Jan. 6, 1959 W. H. BRUNS 2,867,292

ELEVATOR CONTROL SYSTEM

Filed Oct. 28, 1957 3 Sheets-Sheet 1

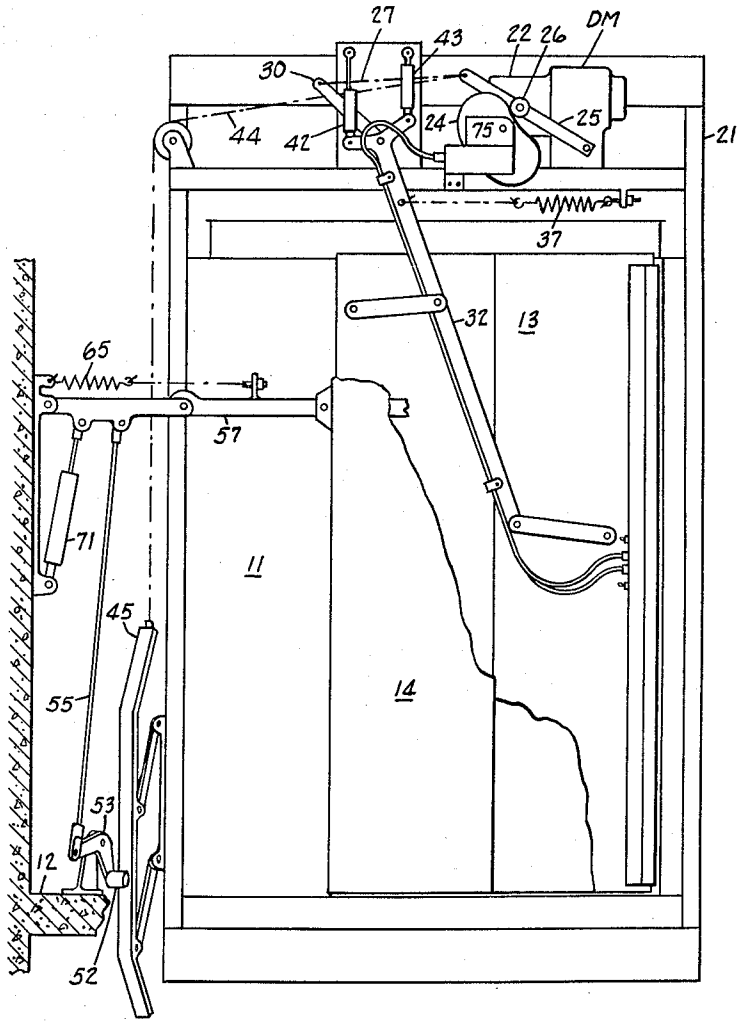


FIG. 1

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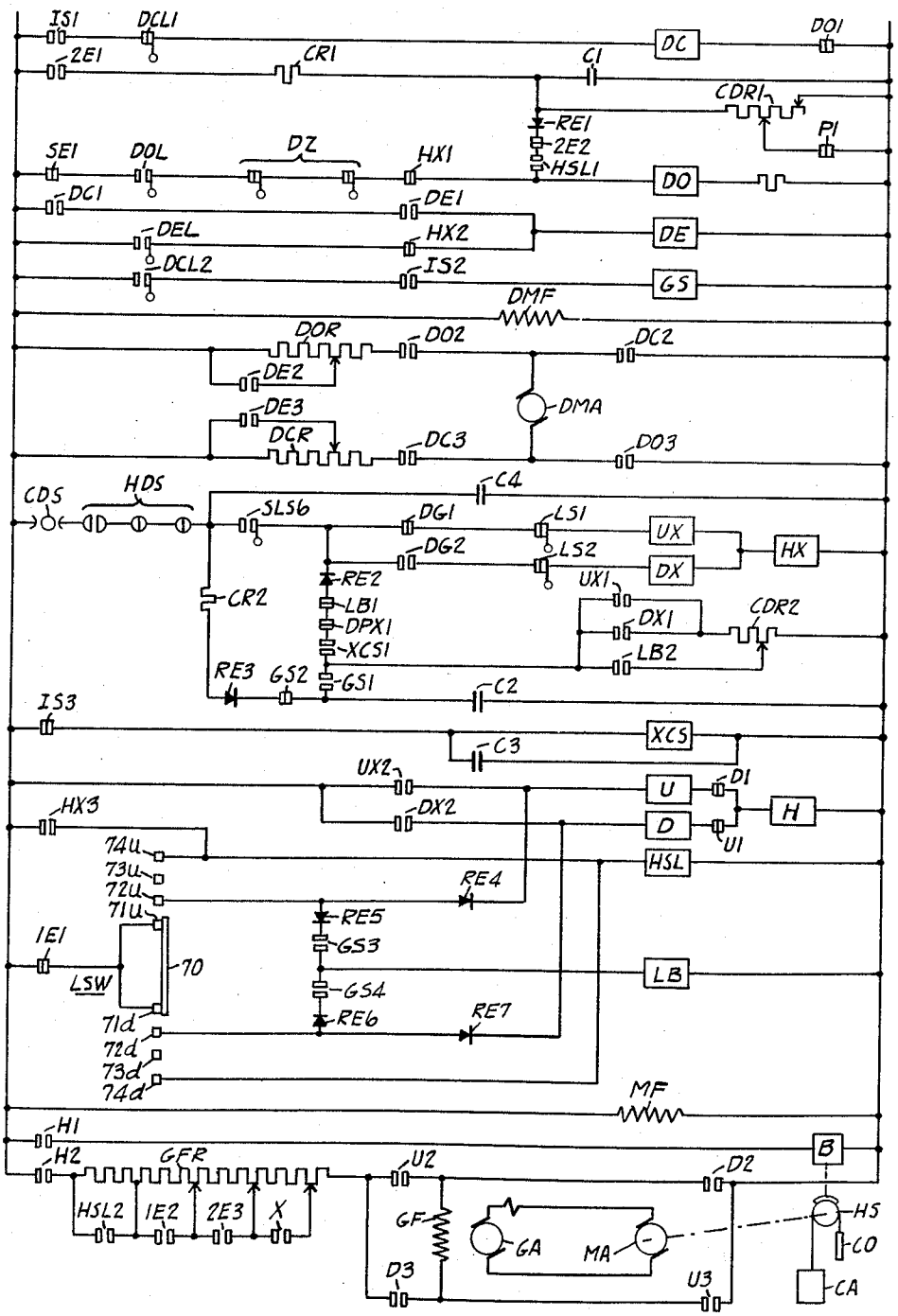


