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ELEVATOR CAR CALL CANCELLING CIRCUIT WHICH
COUNTS CALLS AND COMPARES WITH LOAD

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2 Sheets-Sheet 1

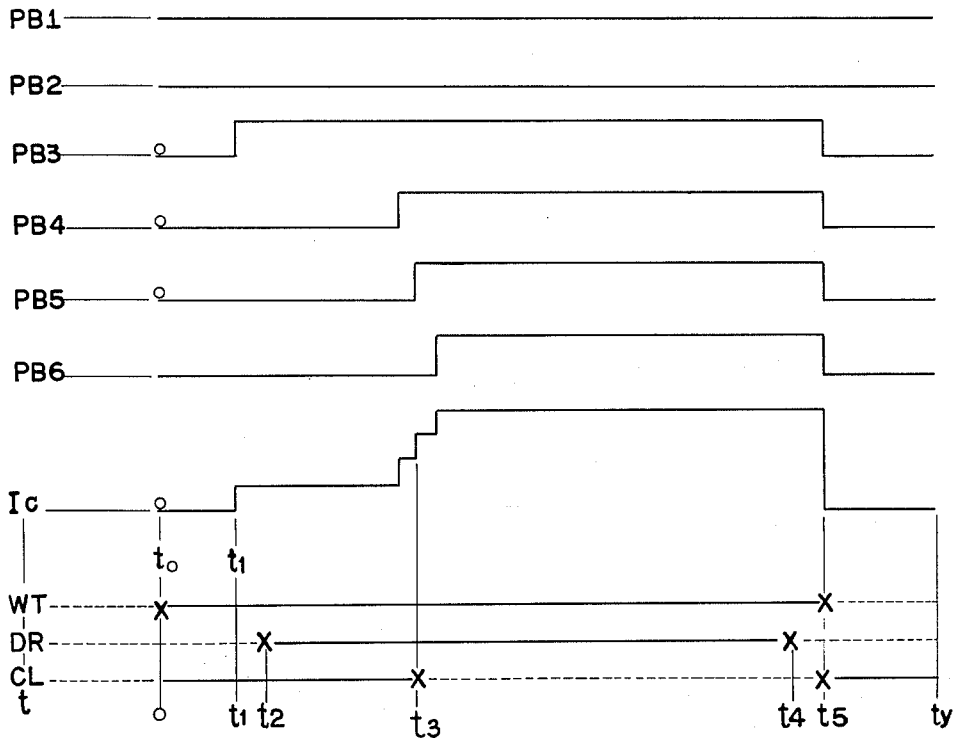
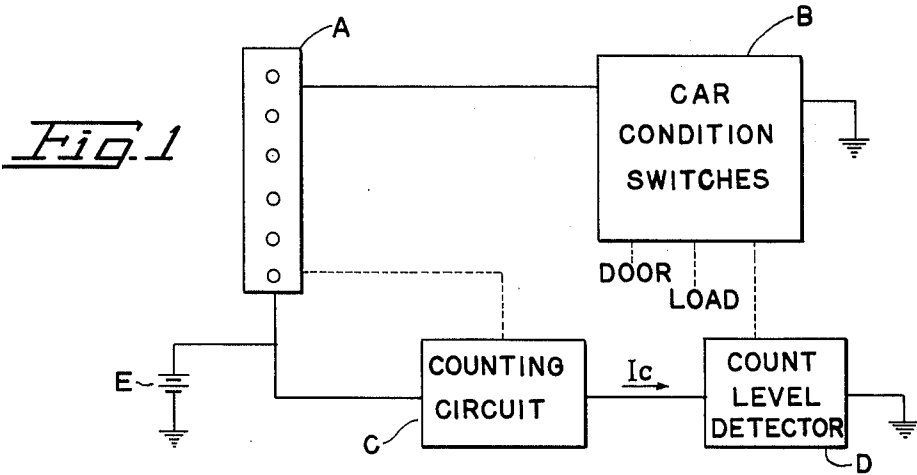


