Jan. 10, 1967 J. E. MAGEE 3,297,109

CUSTODY CONTROL FOR ELEVATORS WHEREBY CARS ARE STOPPED AND DOORS HELD CLOSED UNTIL EXTERNALLY OPENED

Filed Feb. 12, 1963 2 Sheets-Sheet 1

Fig. 1.

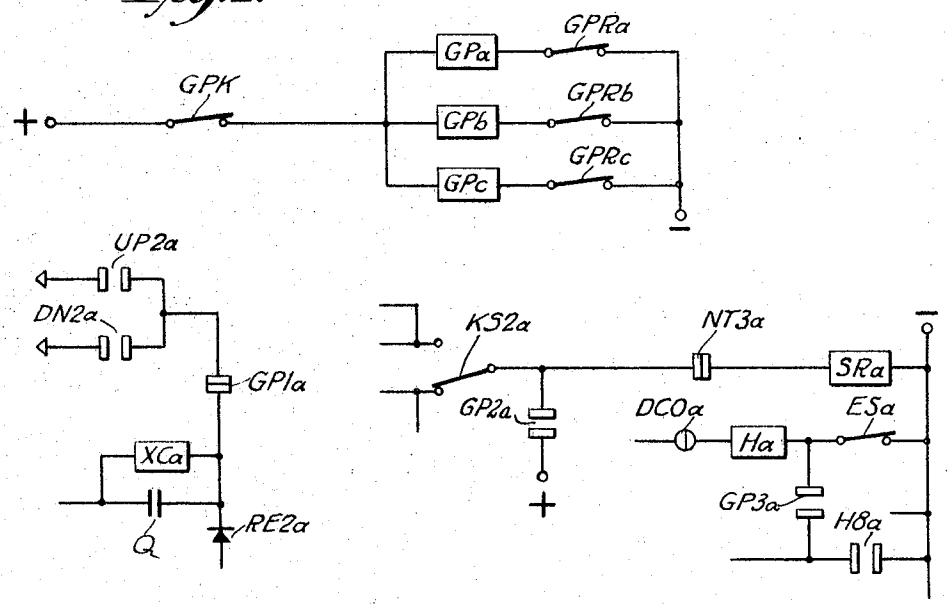

Fig. 2.