FIG. 2

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ELEVATOR CONTROL SYSTEM

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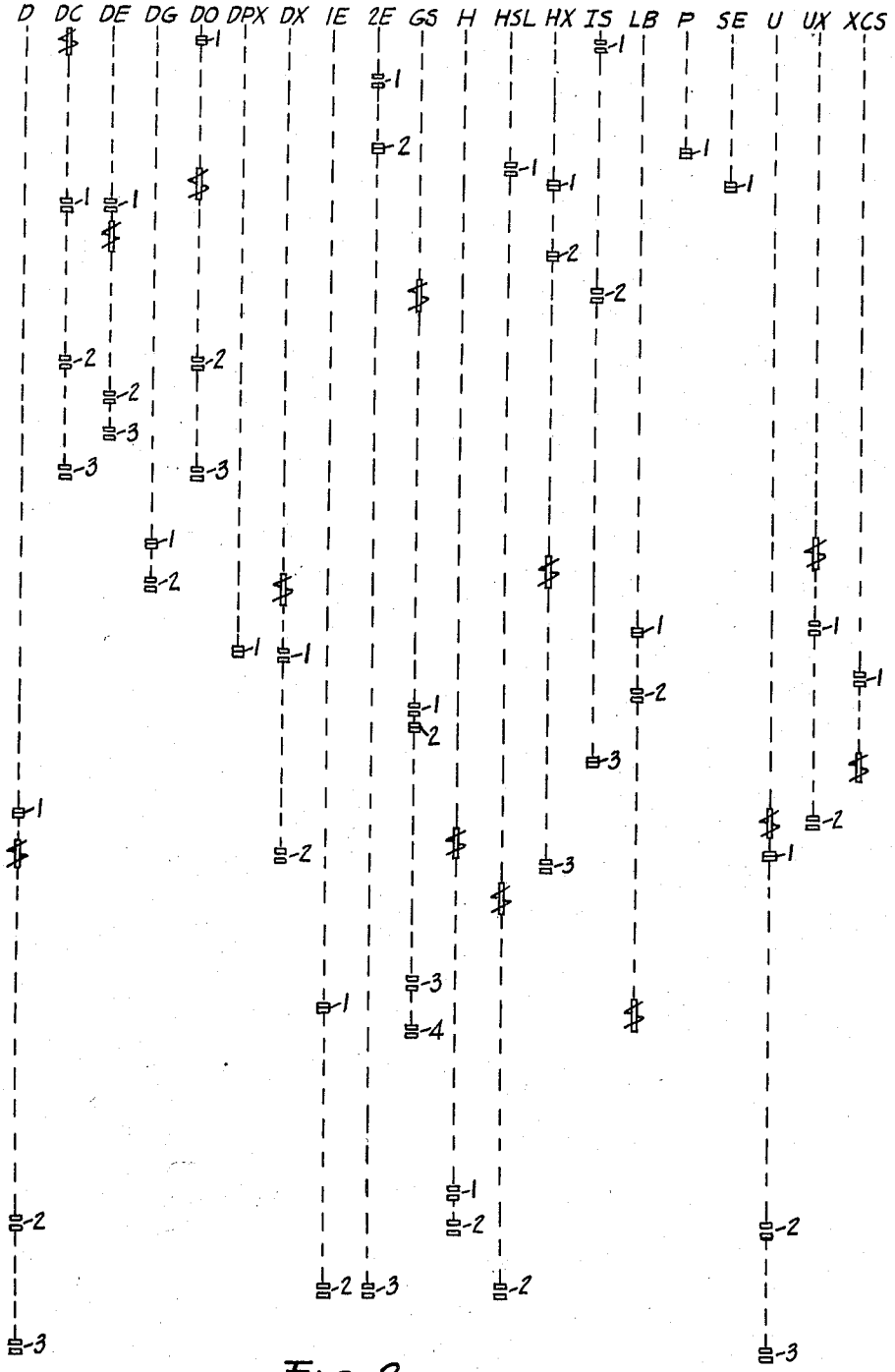


