United States Patent

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[72] Inventor **Gordon P. Sprague**
Toledo, Ohio

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[73] Assignee **Reliance Electric Company**
Euclid, Ohio
a corporation of Delaware

[54] **ELEVATOR FALSE CAR CALL CANCELLATION CONTROL**
7 Claims, 2 Drawing Figs.

[52] **U.S. Cl.** **187/29**
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[50] **Field of Search** 187/29

[56] **References Cited**
UNITED STATES PATENTS

2,776,733	1/1957	Drexler	187/29
2,779,438	1/1957	Thurston	187/29
3,219,151	11/1965	Henker	187/29

Primary Examiner—Chris L. Rader
Assistant Examiner—W. E. Duncanson, Jr.
Attorney—Wilson & Fraser

ABSTRACT: False car call registrations as by the registration of successive calls at a rapid rate by sweeping a hand across the array of call buttons in a car operating panel are sensed as a rate at which the calls are registered exceeding a preset level. When such rate is sensed, the car calls are automatically canceled.

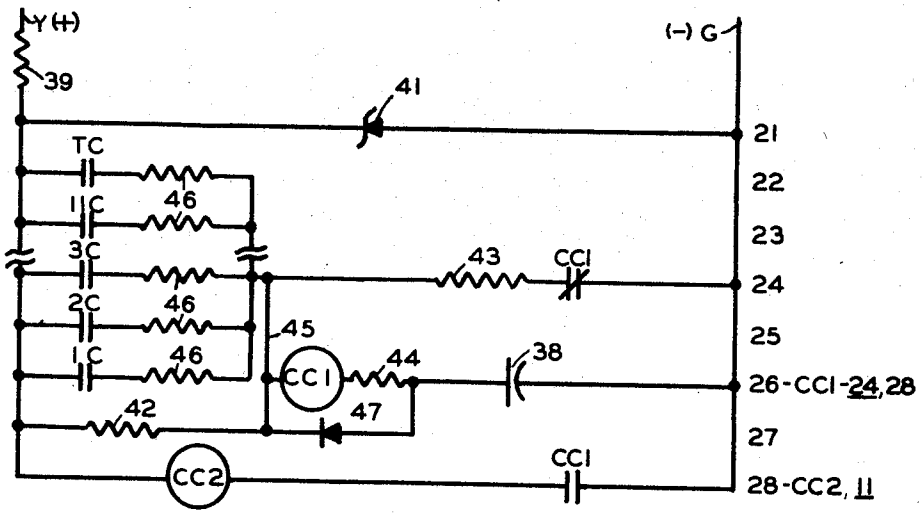


FIG. 1

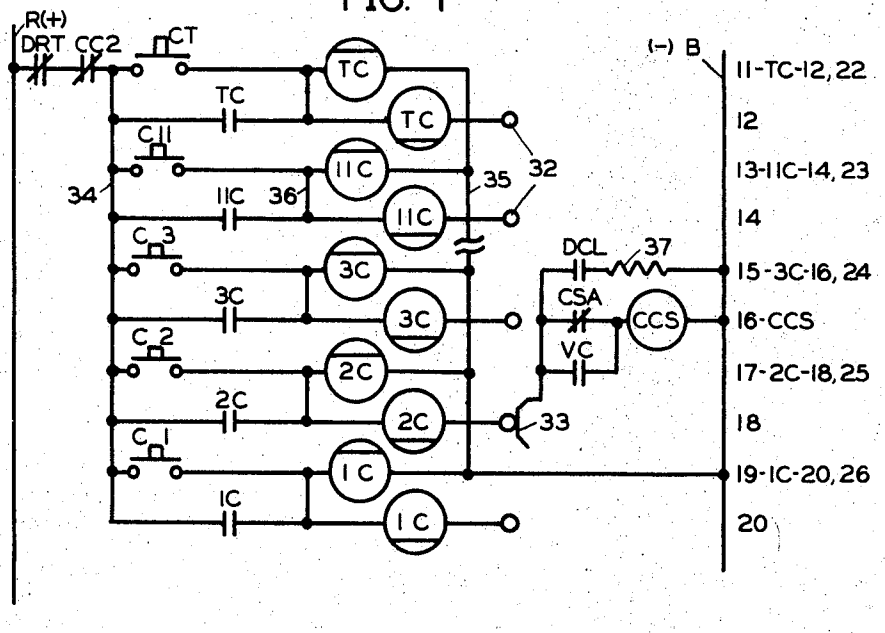
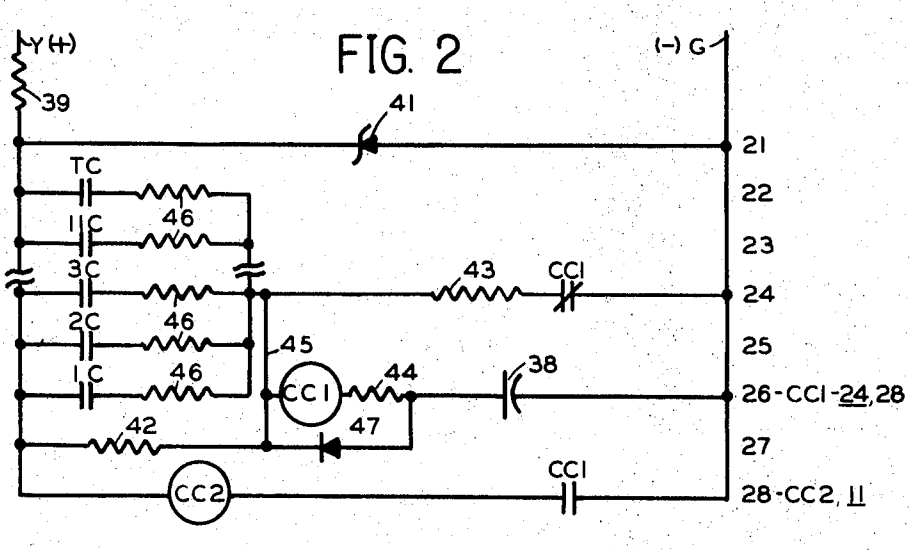


FIG. 2



INVENTOR.
GORDON P. SPRAGUE

BY
Wilson & Fraser
ATTORNEYS

ELEVATOR FALSE CAR CALL CANCELLATION CONTROL

BACKGROUND OF THE INVENTION

This invention relates to elevator controls and more particularly to controls for assessing the validity of call registrations at a station where a plurality of calls can be registered.

Heretofore it has been recognized that elevator service is frequently impeded by falsely registered calls. In Ernest B. Thurston patent 2,779,438 of Jan. 19, 1957 for "Car Call Cancellation Means" the problem of departing passengers at a lower terminal sending a car to a floor by registering car calls was met by rendering the circuits for initiating a car call registration ineffective for a time after the car arrived at the lower terminal. In Thurston et al. Pat. 2,826,751 of Mar. 11, 1958 for "Floor Call Registering Circuits" the practice of simultaneously registering