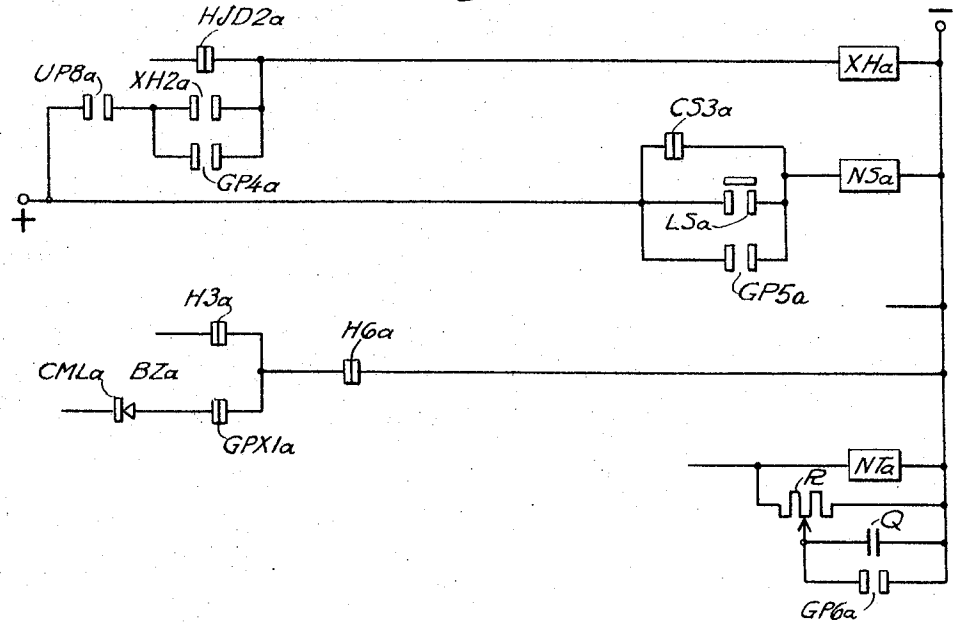

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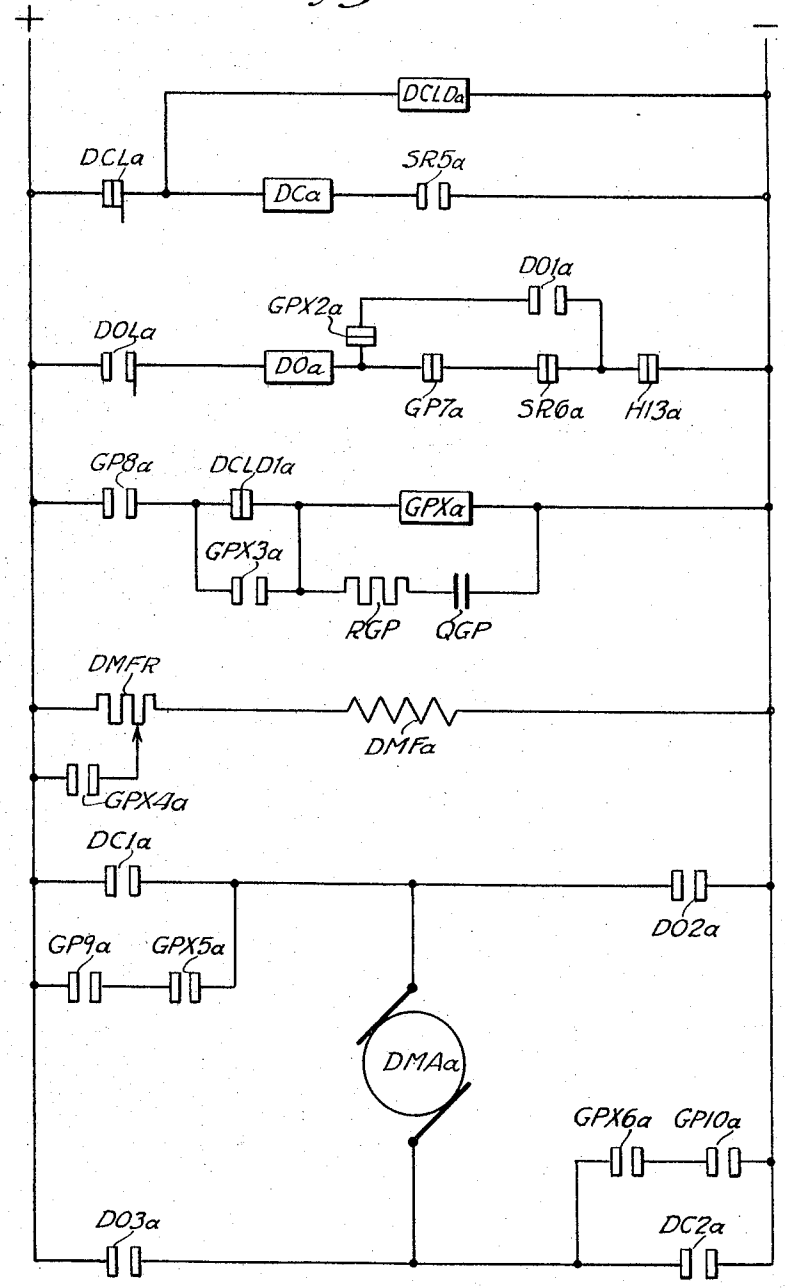
Fig. 3.



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CUSTODY CONTROL FOR ELEVATORS WHEREBY CARS ARE STOPPED AND DOORS HELD CLOSED UNTIL EXTERNALLY OPENED

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7 Claims. (Cl. 187—29)

This invention relates to control systems for a single elevator and for a plurality of elevators operating as a group.