FIG. 2S

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United States Patent Office 2,867,292
Patented Jan. 6, 1959

2,867,292

ELEVATOR CONTROL SYSTEM

William Henry Bruns, Lincolndale, N. Y., assignor to Otis Elevator Company, New York, N. Y., a corporation of New Jersey

Application October 28, 1957, Serial No. 692,684

20 Claims. (Cl. 187—29)

The invention relates to the control of elevators.

The time consumed by elevators in performing certain operations is becoming an increasingly important factor. This is particularly true of elevators in tall buildings which are being erected today. The elevator installation must be adequate to populate and depopulate the building within a short time during the morning and evening rush hours and to serve the building without undue delays for the remainder of the day. On the other hand, the elevators cannot take up too great a proportion of the building space or the building will not be economically feasible. Thus any improvement that helps to speed up elevator service is highly desirable. The present invention is directed to improvements of this character.

One of the principal factors influencing the time consumed by the elevators is the operation of the elevator doors. When an elevator car makes a stop at a floor, it is desirable that the elevator doors be sufficiently opened by the time the car comes to a stop to enable passenger transfer to start immediately. In the past, it has been the practice to start the door opening operation by the time the car reaches a zone in which the car leveling mechanism is effective, which zone extends a certain distance on each side of the floor. However, with improvements in the operation of elevators to provide high speed of approach in stopping and due to the limitations of door operators, the doors do not get sufficiently open, by the time the car is brought to a stop, to enable the passenger transfer to take place at once. As a result, time is lost on each stop which, when the overall operation for a day for all elevators is considered, is a very considerable factor.

Another factor is the time lost in the final closing movement of the dors. To avoid slamming with its objectionable noise, jar to passengers and wear and tear on equipment, the doors are slowed down in closing as they come within a certain distance of door closed position. Door interlock contacts are provided which are closed in the final door closing movement. It has been the practice in the past to prevent the establishment of starting circuits until the interlock contacts are closed. Due to the slowing down of the doors, a considerable amount of time is consumed in effecting the final closing movement and thus a considerable amount of time is lost in getting the car started away from the floor. This is especially true of non-attendant operated elevators where, due to the lack of an attendant to act as a guard, the interlock contacts are not closed until the doors reach substantially closed position. There is the further factor that time is lost in effecting operation of electromagnetic starting switches after the interlocks close and in getting the electromechanical brake released after the switches are operated. Where the overall operation for a day of all elevators is considered, here again the time lost is a considerable factor.

One object of the invention is to insure, without sacrifice of safety, the opening of the elevator doors sufficiently for passenger transfer to take place by the time the car comes to a stop.

Another object of the invention is to minimize the time lost in the door closing operation by utilizing a portion of the final door closing time for initiating the starting of the car away from the floor, again without sacrifice of safety.

In carrying out the invention as applied to the door opening operation, there is a transitory supply of current for causing operation of the door opening switch in advance of the leveling zone, in turn causing the doors to start to open at a slow speed. When the car reaches a certain distance from the floor, preferably commensurate with the leveling zone, the speed of door opening is increased to normal value so that the desired door opening is obtained by the time the car comes to a stop. In the preferred embodiment, this transitory current supply is obtained from a charged condenser which supplies a current pulse to the coil of the door open switch. This minimizes the amount of door opening operation which can take place before the leveling zone is reached since, if the leveling zone is not reached before the condenser pulse is no longer able to hold in the door open switch, the advance door opening operation ceases. Thus too early door opening is obviated.

In carrying out the invention as applied to the door closing operation, as the doors reach a certain distance in advance of fully closed position, a transitory supply of current to starting switching mechanism takes place. This enables the switching sequences to get under way to initiate car movement during the final closing movement of the doors. In the preferred embodiment, again the transitory current supply is obtained from a charged condenser which supplies a current pulse to the coil of a starting relay. This minimizes the amount of car movement which can take place before the interlock contact closes, since if the interlock is not operated before the condenser pulse is no longer able to hold in this relay, the advance starting operation ceases. Also other switching mechanism is provided to limit the amount of car movement due to the condenser pulse. Thus an undesirable amount of car movement before the interlock contact closes or where the interlock contacts fail to close is obviated.