an up and down hall call to stop a car from either direction was met by circuits which permitted only one call to be registered for the simultaneous or quickly successive operation of landing buttons for both directions at a landing. Drexler Pat. 2,776,733 of Jan. 1, 1957 caused all car calls to be canceled when the car was empty.

Each of the above means for negating false calls impedes the registration of certain valid calls.

It has been noted that one form of false car call is generated by people who as they leave the car, run their hand down the array of buttons in the car control panel thereby registering a number of false calls requiring needless stops.

SUMMARY OF THE INVENTION

The present invention overcomes the poor service caused by the last mentioned type of call registration by sensing the rate at which the calls are registered to determine their validity. A control cancels all car calls when the rate at which a plurality of those calls are registered exceeds what has been predetermined to be a normal maximum registration rate. When the critical rate is exceeded, the car calls are canceled immediately and the car call registration circuits are disabled for an interval sufficient to discourage the person seeking to disrupt the system from waiting to again reregister false calls.

In one embodiment a rate responsive circuit made up of a capacitance and a sensitive relay are connected across a resistance to a source of direct current through a parallel group of resistances which are added to the circuit as car calls are registered. The rate of charging of the condenser thus determines the current in the relay and is dependent upon the rate reduction of resistance in the parallel group and thus the rate of call registration. When the critical limit is reached, the relay pulls in to cancel the car calls by opening the car call registration circuits and disconnects the shunting resistance. The decay of the current in the relay establishes the dropout interval and thus the delay in resetting the car call registration circuits.