Fig. 3

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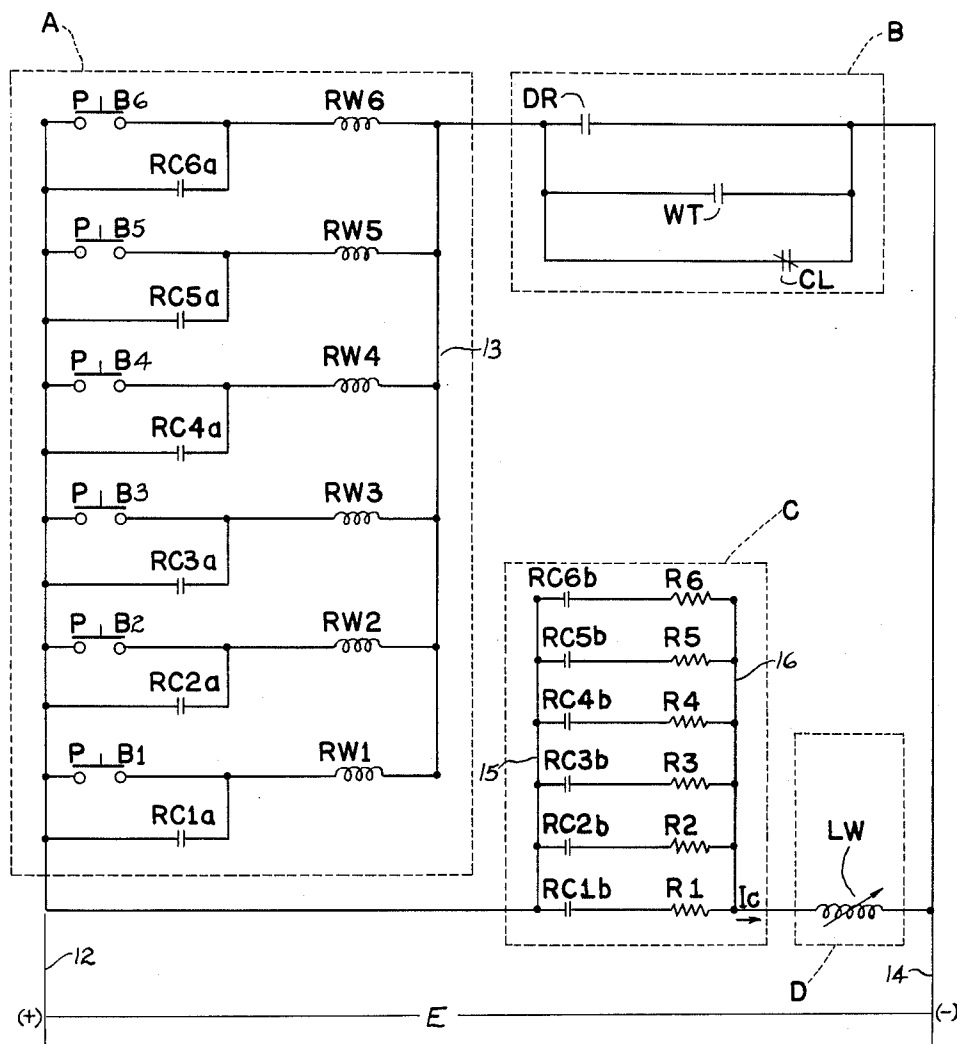


Fig. 2

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ELEVATOR CAR CALL CANCELLING CIRCUIT WHICH COUNTS CALLS AND COMPARES WITH LOAD

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1 Claim. (Cl. 187—29)

This invention relates to a system for overriding the in-car floor selection circuit when a predetermined set of car conditions exist.

The modern automatic selfoperated elevator has become a source of amusement for certain irresponsible individuals. When leaving the elevator they have the habit of pushing the entire row of floor call buttons thereby requiring the unoccupied elevator to cycle through the entire set of calls before it can be used again. Unnecessary delay, waste of power, and wear and tear on the equipment are the results of this action.

This invention provides an overriding circuit which will release erroneous floor selections from the in-car elevator floor selector when certain predetermined conditions exist. By sensing both car load weight and the number of floors selected, the floor selections will be released if a predetermined illogical relationship exists between car load weight and number of floors selected.

A feature and advantage of this invention resides in the fact that if a plurality of the call buttons are pushed either accidentally or intentionally while the elevator is in operation these calls will not be released from the circuit until the car door opens at the first selected floor.

Another feature and advantage of this invention resides in the fact that erroneously selected floors will be released from the circuit as soon as the car load drops below a minimum level whether the floors were erroneously selected with a full load in the car or not.