Features and advantages of the invention will be seen from the above and from the following description and appended claims.

In the drawings:

Figure 1 is a somewhat simplified view in front elevation of an elevator car, with the car door, associated hoistway door and door operating mechanism, to which the invention may be applied;

Figure 2 is a representation in "across the line" form of simplified circuits for controlling the doors and the elevator car, embodying the invention; and

Figure 2*s* is a locating diagram, showing in spindle form the relationship of the coils and contacts of the switches employed in Figure 2.

Elevator control systems are very complex and it is to be understood that certain amplifications and alterations may be in order in adapting the invention to complete elevator systems.

Referring first to Figure 1, the elevator car **11** is illustrated as positioned at a landing **12**. The car door **13** and hoistway door **14** for that landing are illustrated in closed position. While it is to be understood that the car door and hoistway doors may be operated in various ways, an arrangement has been illustrated in which these doors are power opened and spring closed. Two speed, side opening doors have been illustrated but it is also to be understood that the invention is applicable to other arrangements, especially center opening doors.

The car door and the hoistway doors are operated by a door motor DM mounted on the car framework 21. This motor operates through reduction gearing arranged in casing 22 to drive an operating cam 24. This cam operates a lever 25 through the intermediary of a roller 26. Lever 25 is connected by chain 27 to a lever 30 for operating the car door operating arm 32. A spring 37 biases the car door to closed position. A pair of door checks 42 and 43 are connected to arm 32 for cushioning the final opening and closing movements of the car door.

Another chain 44 is illustrated as connected to lever 25 from which it extends to a retiring cam 45. The cam is adapted when extended to engage roller 52 of bell crank lever 53 connected by tie rod 55 to a toggle lever 57 for operating the hoistway door. A spring 65 acts through the toggle lever to bias the door to closed position. A double acting door check 71 is connected for operation by lever 57 to cushion the final opening and closing movements of the hoistway door.

Limit switches are provided for controlling the operation of the door operating motor DM. For convenience it will be assumed that these switches are arranged in a casing 75 for operation as by cams rotated by the motor. These switches are shown in the wiring diagram, Figure 2. Car door contacts and hoistway door interlock contacts are not illustrated in this figure but are included in Figure 2.

To open the doors, motor DM is energized for rotation in a direction to effect clockwise movement of cam 24. This pushes lever 25 clockwise which acts through chain 27 to pull lever 30 clockwise. Thus car door operating arm 32 is swung clockwise and acts through its link connections to the car door sections to open the car door. Lever 25 also acts through chain 44 to lift retiring cam 45. Bell crank lever 53 is thus swung in a direction to push upwardly on tie rod 55. Thus toggle lever 57 is operated to break the toggle and to pull the hoistway door to open position. As the doors reach open position, the door open limit switch in casing 75 causes deenergization of motor DM to bring it to a stop. The contour of cam 24 is such as to give the desired acceleration, speed, and retardation during opening movement of the doors. The final opening movement of the doors is cushioned by their checks.

During opening movement of the doors, tension is placed in springs 37 and 65 which act to close the doors upon motor DM being energized for reverse rotative movement. Spring 37 acts directly on lever 32 to close the car door as reverse movement of motor DM takes place. Retiring cam 45 drops back as this reverse movement takes place which enables spring 65 to straighten out the toggle and thus close the hoistway door. Thus while the doors are spring closed, their closing movement can not take place any faster than permitted by motor DM. The final closing movement of the doors is cushioned by their checks and as the doors reach closed position, the door close limit switch opens to bring motor DM to a stop.

Referring now to Figure 2, the electromagnetic switches employed in the circuits which are shown are designated as follows:

D—Down direction switch
DC—Door close switch
DE—Door speed switch
DG—Direction holding switch
DO—Door open switch
DPX—Auxiliary door protective relay
DX—Auxiliary down direction switch
1E—First speed switch
2E—Second speed switch
GS—Auxiliary door relay
H—Field and brake switch
HSL—Fast speed leveling switch

HX—Auxiliary brake and field switch
IS—Incident to start relay
LB—Motion detecting switch
P—Potential switch
SE—Stop indication relay
U—Up direction switch
UX—Up auxiliary direction switch
XCS—Nudging relay

The electromagnetic switches are illustrated in deenergized condition. B designates the coil of the electromechanical brake.

Certain of the switches embodied in the circuits are mechanically actuated by car movement, as by a selector machine driven by the car as is well known in the art. This is the case of selector switch SLS6 which is one of a sequence of selector switches actuated at different distances from each floor at which a stop is made. The same is true of the door zone switches DZ which are closed in the leveling zones. LSW is the leveling switch which may also be provided on the selector machine. For convenience, switch LSW is illustrated as a bridging contact 70 representative of a plurality of contacting cams, one for each floor, for engaging contacts 71*u*, 72*u*, 73*u* and 74*u* for up leveling and contacts 71*d*, 72*d*, 73*d* and 74*d* for down leveling. A selector machine such as illustrated in the patent to Dunn et al. Number 2,074,578 may be utilized with the leveling mechanism arranged as shown in the patent to Larson Number 2,611,451. LS1 and LS2 are limit switches in the hoistway.