In present day non-attended elevators, response of the elevator cars is dictated primarily by riding passengers and waiting passengers. In attendant operated elevator cars, response is more directly subject to dictates of the attendant even though the system may be a semi-automatic system. In certain instances, it may be advantageous to automatically restrict response of all cars in a group to provide immediate travel of all cars to a common landing to be held there with doors closed until caused to open selectively by authorized personnel.

It is, therefore, an object of this invention to provide a simplified control system, which I call a custody control, for one or more elevator cars which will expedite travel of all cars to a designated landing without making intervening service stops.

It is also an object of the invention to arrange such control to restrict passenger transfer to the designated landing.

It is a further object of the invention to enable such passenger transfer at the designated landing to be discretionary with personnel external to the elevators.

In the preferred embodiment, actuation of a lobby key switch initiates custody control. Normal group control of cars at the upper terminal is overridden to start such cars down. Ascending cars are caused to reverse at nearest floors permitting normal slowdown without opening doors at such reversal points. Stopped cars with doors opening complete the opening cycle but then immediately close their doors. Such cars with doors fully open have their doors immediately closed. Response of all cars, once in motion, is voided for all car or landing calls and door closing torque is increased and retained to prevent manual opening of car doors. Upon arrival at the lobby, each car is prevented from travelling away from the lobby floor and the increased door closing force is retained to avoid opening thereof until selectively released at the control station which may be at the lobby floor. Where car call registration indicators are furnished, both registration and indication functions preferably shall remain active, only response to associated registered calls being voided. Where car position indicators are furnished such units in the cars preferably shall be extinguished but preferably counterpart lobby units shall be retained effective.

Other objects and advantages of the invention will be apparent from the following detailed description of a preferred embodiment thereof, which description should be considered in conjunction with the accompanying drawings in which:

FIG. 1 is a simplified schematic wiring diagram of custody control initiating circuits and certain circuits of FIG. 1 of the Patent No. 2,944,634 as altered in accordance with this invention;

FIG. 2 is a simplified schematic wiring diagram of circuits of FIG. 2 of Patent No. 2,944,634 which have been altered in accordance with the invention; and

FIG. 3 is a simplified schematic wiring diagram of door control circuits incorporating the custody control circuits of the invention.

Since custody control, by its nature, is a control which

modifies the operation of conventional control systems, it will be obvious to those skilled in the art that the custody control system of the invention may be used with various types of dispatching and control systems now used in the art including dispatching and control systems for single elevator car installations. For purposes of simplification the invention will be described by reference to, and operation in conjunction with, the system of control described in my Patent No. 2,944,634. It will be understood, however, that the description of the invention in conjunction with the control system of said patent is merely for purposes of illustration.

In the description hereinafter given, it will be assumed that the elevator system comprises the circuits, controls, mechanisms, etc. set forth in said Patent No. 2,944,634 modified as set forth hereinafter to include the circuits and controls of the present invention. Accordingly, the description of the operation of the system set forth in said Patent No. 2,944,634 will not be repeated herein, and the description and drawing will herein be limited to the modifications of the system set forth in said Patent No. 2,944,634 required to adapt my present invention thereto and to certain portions of the system of said Patent No. 2,944,634 with which the modifications cooperate. For convenience, the symbols, diagram conventions, etc. employed in said Patent No. 2,944,634 will be used herein.

Electromagnetic switches employed in the preferred embodiment disclosed herein and not shown in said Patent No. 2,944,634 are as follows:

GP—Control modifying switch
GPX—Door operation modifying switch
DC—Door closing switch
DCLD—Door status switch
DO—Door opening switch

A three car elevator group is given as a specific example in said Patent No. 2,944,634 and in the preferred embodiment described herein it will be assumed that a three car elevator group is also involved. However, for the purpose of simplifying the disclosure, the operation of only the switches and circuits for car *a* will be fully described, it being understood that similar controls and circuits are provided for cars *b* and *c* of the three car group.

Additional contacts are employed on certain electromagnetic switches of said Patent No. 2,944,634 and are utilized in circuits of the preferred embodiment of the invention. In each case, reference letters of the activating coils shown in said patent are employed in association with numerals, such contacts being as follows:

Coil of Patent No. 2,944,634	New Contact(s)
SR	SR5*a* and SR6*a*
H	13*a*

Circuits and components shown in FIGS. 1 and 2, other than those identified above as being added, are shown in FIGS. 1 and 2, respectively, and described in the specification of said Patent No. 2,944,634.