Another object of this invention is to provide an in-car, floor selector overriding network which is independent of the out-of-car floor selector system whereby a multiplicity of calls from within the car are erased when certain predetermined conditions exist and the out-of-car calls remain unaffected.

A feature and advantage of this device resides in the fact that the predetermined conditions can be varied to suit a variety of conditions.

Other objects and advantages of this invention will become apparent upon reading the detailed description and accompanying drawings in which:

FIGURE 1 is a block diagram of the selector switch overriding circuit.

FIGURE 2 is a schematic diagram of the block diagram of FIGURE 1.

FIGURE 3 is a timing chart showing the inter-relationship of the electrical signals of individual elements.

As illustrated in FIGURE 1 there is provided in-car floor selector switch A connected to one terminal of power source E. Car condition switch circuit B is connected in series between floor car selector switch and the common terminal of power source E. Another series circuit including floor selection counting circuit C and count level detector D is also connected between the terminals of power source E. Floor selector A is mechanically coupled to counting circuit C whereby the level of signal I_c is related to the number of floors selected. Count level detector D is actuated when a predetermined count is reached thus transmitting existence of a predetermined condition to car condition switches B. Elevator door and load condition switches are also included in the car condition switches B so that the circuit between selector A and

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common is broken only when the car door is open, the car load is below a pre-set level and a given number of floors are selected.

As illustrated in FIGURE 2 the floor selector circuit A includes a parallel array of push button selector and holding relay circuits connected between a power line 12 and common lead 13. Each individual push button PB1 through PB6 is connected in series with the windings of one circuit holding relay RW1 to RW6 respectively. One of circuit holding relay switch contact sets RC1a through RC6a is connected in parallel with each push button whereby actuation of the respective relay windings RW1 through RW6 will close the contact points and shunt the individual push buttons. The selected windings RW1 and RW6 thus remains energized through this shunt path after the push button is released. Thus, the total count of selected floors is stored within the selector circuit A until released.

Car condition switches B are connected between common lead 13 of floor selector A and power source terminal 14. Three sets of switch contacts —DR, WT and CL—are included within switch circuit B. Each of these sets of contacts is connected in parallel with one another so that a closed circuit path is provided between floor selector A and common terminal 14 when any one of the switch contact sets is closed. Switch contact set DR is connected to a car door position indicating mechanism which will open the contacts points when the door opens and close them when the door closes. Switch contact set WT is coupled to a car load weight sensing mechanism (not shown) wherein the normally open contact points are closed only when a predetermined lower weight limit is exceeded. The third set of normally closed switch contacts CL form a part of the count level detector circuit to be explained.

The floor call counting circuit C includes a parallel series of selectably switched resistors R1 through R6 connected at one end through lead 15 to power source terminal 12. Relay contact sets RC1b through RC6b are mechanically coupled to and actuated by the relay windings RW1 through RW6 respectively of floor selector A. Although these contact sets are shown separately, it should be understood that they may be included as part of relay contacts RC1a through RC6a of floor selector A.

Under normal, car-at-rest operating conditions, all of the relay contacts RC1b through RC6b are open, thereby preventing current flow through the current sensitive relay windings LW. When a floor is selected by a push button, that set of relay contacts RC1b to RC6b associated with the respective hold relay winding RW1 to RW6 will be moved from the normally open condition to the closed condition, thereby completing the circuit path through that selected resistor R1 to R6. In accordance with Ohm's law the current I_c through counting circuit C is inversely proportional to the equivalent resistance:

$$(1) \quad I_c = \frac{E}{R_E}$$

By switching additional resistors in parallel with another they are added inversely to one another thereby decreasing the equivalent resistance in accordance with the following formula:

$$(2) \quad R_E = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \dots + \frac{1}{R_6}}$$

Since the voltage of power source E is constant, the decrease in resistance allows a greater current I_c to flow through circuit C. Upon sufficient resistors being connected in parallel, a large enough current I_c flows through

output lead 16 whereby count level detector D is energized.

Count level detector D is connected between the output lead 16 of counting circuit C and power source common terminal 14. Detector D comprises a current level sensitive relay including relay windings LW connected between output lead 16 of counting circuit C and power source common terminal 14. Winding LW is of any conventional design of the type which can be preset to operate only when a predetermined current level is exceeded. When sufficient current I_c passes through winding LW, it is energized, thereby opening the mechanically connected contact point CL located with car condition switches B. Contact points CL of relay LW are normally closed and located in parallel circuit relationship with the other car condition switches of circuit D, as previously explained. As a result, contact set CL opens only when a predetermined number of floors are selected.