The door operated limit switches in casing 75 are designated DCL1, DCL2, DOL and DEL. Switch DCL1 is opened as the doors reach closed position. Switch DCL2 is opened in advance, say four inches, of closed position. Switch DOL opens as the doors reach closed position. Switch DEL is open within say one-half inch of door closed and door open positions. CDS are the car door contacts while HDS are the hoistway door interlock contacts.

The door operating motor is illustrated as a direct current motor, its armature being designated DMA and its field winding DMF. DOR and DCR are resistors for controlling the amount of current supplied to the door motor armature. The elevator hoisting motor is also a direct current motor, its armature designated MA and its field winding MF. HS is the hoisting sheave driven by the hoisting motor while CA and CO designate the car and counterweight respectively raised and lowered by the hoisting sheave. The hoisting motor armature is supplied with current at a variable voltage from the armature GA of a direct current generator. The separately excited field winding of the generator is designated GF. GFR is a resistor for controlling the strength of the generator field. C1 and C2 are the pulsing condensers, C1 for the advance door opening and C2 for the advance starting. CR1, CR2, CDR1 and CDR2 are resistors for controlling the charging and discharging of these condensers. Blocking rectifiers are designated RE.

It is assumed that the car is parked at a floor with the doors open. As a consequence, contacts CDS, one pair of interlock contacts HDS, and door limit switches DOL, DEL and DCL2 are open. It will also be assumed that the car is set for upward travel, this being indicated by the engagement of contacts DG1 of switch DG, the coil for which is not shown. The coil of switch IS also is not shown. It will be understood that this coil is energized through any suitable circuit arrangement to cause the operation of the switch incident to operations involved in initiating the starting of the car. Upon operation, switch IS engages contacts IS1, completing a circuit for the coil of door close switch DC. Switch DC operates to engage contacts DC2 and DC3 to complete a circuit for armature DMA of the door operating motor for a direction of rotation to effect the

closure of the doors. As the doors start to close, limit switch DOL closes to prepare for a subsequent reopening operation. As the doors move out of open position, switch DEL closes, completing a circuit through contacts HX2 for the coil of door speed switch DE. Switch DE operates to engage contacts DE3, short circuiting a portion of resistor DCR to increase the current supplied to the door motor armature for purposes of acceleration. It also engages contacts DE1 to establish a holding circuit.

As the doors near closed position, switch DCL2 closes, completing a circuit through contacts IS2 for the coil of auxiliary door relay GS. Relay GS operates to engage contacts GS1, connecting condenser C2 by way of contacts XCS1, DPX1 and LB1, rectifier RE2, contacts DG1 and switch LS1 across the coils of auxiliary direction switch UX and auxiliary brake and field switch HX. As will be explained later, due to the previous operation of the car, condenser C2 is in a charged state and thus causes a pulse of current to be supplied to the coils of these switches, causing their temporary operation. Switch HX engages contacts HX3 to complete a circuit for the coil of switch HSL. Switch HSL engages contacts HSL2 to short circuit a portion of resistor GFR. Switch UX engages contacts UX2 to complete the circuit for the coils of up direction switch U and field and brake switch H. Switches U and H engage contacts U2, U3 and H2 to complete a circuit for generator field winding GF, causing current to be supplied to the elevator hoisting motor. Also switch H engages contacts H1 to cause current to be supplied to brake release coil B, releasing the brake. As a result upward movement of the elevator car is initiated.

Along with the engagement of contacts IS1 to cause the closing of the doors and the closing of contacts by the car door as it reaches closed position, circuits are set up to cause operation of advancer mechanism on the selector machine, resulting in the closing of switch SLS6. Thus the running circuit through car door contacts CDS, hoistway door interlock contacts HDS and switch SLS6 is completed for the coils of relays UX and HX, maintaining these relays operated. The coils of switches 1E and 2E are not illustrated. These switches are controlled in any suitable manner to cause the engagement of contacts 1E2 and 2E3 to short circuit steps of resistor GFR in sequence to increase the excitation of the generator field winding. Further accelerating steps are provided as indicated by contacts X to bring the elevator hoisting motor to full speed.

