 2
G2A—Ground floor destination relay, level 2, Lift A
G2B—Ground floor destination relay, level 2, lift B
DT—Door trip contacts, level 2
G2A(1)—G2A(7), contacts on G2A relay
G2B(1)—Hold contact of relay G2B
GHA2—Destination relay, level 2 to ground
GHA2(1)–GHA2(5)—Contacts of relay GHA2
U—Up direction relay
MA—Lift motor A control relay
MB—lift motor B control relay
MA(1)–MA(3)—Contacts of relay MA
MB(1)–MB(3)—Contacts of relay MB
*f*—Selection relay for motor MTA
*b*—Selection relay for motor MTB
R1, R2, R7, R8—Hold resistances for relays
*f*1, *f*2—Contacts of relay *f*
*b*1, *b*2—Contacts of relay *b*
MTA—motor driving elevator A
MTB—Motor driving elevator B
F2—Level 2 floor relay
F2(1), F2(2)—Contacts of relay F2
G'—"Ground floor" indicator, landing 2
ST—Elevator stop relay
L1—Elevator inductor
D—Down direction relay
FG—Ground floor relay
FG1—Ground floor inductor
FG(1)—Contact of relay FG
ST1—Stop relay contact for elevator A
ST2—Stop relay contact for elevator B
J—Door motor relay
J1—Ph. cell relay
M—Next floor stop

The significance of other references shown in the drawings will be apparent from the description which follows.

Referring now to FIGS. 1, 2 and 3, which show the elevator motors and motor controls and the circuit devices associated with the top floor or level 2 of the elevator system, and assuming that both elevators are at rest and a passenger on level 2 desires to travel to the ground floor, it will be seen that if a passenger presses floor selector button G at level 2, this energises relays G2A and G2B. Selection relay *f* operates first (the other selection relay *b* being deliberately made slower in operation) on circuit for elevator motor MTA and the drawing shows from this

point onwards only the essential control circuits for MTA. The operation of *f* isolates motor MTB from this particular destination call. Motor MTB is available for calls from other floors which may be registered and these calls would connect at point X on the drawing causing the same sequence of operation as that described for the call on motor MTA.

Relay G2A closes contacts G2A(1), G2A(2), G2A(3), G2A(4) and G2A(5) and opens contacts G2A(6) and G2A(7).

Destination relay GHA2 is energized by G2A(2) contacts closing and is held by GHA2(1) contacts when G2A(2) contacts open.

G2A(3) contacts close the up direction relay contacts thus energising relay U and setting the motor MTA for up direction of rotation.

G2A(4) and GHA2(2) close and MTA motor contacts MA(2) are closed by relay MA. Relay MA closes (because selection relay *f* acts before the companion *b* and this isolates the slower relay circuit at contacts *f*2.

Relay MA is isolated from other calls which may come from other floors at point Z by the opening of contacts MA(1). MA is held by contacts MA(3) through resistance R1 to the negative pole of the power supply.

Selection relay *f* is held by the closing of contacts *f*1 through resistance R7 to positive supply.

The motor MTA moves the elevator upward to level 2 until it reaches floor relay F(2) which has been preset by contacts G2A5. When the elevator reaches level 2 inductor F2I closes and energises floor relay F2.

F2(1) closes the ground floor indication circuit and shows, before the doors open, that the elevator is going to the ground floor. This circuit has been preset by the contacts GHA2(3) of the destination relay GHA2.

F2 also pre-sets stop relay ST by the closing of contacts F2(2) and a final stop is made by the closing of elevator inductor L1 when the elevator arrives.

When the doors close, F2(1) contacts open, but G2A(6) contacts close when the button relay G2A is cancelled by the door trip on closing of the doors thus sustaining the destination sign G and opening all normally open contacts of relay G2A.

When G2A relay is cancelled by door trip DT down relay D is energised by G2A(7), the circuit having been pre-set by contacts GHA2(4).

The normally closed contacts STI close and the motor is energised, causing the car to move in the down direction.

When it arrives at the ground floor the inductor closes floor relay FG which had been pre-set by relay GHA2 and the FG(1) contacts of FG relay close and stop the car.

When the doors reclose, thus opening the door trip contacts (not shown), at the ground floor, this movement is completed and all circuits, including GHA2 and its contacts, return to normal unless other calls are registered.