The switch GPK preferably is a manually operable conventional switch which can be operated only by means of a key so as to avoid operation thereof by unauthorized personnel, but may be operated automatically by a conventional security alarm system, such as those commonly used in banks or to protect various areas. Although the switch GPR may be located at any desired place and may, for example, be located at the starter's position in the lobby of the building where the elevators are located, preferably it is located at a position where it is generally inaccessible to the public, such as in the office of the building security personnel or guards.

It can be seen from FIG. 1 that actuation of manual key switch GPK causes actuation of a GP switch for each

car *a*, *b* and *c* subject to an associated normally closed manual switch GPR. The resulting operation will be described for car *a*, it being understood similar response of cars *b* and *c* in the assumed three car bank will occur.

Contacts GP1*a* opening prevent operation of car call pick-up switch coil XC*a*. Contacts GP2*a*, closing cause setting of the SR*a* relay, and thus starting of the car *a* to be directly dependent only on release of NT*a* switch, which colses NT3*a* contacts, and hence, independent of normal group control action determined normally by circuits in said patent intermediate contacts NT3*a* and the + feeder. If desired, contacts GP3*a* may be provided, and upon closing, afford means for rendering the emergency stop switch ES*a*, ineffective once the car is in motion, contacts H8*a* being then closed.

In FIG. 2, contacts GP4*a* closing, upon inception of custody control, insure reversal of car *a* by XH*a* actuation, if car *a* ascending, contacts UP8*a* being closed. Contacts GP5*a* closing cause actuation of non-stop switch NS*a* to void response of car *a* to landing calls. Contacts GP6*a* in shunting relationship to condenser Q will be seen to erase timing in release of switch NT*a* for immediate starting through NT3*a* contacts of FIG. 1 following completion of the door closing operating cycle. Contacts GPX1*a*, delayed in operation with respect to switch GP*a*, as will be described further, when separated, prevent reversal to upward travel upon return of the car to the lobby.

FIG. 3 includes conventional elevator door operation drive elements DMF*a* and DMA*a*, the element DMF*a* being arranged for continuous excitation through resistor DMFR and the element DMA*a* being reversibly energized through DO and DC contacts, for respectively opening and closing the car doors. Switches DO*a* and DC*a* will be seen to be responsive to mechanical limit switches DOL*a* and DCL*a*, respectively, contacts of which are actuated, by the door opening mechanism, to their open condition at the respective limits of door travel. Primary control of initiation of either switch action can be seen to be governed by status of the SR*a* contacts, the SR5*a* contacts being closed upon car stopping, with H13*a* contacts closed, and the SR5*a* contacts being closed on dictation of car starting. Switch DCLD*a* is seen to directly reflect the status of DCL*a* limit contacts.

Upon inception of custody control, contacts GP7*a* open to prevent initiation of door opening. If opening has just previously been initiated, however, the cycle is sustained through self-holding DO1*a* contacts and GPX2*a* contacts, which will remain closed to completion of the door closing cycle.

If the car doors are closed when the GP8*a* contacts close, switch GPX*a* and its delayed-release capacitor QGP are energized through the closed DCLD1*a* contacts. If passenger transfer is taking place this action is delayed to completion of door closing, with consequent release of switch DCLD*a*.

When switch GPX*a* is actuated, its contacts GPX5*a* and GPX6*a* close and in conjunction with previously closed contacts GP9*a* and GP10*a*, respectively, cause excitation of the door operator motor armature DMA*a* for door closing torque. Contacts GPX4*a* closing concurrently strengthen excitation of the door operator motor field to increase torque sufficient to effectively prevent a passenger from manually forcing the car door open. Contacts GPX2*a* and GPX3*a* exercise control following arrival of the car at the desired terminal landing, as will be described further.