As the doors reach closed position in the above sequence, door close limit switch DCL1 opens to break the circuit for the coil of switch DC. Switch DC drops out to separate contacts DC2 and DC3 to disconnect armature DMA from the supply lines. Also, it separates contacts DC1 to break the holding circuit for the coil of switch DE. After the running circuits are established the contacts of the leveling mechanism are retracted so as not to engage the bridging contacts (cams) 70, this being indicated for convenience by the separation of contacts 1E1 in this circuit to feed contacts 71*u* and 71*d*. Also, after the running circuits are established switch IS drops out to separate contacts IS2, disconnecting the coil of switch GS from the supply lines. Switch GS drops out to separate contacts GS1 and to engage contacts GS2 with the result that a charging circuit is established for condenser C2 through contacts CDS, HDS and GS2, rectifier RE3 and resistor CR2. Also, during the acceleration of the car, switch 2E operates to separate contacts 2E2 and engage contacts 2E1. Thus a charging circuit is also established for condenser C1 through contacts 2E1 and resistor CR1.

Assume now that a call has been picked up and that slowdown has been initiated in the sequence of bringing the car to a stop at the floor for which the call is registered. This involves the separation of contacts X and dropping out of switches 2E and 1E to separate contacts 2E3 and 1E2, in sequence as the car approaches the floor, inserting resistance GFR in steps in circuit with generator field winding GF to slow down the car. This operation is controlled by the selector machine to provide distance control of the slowdown. Switch 2E is dropped out considerably in advance of the arrival of the elevator car in the leveling zone. Upon dropping out, switch 2E also separates contacts 2E1 and engages contacts 2E2. Thus condenser C1 is disconnected from the supply lines and connected through contacts 2E2 and HSL1 and rectifier RE1 across the coil of door open switch DO. The condenser supplies a pulse of current to the door open switch coil, causing temporary operation of this switch. Upon operation, switch DO separates interlock contacts DO1 in circuit with the coil of switch DC and engages contacts DO2 and DO3, completing a circuit for armature DMA of the door operating motor for a direction of rotation to effect opening of the doors. Inasmuch as contacts DC1 and HX2 are now separated, switch DE is deenergized. Thus contacts DE2 are separated so that resistance DOR is in circuit with the door motor armature, causing this initial door opening operation to take place at slow speed.

As the car continues toward the floor, the leveling contacts are released for cooperation with the bridging contact 70 (cam for that floor), represented by the engagement of contacts 1E1. Movement of contact 70 as the car continues its movement results in its engaging contacts 74*u*, 73*u*, 72*u* and 71*u* in the order named. As the last mentioned contact, which is the up feed contact, is engaged, the car is considered as having entered the leveling zone. Switch SLS6 is set to open just after the car enters the leveling zone. Due to the motion of the switches and the door operating mechanism, this normally will occur before the separation of the door interlock contacts. This causes the disconnection of the coils of switches UX and HX from the supply lines. As a result these switches drop out to separate contacts UX2 and HX3. This does not cause the dropping out of switches U and H at this time as the circuit for these coils is maintained by the leveling switch. Also the leveling switch maintains switch HSL operated after the separation of contacts HX3. However, the engagement of contacts HX1 connects the coil of switch DO to the supply lines to maintain this switch operated, the circuit being through limit switch DOL and contacts SE1 of the stop indicating relay which are now engaged. The coil of switch SE is not shown but it is to be understood that this switch is controlled so as to drop out each time a stop is being made. The circuit for the coil of switch DO also extends through the door zone switches DZ. The door zone switches may be operated by the leveling cams as set forth in the aforementioned Larson patent. The time of operation of the door zone switches with reference to the selector switch SLS6 depends upon the characteristics of the particular installation. Also the closing of door limit switch DEL as the doors leave closed position completes a circuit through contacts HX2 for the coil of switch DE. Switch DE operates to engage contacts DE2, short circuiting a portion of resistor DOR to increase the opening speed of the doors. As the doors reach open position, limit switches DEL and DOL open to drop out switches DE and DO. Switch DE separates contacts DE2 to insert resistance DOR in circuit with armature DMA of the door operating motor and switch DO operates contacts DO2 and DO3 to disconnect the armature from the supply lines. This brings the doors to a stop in open position.

As the doors are being opened, the leveling mechanism acts to bring the car to a stop at the landing level. In the approach of the car to the landing in the leveling zone, contact 70 moves off contact 74*u*, breaking the circuit for the coil of switch HSL. This switch drops out, separating contacts HSL2 to insert a further portion of resistance GFR in circuit with the generator field winding, further slowing down the car. Also, contacts HSL1 separate to disconnect the coil of switch DO from

across condenser C1, the coil being maintained energized by way of contacts HX1. As the car reaches the landing, contact 70 runs off contact 72*u*, breaking the circuit for the coils of switches U and H. These switches drop out to disconnect generator field winding GF and brake release coil B from the supply lines, causing the car to be brought to a stop at the landing level.

It is believed that the operation of the system in case of down car travel will be understood from the above without detailed description.