In accordance with the schematic diagram of FIGURE 2 and the timing chart of FIGURE 3, push buttons PB1 through PB6 can be pushed in any random order. Say, for instance, that a delivery boy enters the car at floor 1 and, at time t_1 , pushes button PB3 to signal a stop at floor 3. His weight is sufficient to actuate the car load detector mechanism and close contact points WT thereby closing the circuit between the power source terminal 14. As the elevator starts the car door closes thereby actuating the door condition mechanism closing, at time t_2 , normally-open contact point set DR in car condition circuit B.

In traveling between floors the passenger may intentionally or accidentally select other floors subsequent to his stop. As each additional push button PB4 through PB6 is pushed, current I_c increases in a staircase step function. As previously explained, count level detector D windings LW are set for energization only when current I_c from counting circuit C exceeds the level for two resistors in parallel, for example. That is, at least three buttons have to be pushed. Energized windings LW then open associated normally closed, count level switch contact points CL in car condition switch circuit B at time t_3 by means of mechanical linkage.

Upon arriving at floor 3 the door opens at time t_4 thereby opening door condition switch contacts DR. As the passenger steps out of the car at time t_5 , the load decreases below that level necessary to maintain contact points WT in the closed position. Since all three sets of contact points are now in the open position, the circuit between floor selector switch A and common terminal 14 of the power source E is open. This causes release of hold relay windings RW4 through RW6—thus erasing the stored floor selection information from floor selector circuit A.

As hold relays RW4 through RW6 are released from the circuit, associated switch contacts RC4b through RC6b are opened. This removes the resistors R4 through R6 from the circuit, thereby decreasing current I_c . Upon current I_c decreasing, current level detector windings LW deenergize. Thus contact CL of car condition switches B again closes preparing the circuit for subsequent use.

A lightweight passenger can operate the elevator even if contact load sensing points WT do not close since normally closed count level detector contact points CL provide a circuit path for selector A.

It should be noted that the door condition switch contacts DR are closed during operation of the elevator. This insures that a person will not erase his floor selection if he inadvertently leans against the buttons during operation. If this feature was not provided, it would be possible for him to become stranded between floors without realizing what has happened. Instead, when the car

door does open, floor selector circuit A is released to erase the erroneous calls.

The mechanism can be adjusted to counteract a variety of other prevalent passenger problems such as, for instance, children using the elevator as a play toy. By pre-setting the car load mechanism to close the contact points WT only when the elevator load exceeds fifty or seventy-five pounds the system will be effective with small children. The preset current level detector D operates when current I_c from counting circuit C is greater than that for two buttons pushed. It can be seen that a small child can only push two floors at a time while riding. If the child attempts to push more than two floors the entire selection circuit will be deenergized when the elevator car opens at the first stop. As a further deterrent, count level detector D could be preset lower and energized if two buttons were pushed, thereby limiting the child's ride to one floor call.

It should be understood that this invention in its broader aspects is not limited to specific examples herein illustrated and described, and that the following claim is designed to cover all changes and modifications within the true spirit and scope of the invention.

What is claimed:

A system for cancelling in-car floor selections when a predetermined set of conditions exists comprising:

- (a) a floor selector circuit including a plurality of selection switches connected in parallel between a first power source terminal and a common lead, each said selection switch including in a series connection a push button and relay winding,
- (b) a floor selection counting circuit connected to said floor selector circuit including a plurality of resistors each adapted to be selectively connected in parallel with one another and to the first power source terminal in response to separate station selections, said resistors being operable to vary the current through said counting circuit,
- (c) a car condition switching circuit connected in circuit between said station selector circuit common lead and a second power terminal, including first and second sets of normally open switch contacts and a third set of normally closed switch contacts each set connected in parallel with the other sets, said first set of contacts being adapted to close when the car contains at least a predetermined load, and said second set of contacts being adapted to close when the elevator door closes,
- (d) and a count level selector including a relay having winding connected in series circuit between said resistors of said floor selection counting circuit and the second power source terminal, and an armature mechanically coupled to said third set of switch contacts, said relay windings being preset to be energized when a current limit is exceeded, to open said third set of switch contacts

whereby the circuit between said floor selector and the second power source terminal is open when all three car condition switches are open.

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