To complete an understanding of the invention the sequence of operation for car *a*, as typical, will be described, assuming initially that car *a* is ascending between stops when key switch GPK is closed to cause actuation of switch GP*a*, and also switches GP*b* and GP*c*, thus initiating custody control.

Contacts GP4*a* closing complete a circuit for actuation of switch XH*a*, through the UP8*a* contacts, closing in con-

junction with upward travel. As described in said patent, XH*a* acts to initiate a stop at the landing approached and causes reversal to downward direction at that point. With such reversal, contacts UP8*a* open to release XH*a*.

At the reversal landing H13*a* contacts closing would normally initiate a door opening action by completing a circuit for DO*a* switch through closed contacts SR6*a* and closed limit contacts DOL*a*. With contacts GP7*a* separated, however, this is prevented. Also, with limit contacts DCL*a* separated, the DCLD*a* switch coil is not energized. Through its closed DCLD1*a* contacts the closed GP8*a* contacts complete a circuit for actuation of switch GPX*a*. Its GPX5*a* and GPX6*a* contacts, through closed GP9*a* and GP10*a* contacts cause the door operating motor armature to be energized for closing torque. Contacts GPX4*a* also close to strengthen the door motor field and thus increase the effective torque to prevent manual opening of car doors from within the car.

Closed contacts GP6*a* cause retention time of switch NT*a* to be minimized. Its release, as described in said patent, completes a circuit for actuation of switch SR*a* set to start downward travel of car *a*. Closed contacts GP2*a* insure this independent of terminal disposition of car *a* by voiding dependence on the normal dispatch system at that point.

During descent of car *a* the open GP1*a* contacts prevent stops in response to registered car calls. Closed contacts GP5*a* energize switch NS*a* to open its NS1*a* contacts, FIG. 2 of said patent, and similarly prevent stops in response to registered landing calls.

It will be assumed, for purposes of illustration that after custody control is initiated, all the cars will be stopped at the lobby terminal, but it will be apparent that another landing may be selected. Upon arrival at the lobby terminal the terminal limit stop devices are effective, but open contacts GPX1*a* prevent reversal for travel in an upward direction. The GP*a* and GPX*a* contacts governing the door operator motor retain preventive torque against manual opening of the car doors.

Switches GPR*a*, GPR*b* and GPR*c* are manually operable switches, which may also be key operated switches, and they permit, respectively, selective opening of the doors on cars *a*, *b* and *c*. Such switches preferably are located in positions where the operator thereof can observe the doors of the cars at the terminal selected for the stopping of all cars, e.g. the lobby terminal. However, they may be located at other positions if desired, particularly if there are communication facilities permitting communication between persons at the selected terminal and persons at the positions of such switches.

At the discretion of authorized personnel key switch GPR*a* is opened to release switch GP*a*. Contacts GP8*a* open but the capacitive charge of capacitor QGP retains switch GPX*a* operated for a predetermined time period. Contacts GP9*a* and GP10*a* opening disconnect the door motor armature DMA*a*. Contacts GP7*a* closing complete the circuit for actuation of door opening switch DO*a* through closed H13*a* and SR6*a* contacts and the closed limit contacts DOL*a*.

The hoistway doors at the selected terminal may be opened manually or may open in a conventional manner with the car doors. At any time while the car doors are opening the cycle can be terminated and reversed to closing by re-energizing switch car GP*a* with manual switch GPR*a*. Contacts GP7*a* would immediately open to terminate the opening cycle since DO1*a* holding contacts are ineffective while contacts GPX2*a* remain separated. Contacts GP8*a* closing would re-energize switch coil GPX*a* through closed contacts GPX3*a* which are now effective to shunt the now open DCLD1*a* contacts. Contacts GP9*a* and GP10*a* would again cause closing energization of the door motor through sustained contacts GPX5*a* and GPX6*a*, and with the increased torque resultant from sustained closed status of contacts GPX4*a*. During such

manipulation of the GPR*a* switch, open GPX1*a* contacts prevent upward departure of car *a*.