In the advance initiation of the door opening operation, should the car not reach the leveling zone to cause the opening of switch SLS6 and thus the dropout of switch HX within a certain time after the start of the initiation, condenser C1 discharges to a point where it is no longer capable of holding switch DO in operated condition. As a result, switch DO drops out to stop the advance door opening operation. Thus is obviated the opening of the doors too soon in the sequence of operations involved in bringing the car to a stop at a landing level. In addition, the dropping out of switch HSL as contact 70 moves off contact 74*u*, separates contacts HSL1 to disconnect condenser C1 from across the coil of switch DO, insuring the dropping out of this switch by the opening of limit switch DOL as the doors reach open position. The control of the duration of the pulse of current supplied by condenser C1 to the coil of switch DO is through bleeder resistance CDR1. In case of an emergency stop, contacts P1 of the potential switch P (the coil of which is not shown) engage to short circuit a portion of resistance CDR1. This causes a quick discharge of condenser C1 to obviate an advance door opening operation in case of an emergency stop. It may be desirable for certain installations to connect a condenser C4 across switch SLS6 and the coils of switches UX (or DX) and HX to prevent the dropout of these switches should door contacts CDS or HDS open before switch SLS6 opens.

In the advance initiation of the starting operation, should switch SLS6 not close to complete the running circuit for the coils of switches UX (or DX) and HX within a certain time after the start of the initiation, condenser C2 is disconnected from across the coil of switches UX (or DX) and HX. This is effected by the utilization of the leveling switch as a motion detector. Assume that, in an advance starting operation in the up direction, there is before the closing of switch SLS6 sufficient car movement (say one-half inch) to cause contact 70 to engage contact 72*d*. This completes a circuit through contacts GS4 and rectifier RE6 for the coil of motion detector switch LB. This switch operates to separate contacts LB1, disconnecting condenser C2 from the coils of switches UX and HX. As a result these switches drop out to discontinue the advance starting operation. In so doing, the separation of contacts UX2 to drop out switch U results in the engagement of interlock contacts U1 to enable a circuit to be completed by the leveling switch by way of contact 72*d* for the coils of switches D and H to return the car to the floor level. This obviates movement of the car due to advance initiation of the starting to more than say one-half inch from the floor. Switch UX (or DX), upon operation, also engages contacts UX1 (or DX1) to connect resistance CDR2 across condenser C2 to bleed the condenser. This insures that the condenser will not be able to hold in these switches for a duration to cause more than say one inch of car movement away from the floor, should for some reason switch LB fail to function. Here again as switch UX (or DX) drops out, the leveling mechanism acts to return the car to the floor. When switch LB operates, it also engages contacts LB2 to short circuit a portion of bleeder resistance CDR2 to effect the quick discharge of the condenser.

Should a person catch the door after the closing of switch DCL2 and cause operation of detector mechanism, such for example as disclosed in the patent to Bruns et al., No. 2,634,828, contacts DPX1 separate to disconnect condenser C2 from the coils of switches UX (or DX) and HX, thus preventing or stopping the advance starting operation. Similarly should the doors fail to reach closed position within a certain time say after the operation of switch IS, relay XCS drops out to separate contacts XCS1, preventing advance start initiation. When switch IS operates, it separates contacts IS3, disconnecting the coil of relay XCS from the supply lines. Relay XCS is delayed in dropping out by the discharge of condenser C3. This relay corresponds to switch DT of the aforesaid Bruns et al. patent and is similarly controlled to provide a "nudging" operation of the doors as explained in that patent.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. An elevator system comprising; an elevator car serving a plurality of landings; closure means controlling access to the car at a landing; means for operating said closure means; first circuit controlling means operable by said closure means as it reaches closed position; additional circuit controlling means operable by said closure means as it reaches a point a certain distance in advance of closed position; and transitory means operable for a predetermined transitory period in response to operation of said additional circuit controlling means for initiating the starting movement of the car, said first circuit controlling means acting, provided it is operated before the transitory period expires, to continue car movement.

2. An elevator system comprising, a first movable body in said system; a second movable body in said system; circuit controlling means operable by said first movable body as it reaches a certain point in its movement; control means subject to the operation of said circuit controlling means for controlling operation of said second movable body; and additional circuit controlling means operable by said first movable body as it reaches another certain point in movement ahead of the first mentioned point for causing transitory operation of said control means, said first named circuit controlling means upon operation prior to the end of said transitory operation acting to maintain said control means operated.

3. An elevator system comprising; an elevator car serving a plurality of landings; closure means controlling access to the car at a landing; means for operating said closure means; circuit controlling means operable by said closure means as it reaches closed position; an electromagnetic switch operable to cause the starting of the car, the circuit for the coil of said switch being subject to the closing of said circuit controlling means; and means responsive to movement of said closure means in closing to within a certain distance of closed position for causing the transitory supply of current to said coil and thus causing the operation of said switch to initiate the starting of the car prior to the closing of said circuit controlling means.