If the passenger had wished to travel to level 1, the corresponding floor selection button (not shown) would have been pushed and different but analogous circuit devices would thereby be pre-set to allow the car operated inductors to control the elevator motions accordingly.

Referring now to FIGS. 4, 2 and 5, these figures show sufficient of the circuit diagram of the control equipment to illustrate its operation in the case of an intermediate call when the elevator is already under call from another floor. For example, it is assumed that a call from floor 2 by a passenger desiring to go to the ground floor has been registered, and another person on floor 1 pushes the button on that level which indicates his desire to travel to floor 2 before the elevator has reached floor 1 on the upward journey.

In these circumstances the lift motor MA would have started the elevator in the upward direction and when button S is then pressed, relay S2A is closed and held by contact S2A1. Contacts S2A2 thus close the circuit through destination relay SHA2 which is held by contacts



SHA2/1. Contacts S2A3 also close but are not needed because contacts G2A3 have already energised and held the up direction relay. Contacts S2A7 close and thus set floor relay F1 which is finally energised by elevator inductor F1IA and the elevator stops at the first floor to pick up the passenger. When the doors close the door trip cancels S2A contacts on floor 1 and the normally closed contacts of this relay energise destination relay SHA2 and the elevator proceeds to floor 2. On arrival at floor 2 the doors open and on cancellation of contacts G2A destination relay GHA2, already pre-set by the first call, is energised by normally closed contacts of relay G2A and the elevator reverses and travels to the ground floor to answer the original call.

If on the contrary the elevator had passed the 1st floor when the 1st floor button was pressed, elevator A would not be affected and the call would be taken by the other elevator if free to respond.

If no elevator is available at the moment of pressing the floor button this call is held by the contacts of the corresponding button relay, for example S2A1, until the call is answered.

The last mentioned operation will now be described with reference to the motors and motor controls:

Assuming that both elevators are at rest and a passenger on floor 2 desires to travel to the ground floor, the passenger presses floor selector button G at level 2, and this energises relays G2A and G2B. Selection relay *f* operates first (the other selection relay *b* being deliberately made slower in operation) on circuit for elevator motor MTA and FIGS. 4, 2 and 5 shown from this point onwards only the essential control circuits for MTA. The operation of *f* isolates motor MTB from this particular destination cell. Motor MTB is available for calls from other floors which may be registered and these calls would connect at point X on the drawings causing the same sequence of operation as that described for the call on motor MTA.

Relay G2A closes contacts G2A(1), G2A(2), G2A(3), G2A(4) and G2A(5) and opens contacts G2A(6) and G2A(7).

Destination relay GHA2 is energised by G2A(2) contacts closing and is held by GHA2(1) contacts when G2A(2) contacts open.

G2A(3) contacts close the up direction relay contacts thus energising relay U and setting the motor MTA for up direction of rotation.

G2A(4) and GHA2(2) close and MTA motor contacts MA(2) are closed by relay MA. Relay MA closes (because selection relay *f* acts before the companion *b*) and this isolates the slower relay circuit at contacts *f*2.

Relay MA is isolated from other calls which may come from other floors at point Z by the opening of contacts MA(1). MA is held by contacts MA(3) through resistance RI to negative of the supply.

Selection relay *f* is held by the closing of contacts *f*1 through resistance R7 to positive supply.

The motor MTA moves the elevator upward to level 2 until it reaches floor relay F(2) which has been preset by contacts G2A5. When the elevator reaches level 2 inductor F2I closes and energises floor relay F2.

F2(1) closes the ground floor indication circuit and shows that the elevator is going to the ground floor before the doors open. This circuit has been pre-set by the contacts GHA2(3) of the destination relay GHA2. F2 also pre-sets stop relay ST by the closing of contacts F2(2) and final stop is made by the closing of elevator inductor LI when the elevator arrives. When the doors close F2(1) contacts open but G2A(6) contacts close when the button relay G2A is cancelled by the door trip on closing of the doors thus sustaining the destination sign G and opening all normally open contacts of relay G2A.

When G2A relay is cancelled by door trip DT down relay D is energised by G2A(7), the circuit having been pre-set by contacts GHA2(4).