DESCRIPTION OF THE DRAWING

FIG. 1 is an across-the-line diagram of portions of a typical car call registration, cancellation, and stopping circuit to which this invention has been applied; and

FIG. 2 is an across-the-line diagram of portions of a sensing circuit for ascertaining the rate of registration of calls according to this invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In the drawing, the circuits illustrative of this invention have been presented in across-the-line form wherein the controlling contacts are depicted in general horizontal alignment with the relay coils they control. Bans or horizontal regions are divided in a marginal index and are numbered **11** through **28** on the right side of the drawing. The relay reference characters are listed in the index in alignment with their coils and the location of those contacts actuated by the relays are listed next to their reference characters. In order to distinguish back contacts, those which are closed when the relay armature is dropped out and are opened by pulling in the armature, from front contacts, those which are opened when the armature is dropped out and are closed by the pull-in of the armature, line location of back contacts is underlined. Thus, the hall cancellation relay CC1 having a coil at line **26** of FIG. **2** has a back contact at line **24** designated by the numeral **24** underlined in the marginal index, and a front contact at line **28** designated by the numeral **28** in the marginal index, both adjacent the reference character and in alignment with the coil location at line **26**.

Two types of relays are illustrated. One has but a single coil which, when energized, pulls in its armature, and when deenergized, drops it out. The car call stopping relay CCS at **16** and the call cancellation relays CC1 and CC2 at **26** and **28** respectively, are of this type. The second type has a latch coil represented by a circle with a cord across its upper portion, and a reset coil represented by a circle with a cord across its lower portion. Energization of either the latch or reset coil singly pulls in the relay armature. Energization of both coils develops a canceling flux in the armature so that simultaneous energization has no effect on the armature, and permits it to remain dropped out, or to drop out if pulled in. These duel coil relays are employed in the car call circuits of FIG. **1** as relays 1C through TC for the first floor car call to the top floor car call for a car.

Inasmuch as false car calls impede effective operation of elevator cars whether they are operating individually or in groups, it is to be understood that the present control can be applied to either single or multicar elevator systems, and that the particular form of car call registration and cancellation circuit shown here are merely typical of many that are known in the prior art. The invention can readily be adapted by those skilled in the art to control many other types of car call registration circuits without departing from the spirit or scope of this invention.

The present invention senses the registration of car calls at a rate in excess of that to be experienced in the individual registration of single car calls by passengers within the car, and in response to the excessive rate of registration, cancels all registered car calls on the presumption that all are falsely registered. Thereafter, it maintains the car call registration circuit incapable of accepting further registrations for a time interval conveniently of the order of 5 seconds. FIG. **1** of the drawing, in general, shows a conventional car call registration circuit.

As shown in FIG. **1**, a car is provided with a commutating device coordinated with its position along the hatchway, and with its speed of movement within the hatchway which may be a vertical array of stationary contact segments **32** spaced in a linear array on a scale corresponding to the spacing of the landings for floors to be served by the elevator car, and arranged to be engaged individually by a brush **33** which is caused to traverse the array of segments in accordance with the effective position of the car along its path of travel in the hatchway. Such devices are generally known as floor selectors, the details of which are not shown here, wherein the movable brush is carried by a crosshead (not shown). These commutated contacts are utilized in the pickup of signals requiring the stop of a car for a car call and for canceling the registered car call during the stopping operation.

Car calls are registered by the push button actuated switches having the prefix C and the landing designation, as C1 to C11, and CT for landing **1** to **11** and top landing, as shown at lines **11** to **19**. The car calls are manually registered by buttons on a control panel (not shown) within the car.

The car call circuit is energized from a source of direct current, for example a 24 volt source connected across the buses R and B. Ordinarily, back contact DRT of the car signal cancellation relay at line **11** and back contact CC1 of the call cancellation relay at line **11** are closed to connect bus R to lead **34**. When a call is registered by the closure of a car call registration contact such as C11 at line **13**, it energizes the set coil

of the car call registration relays as 11C by completing a circuit from lead 34 to lead 35 and thence to bus B. The armature of relay 11C pulls in to close contact 11C at lines 14 and 23. Contact 11C at 14 seals the car call through the bridging connection 36 and activates the floor selector segment 32 for the 11th floor car call at line 14.