If car *a* was travelling downward when switch GPK was initially actuated, response would follow the latter portion of the sequence just described, that is, without the action of switch XH*a* described above. If it was in the process of transferring passengers, contacts GPX2*a* would be closed to permit the DO1*a* contacts to sustain opening door action to the full open position independent of the separation of GP7*a* contacts.

It is apparent to those skilled in the art that where car position indicators are furnished in an installation, an additional pair of normally closed GPX contacts (not shown), for each car, may be employed to interrupt the common feeder to such car position indicator lights located within the car and to extinguish such lights. It is also understood that where applicable codes permit, the GP3*a* contacts would be used, subject to the H8*a* contacts, as in FIG. 1, to nullify the effect of the car emergency stop switch, ES*a*, once the car was in motion.

It is readily seen from the foregoing that with similar circuitry for cars *b* and *c*, the operation of captive control insures expedited return of all cars to the selected terminal regardless of the prior status of each car as to motion, direction or position, and without stop recognition by any of the cars of registered landing calls or car operating panel demands, such as car calls or other service demands which may be registered within a car. In conjunction with such accelerated return, doors of each car, once closed, are prevented from opening automatically or being opened manually until permitted at discretion of authorized personnel at the custody terminal or elsewhere. Such discretionary door operation is then fully responsive to control of such personnel as to extent of opening and reclosing. Upon availability of any one of the cars following passenger discharge such car may be released from custody control selectively, by keeping its GPR switch open, to then permit its attended use by authorized personnel.

It will be apparent to those skilled in the elevator art that various changes in the specific embodiment illustrated and apparently modified embodiments of the invention may be made without departing from its scope. It is intended that all material contained in the preceding description or shown on the accompanying drawings shall be interpreted as illustrative only and not in a limiting sense.

What is claimed is:

1. In an automatic elevator system comprising a plurality of elevator cars operating between a plurality of floors, each car having a door which opens and closes and car call registering means therein for registering calls for service to said floors by a passenger therein, hoistway doors at a plurality of said floors providing access to said cars, floor call registering means at a plurality of said floors for registering calls for service at said floors, means for opening and closing the car doors, means for opening and closing the hoistway doors, normal control circuit means controlled by said call registering means for normally causing said cars to move between said floors and to stop at floors for which calls are registered and controlling said door opening and closing means for normally causing the door of a car stopped at a floor and the hoistway door providing access to said last mentioned car to open automatically thereby to permit passengers to enter and leave the stopped car, the combination therewith of manually operable, overriding custody control means external to said cars for modifying the operation of said normal control means comprising means connected in circuit with said normal control means for causing all the cars which are not at a predetermined one of said floors to move to and stop at a predetermined one of said floors, and for preventing the stopping of cars in response to car and floor calls at floors other than said one floor, means connected in circuit with said normal control means for preventing the opening by said normal control means of the car doors of the cars stopped at said one floor and the hoistway doors providing access to the stopped cars, and manually operable door opening means for selectively and individually opening said doors at said one floor whereby when the custody control means is operated, passengers in the cars and persons at the floors are prevented from causing movement of the cars to, and stopping of the cars at, floors under control of the car call and floor call registering means and are prevented from opening the doors, passengers in the cars thereby being confined in the cars until said last-mentioned door opening means is operated.

2. An automatic elevator system comprising a plurality of elevator cars operating between a plurality of floors, each car having a door which opens and closes and car call registering means therein for registering calls for service to said floors by a passenger therein, floor call registering means at a plurality of said floors for registering calls for service at said floors, means for opening and closing the car doors, normal control circuit means controlled by said call registering means for normally causing said cars to move between said floors and to stop at floors for which calls are registered and controlling said door opening and closing means for normally causing the door of a car stopped at a floor to open automatically thereby to permit passengers to enter and leave the stopped car, and manually operable, overriding custody control means external to said cars for modifying the operation of said normal control means comprising means connected in circuit with said normal control means for causing all the cars which are not at a predetermined one of said floors to move to and stop at said predetermined one of said floors and for preventing the stopping of cars in response to car and floor calls at floors other than said one floor, means connected in circuit with said normal control means for preventing the opening by said normal control means of the car doors of the cars stopped at said one floor, and manually operable door opening means for selectively opening said doors of the cars stopped at said one floor whereby when the custody control means is operated, passengers in the cars and persons at the floors are prevented from causing movement of the cars to, and stopping of the cars at, floors under control of the car call and floor call registering means and are prevented from opening the doors, passengers in the cars thereby being confined in the cars until said last-mentioned door opening means is operated.