The normally closed contacts STI close and the motor is energised, the car then moves in the down direction. When it arrives at ground floor the inductor closes floor relay FG which had been pre-set by relay GHA2. FG(1) contacts of FG relay close and stop the car.

When the doors reclose thus opening the door trip contacts at the ground floor (not shown), this movement is completed and all circuits, including GHA2 and its contacts, return to normal unless other calls are registered.

If the passenger had wished to travel to level 1, the corresponding floor selection button (not shown) would have been pushed and different but analagous circuit devices would thereby be pre-set to allow the car operated inductors to control the elevator motions accordingly.

It will be appreciated that the above description with reference to the drawings indicates only the equipment required to ensure operation of an elevator system in the manner envisaged by the present invention. In practical lift systems incorporating the invention other equipment would be included such as "next floor stop buttons" within each car to enable a passenger to stop the car at a floor other than that which he initially selected if he should have changed his mind since entering the car. Floor indicators may be provided inside the car to show which floor it is at, at any instant. The car doors would be provided with safety buffers and other conventional devices to control their opening and closing movements at each floor and, of course, conventional emergency stop equipment, alarm equipment, overload protection and emergency telephone facilities could also be provided.

Various modifications of the present invention are envisaged. For example, a computer may be employed, to which a signal may be fed each time a floor selector button is operated. In accordance with the pre-determined traffic patterns the computer would then select the most efficient car movements to shift the passengers in the manner required. Under these circumstances, in large installations, passengers would simply press a button to indicate the floor to which they intend to travel and then stand back, scruntinise the various car destination indicators, and simply select a car travelling to the desired floor in a manner analogous to the way passengers at a railway station select an electric train which happens to be travelling to another station to which they wish to travel. In other words the operation of such an elevator installation (insofar as the traveller is concerned) would be indistinguishable from that normally used in other forms of public transport, but instead of running to pre-determined time tables the elevators would run to a time table determined by and under continual modification by the beforementioned computer.

I claim:

1. In an elevator system comprising at least two elevator cars each serving at least three floors, an array of floor selector buttons adjacent to the car landings at each floor, circuit means which are pre-set by operation of any one of said floor selector buttons, said circuit means being adapted, after pre-setting, to control the driving motors of the elevator cars so as to control one of said elevator cars to halt at a floor at which a floor selector button was operated, and to remain there for a time sufficient to enable a passenger to enter said car, and then



to control said car to travel to the selected destination floor and means located in each of said elevator cars for indicating the destination of that car and means located at each of said floors for indicating the destination of each elevator car.

2. In an elevator system comprising at least two elevator cars each serving at least three floors, an array of floor selector buttons adjacent to the car landings at each floor, circuit means which are preset by operation of any one of said floor selector buttons, said circuit means being adapted, after presetting to control the driving motors of the elevator cars so as to control one of said elevator cars to halt at a floor at which a floor selector button was operated, and to remain therefor a time sufficient to enable a passenger to enter said car, and then to control said car to travel to the selected destination floor, means within each of said elevator cars for indicating the position of that car, and means located at each of said floors for indicating the positions of each of said elevator cars.

3. In an elevator system serving a plurality of floors,

a plurality of initiating circuit means, one of said circuit means located at each floor served by the elevator system,

first circuit means operable to control an elevator to travel to a loading floor, said first circuit means operative in response to actuation of one of said initiating circuit means located on said loading floor,

second circuit means operable to control an elevator to travel to a destination floor after said elevator first traveled to said loading floor under the control of said first circuit means, said second circuit means operative in response to the same actuation of said initiating circuit means as was said first circuit means,

means associated with said initiating circuitry means for indicating at each of said floors and in each elevator car the position of said car.

4. In an elevator system serving a plurality of floors,

a plurality of initiating circuit means, one of said circuit means located at each floor served by the elevator system,

first circuit means operable to control an elevator to travel to a loading floor, said first circuit means operative in response to actuation of one of said initiating circuit means located on said loading floor,

second circuit means operable to control an elevator to travel to a destination floor after said elevator first traveled to said loading floor under the control of said first circuit means, said second circuit means operative in response to the same actuation of said initiating circuit means as was said first circuit means,

means associated with said initiating circuit means for indicating at each of said floors and in each elevator car the destination of said car.

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