Car call stops are initiated by energizing car call stopping relay CCS at 16. As the car effectively approaches the 11th landing, brush 33 engages segment 32 at line 14. Upon the car reaching the position from which a call can be accepted to initiate slowdown for stopping at floor 11, generally termed the call acceptance zone, vernier crosshead relay VC (not shown) having a contact at line 17 is energized. This relay defines the limits of the call acceptance zone by its interval of energization, and is controlled by other segments and brushes of the floor selector machine which are not shown here. Its operation is more fully described in the patent application of Paul F. DeLamater entitled "Elevator Control" Ser. No. 565,551, filed Jul. 15, 1966. During the initial portion of the engagement of brush 33 with contact segment 32 for floor 11, contact VC at 17 is closed completing a circuit from bus R through back contacts DRT and CC1 at 11, lead 34, contact 11C at 14, reset coil 11C, segment 32 and brush 33 at 14, contact VC at 17, coil CCS at 16, and bus B. Relay CCS when energized initiates a stop by dropping car starting relay CSA (not shown) to close its back contacts at line 16 so that as the relay VC is dropped with the advance of the car beyond the call acceptance zone, and the centering of the crosshead on the floor selector at the position for the 11th landing, an alternate circuit is available for holding relay CCS energized.

As the car enters its leveling door open zone, the car doors are started to open and door close limit relay DCL (not shown) is energized to close its contact at line 15. The initial circuit established through the coil of relay CCS and the reset coil of relay 11C is sufficient impedance to restrict the current in reset coil 11C below the level necessary to develop a canceling flux for that of the latch coil 11C and drop the armature of relay 11C. Thus, the car call remains registered until a substantial portion of the stopping sequence for the landing of the call has been completed. When the door close limit relay contact DCL closes, however, the coil of relay CCS is shunted by resistor 37 to reduce the impedance of the circuit, and, thereby raise the current flowing through reset coil 11C to a level sufficient to develop a canceling flux to drop the armature 11C, thereby canceling the call and resetting relay CCS. At this time, the stopping sequence is sufficiently advanced that other circuits not shown here complete that sequence.

In normal operation the car call circuits are reset when the car is reversed. Reset is by deenergizing the set coils to insure that any car calls remaining energized after the setting up of the stop for the landing for which a reversal is made are dropped out. Thus car calls registered behind the car, e.g. for floors below an ascending car, are canceled upon the reversal of the car and must be reregistered if the passengers registering the calls remain aboard the car.

In some elevator systems it has been found that the closely arrayed car buttons are frequently misused, particularly by a departing passenger, by sweeping a hand across the array to register car calls for all or a substantial portion of the total landings served even though passengers wish service to those floors. The circuit of FIG. 2 responds to such falsely registered calls by pulling in relay CC1 at 26 to pull in auxiliary call cancellation relay CC2 at 28 by closure of contact CC1 at 28. CC2 opens back contact CC2 at 11 thereby canceling all car calls, as for a car reversal, by deenergizing all car call registration relays.

The circuit of FIG. 2 measures the rate of registration of car calls through the charging of a condenser 38. It, therefore, requires a well regulated direct current power supply connected across the buses Y and G. It has been found desirable to provide supplemental regulation by including a series resistance 39 to the circuit and a zener diode 41 across the main buses. In the static condition, the circuit comprises a voltage divider made up of resistance 42 and 43 connected through back contact CC1 at 24 across buses Y and G. The call cancellation relay CC1, a resistance 44 and capacitor 38 are connected from lead 45 at the junction of resistances 42 and 43 to bus G. The condenser, under these circumstances, is charged to a static value, e.g. 75 volts.

When a car button is pressed, a resistor 46 is inserted in parallel with resistance 42, as by the closure of contact 11C at 23, reducing the resistance between lead 45 and bus Y. This institutes a transient condition in applying a greater voltage across lead 45 and bus G to cause condenser 38 to charge to a higher voltage at a new static state. The charging current for condenser 38 flows through relay CC1 coil. Normally a reasonable number of calls closely registered in time cause a charging current insufficient to pick up relay CC1 and at the new static state no current flow.

Cancellation of a car call reopens the car call relay contact, as 11C at 23, to disconnect a resistance 46 from its parallel connection with resistance 42 thereby reducing the voltage across resistance 43 and condenser 38. The transient to the lower voltage as condenser 38 discharges flows through unidirectionally conductive diode 47 and thereby bypasses the CC1 relay coil. Ordinarily only one call is canceled at a time and, therefore, the transients to lower voltages are of relatively small magnitude. However, even if a substantial number of call cancellations occur simultaneously as upon operation of the direction reversal controls to open back contact DRT at 11 and the removal of a substantial number of resistances 46, the bypassing diode prevents response by relay CC1.