3. An automatic elevator system comprising a plurality of elevator cars operating between a plurality of floors, each car having a door which opens and closes and car call registering means therein for registering calls for service to said floors by a passenger there, hoistway doors at a plurality of said floors providing access to said cars, floor call registering means at a plurality of said floors for registering calls for service at said floors, means for opening and closing the car doors, means for opening and closing the hoistway doors, normal control circuit means controlled by said call registering means for normally causing said cars to stop at floors for which calls are registered and controlling said door opening and closing means for normally causing the door of a car stopped at a floor and the hoistway door providing access to said last mentioned car to open automatically thereby to permit passengers to ener and leave the stopped car, and manually operable, overriding custody control means external to and remote from said cars for modifying the operation of said normal control means comprising means connected in circuit with said normal control means for preventing the stopping of cars which are not at a predetermined one of said floors in response to any floor and car calls and for causing all the cars to move to and stop at said predetermined one of said floors, means connected in circuit with said normal control means for preventing the opening by said normal control means of

the car doors of the cars stopped at said one floor and the hoistway doors providing access to the cars stopped thereat and for increasing the force required to open said doors manually and manually operable door opening means for selectively and individually opening said doors at said one floor whereby when the custody control means is operated, passengers in the cars and persons at the floors are prevented from causing movement of the cars to, and stopping of the cars at, floors under control of the car call and floor call registering means and are prevented from opening the doors, passengers in the cars thereby being confined in the cars until said last-mentioned door opening means is operated.

4. In a control system for an elevator car, said car having a door which opens and closes and said car operating between a plurality of floors, said control system having means in said car operable by a passenger therein for registering car calls, means at said floors for registering floor calls, means for normally causing said car to stop at said floors in response to said floor calls and said car calls and means for normally causing said door to open and close automatically at a floor at which said car stops, the combination therewith of custody control means external to said car for causing said car to stop at one of said floors and to remain at said one floor with its door closed and restrained from being opened either automatically or manually regardless of the registration of car or floor calls, and door releasing means manually operable from externally of said car for selectively releasing and opening the door of said car whereby when the custody control means is operated, a passenger in said car and persons at the floors are prevented from causing movement of the car to, and stopping of the car at, floors under control of the car call and floor call registering means and are prevented from opening the car door, passengers in said car thereby being confined therein until said last-mentioned door releasing means is operated.

5. The control system as set forth in claim 4 wherein said custody control means includes means which when said car is not at said one floor causes said car to travel to said one floor without stopping at other floors for which there are registered car or floor calls.

6. The control system as set forth in claim 4 wherein said custody control means includes means for increasing the force maintaining said car door closed when said custody control means is operated.

7. In a control system for an elevator car, said car having a door which opens and closes and said car operating between a plurality of floors and the hoistway for said car having hoistway doors at the floors served by said car which open and close to provide access to said car, said control system including means in said car operable by a passenger therein for registering car calls, means for normally causing said car to travel to and stop at floors selected by said car call registering means and means for normally causing said car door and the hoistway door at the floor at which the car is stopped to open automatically to permit passengers to leave or enter the car, the combination therewith of custody control means external to said car for causing said car to stop at one of said floors and to remain at said one floor with at least one of said cars and the associated hoistway doors closed and restrained from being opened by said means for opening said doors automatically, said custody control means including means for interrupting the normal operation of said means for causing cars to travel to and stop at floors other than said one floor selected by said car call registering means and the normal operation of said door opening means, and door releasing means manually operable from externally of said car for releasing and opening each restrained door to permit a passenger to leave or enter the car at said one floor, whereby when the custody control means is operated, a passenger in said car is prevented from operating the car and the doors under control of the car call registering means and is confined in said car at said one floor until said door releasing means is operated.

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