Thus it is seen that each car call registration imposes a positive step voltage increase across resistance 43 and capacitance 38 to cause charging current to flow in coil CC1 while each car call cancellation is a negative going step voltage, the discharge current of which is bypassed by diode 47. As the resistance between bus Y and lead 45 is decreased, the charging current is proportionally increased momentarily followed by an exponential decay. If a plurality of calls are registered simultaneously, or nearly simultaneously, the charging current will be higher than if one call had been registered as a function of the number and time spacing of the relative resistance change or changes.

If a sufficient number of calls are registered within a short enough interval of time, the charging current for condenser 38 will be great enough to pick up relay CC1. For example, if four calls were registered by sweeping a hand across car buttons C1 to C4 to essentially simultaneously parallel resistance 42 with four resistances 46, the charging current will pull in CC1. Relay CC1 upon pull in closes contact CC1 at 28 to energize auxiliary call cancellation relay CC2 and opens back contact CC1 at 24 to disconnect the voltage divider from across the buses Y and G. With the resistance 43 no longer shunting coil CC1, resistance 44 and condenser 38 the full line potential is applied across the low resistance between bus Y and lead 45 and the series connection of CC1, 44 and 38 to bus G. This appears as a step voltage applied to condenser 38 and causes its further charging at a rate determined by the series resistance. Charging current therefore continues to flow in coil CC1 at a level sufficient to hold that relay pulled in for an interval dependent upon the dropout current of the relay and the time constant of the circuit. It has been found convenient to arrange for the charging current to remain above the dropout current of the relay for about 5 seconds.

Pull in of relay CC2 opens back contact CC2 at 11 to drop all registered car call relays thereby removing all resistances 46 from their parallel relation with resistance 42. This change of resistance alters the time constant of the charging circuit for condenser 38 and is a primary factor determining the hold in interval of CC1.

When condenser 38 approaches the fully charged condition its charging current diminishes to a level permitting relay CC1 to drop out. Back contact CC1 at 24 closes to reconnect the voltage divider across buses Y and G. This reduces the voltage across condenser 38 permitting it to discharge through diode

47 and resistance 43. Within about one second the static condition of no call registrations is reestablished.

It is to be appreciated that the above is merely descriptive of an illustrative embodiment of the invention and that variations therein can be made without departing from its spirit or scope. For example, other switching means such as electron discharge devices or semiconductive devices can be employed in place of the relays, a unijunction transistor timer could be employed, and gating circuits can be substituted for relay contact combinations.

I claim:

1. An elevator control comprising a plurality of switch means for registering calls for service, means for canceling registered calls for service, means for sensing the rate of registration of calls, and means responsive to registration of calls at a rate in excess of a predetermined level for canceling a plurality of registered calls including the calls registered at said excessive rate.

2. A control according to claim 1 wherein said switch means are for calls registered from within an elevator car and said canceling means is effective to cancel all calls registered by said switch means.

3. A control according to claim 1 including means to maintain said canceling means effective for a time interval following the response thereof to the excessive rate of registrations in excess of the predetermined level.

4. An elevator control comprising a plurality of car call registration means available to passengers within an elevator car, a voltage divider comprising a first and second resistance, means responsive to the registration of each car call by said registration means to insert a resistance in parallel with said first resistance, means connected in parallel with said second resistance for developing a signal which changes with time in response to the change of resistance paralleling said first resistance, means responsive to a critical value of said time dependent signal to disable said car call registration means.

5. A combination according to claim 4 wherein said means in parallel with said second resistance includes a capacitance, and said means responsive to the critical value of the time dependent signal is responsive to the charging current for said capacitance.

6. A combination according to claim 5 including a unidirectional conductive device in parallel with said current responsive means poled to pass discharge current from said capacitance whereby said discharge current effect on said current responsive means is reduced.

7. A combination according to claim 5 including means responsive to said current responsive means disconnects said second resistance from said voltage divider whereby said first resistance is connected in series with said capacitance to impose a voltage thereacross and continue charging said condenser.