4. An elevator system comprising; an elevator car serving a plurality of landings; closure means controlling access to the car at a landing; means for operating said closure means; circuit controlling means operable by said closure means at it reaches closed position; a source of current; an electromagnetic switch operable to cause the starting of the car; a circuit subject to the operation of said circuit controlling means for connecting the coil of said switch to said source; second circuit controlling means operable by said closure means as it arrives within a certain distance of closed position; and means respon-

sive to said operation of said second circuit controlling means for causing without bypassing the first named circuit controlling means the transitory supply of current to said coil to initiate the starting of the car prior to the closure means reaching closed position.

5. An elevator system comprising; an elevator car serving a plurality of landings; closure means controlling access to the car at a landing; means for operating said closure means; circuit controlling means operable by said closure means as it reaches closed position; an electromagnetic switch operable to cause the starting of the car, the circuit for the coil of said switch being subject to the closing of said circuit controlling means; means responsive to movement of said closure means in closing to within a certain distance of closed position for causing the temporary supply of current to said coil to cause operation of said switch to initiate starting of the car prior to the closing of said circuit controlling means; and means for preventing the continuance of said temporary supply of current to said coil for more than a certain time interval after such current is initially supplied.

6. An elevator system comprising; an elevator car serving a plurality of landings; closure means controlling access to the car at a landing; means for operating said closure means; circuit controlling means operable by said closure means as it reaches closed position; a source of continuous current supply; an electromagnetic switch operable to cause the starting of the car; a circuit subject to the operation of said circuit controlling means for connecting the coil of said electromagnetic switch to said source; a source of non-continuous current supply; second circuit controlling means operable by said closure means as it arrives within a certain distance of closed position; and a second circuit subject to the operation of said second circuit controlling means for connecting the coil of said switch to said source of non-continuous current supply to initiate the starting of the car prior to the closing of said closure means.

7. An elevator system comprising; an elevator car serving a plurality of landings; closure means controlling access to the car at a landing; means for operating said closure means; circuit controlling means closed by said closure means upon said closure means reaching closed position; means subject to the closing of said circuit controlling means for causing the starting of the car; and means responsive to said closure means in closing reaching a certain distance from closed position for causing the transitory operation of said starting means to initiate the starting of the car prior to the closing of said circuit controlling means, said circuit controlling means in closing prior to the end of said transitory operation acting to maintain said starting means operated.

8. An elevator system comprising; an elevator car serving a plurality of landings; closure means controlling access to the car at a landing; means for operating said closure means; circuit controlling means operable by said closure means as it reaches closed position; an electromagnetic switch operable to cause the starting of the car, the running circuit for the coil of said switch being subject to said circuit controlling means; a condenser; and means responsive to movement of said closure means in closing to within a certain distance of closed position for causing the discharge of said condenser into said coil and thus causing the operation of said switch prior to the closing of said circuit controlling means to initiate the starting of the car during the final closing movement of said closure means.

9. An elevator system comprising; an elevator car serving a plurality of landings; closure means controlling access to the car at a landing; means for operating said closure means; circuit controlling means closed by said closure means upon said closure means reaching closed position; an electromagnetic switch operable to cause the starting of the car, the running circuit for the coil of said switch being subject to said circuit controlling means; a condenser; means responsive to said closure means in closing reaching a certain distance from closed position for causing the discharge of said condenser into said coil and thus causing the operation of said switch, prior to the closing of said circuit controlling means, to initiate the starting of the car during the final closing movement of said closure means; and means responsive to a certain amount of movement of the car for discontinuing the discharge of said condenser into said coil to cause dropout of said switch in the event that said circuit controlling means is not then closed.

10. An elevator system comprising; an elevator car serving a plurality of landings; closure means controlling access to the car at a landing; means for operating said closure means; circuit controlling means closed by said closure means upon said closure means reaching closed position; an electromagnetic switch operable to cause the starting of the car, the running circuit for the coil of said switch being subject to said circuit controlling means; a condenser; means responsive to said closure means in closing reaching a certain distance from closed position for causing the discharge of said condenser into said coil and thus causing the operation of said switch to initiate the starting of the car during the final closing movement of said closure means prior to the closing of said circuit controlling means; and means responsive to the operation of said switch for insuring the discharge of said condenser to prevent more than a limited amount of movement of the car before the closing of said circuit controlling means.

11. An elevator system comprising; an elevator car serving a plurality of landings; means for causing the car to be brought to a stop within a certain zone with respect to each landing; closure means controlling access to the car at each landing; means for operating said closure means; circuit controlling means closed by said closure means upon said closure means reaching closed position; an electromagnetic switch operable to cause the starting of the car, the running circuit for the coil of said switch being subject to said circuit controlling means; a condenser; means responsive to said closure means in closing reaching a certain distance from closed position for causing the discharge of said condenser into said coil and thus causing the operation of said switch, prior to the closing of said circuit controlling means, to initiate the starting of the car during the final closing movement of said closure means; means responsive to movement of the car out of said zone for disconnecting said condenser from said coil to cause dropout of said switch in the event that said circuit controlling means is not then closed; and means responsive to the operation of said switch for bleeding said condenesr to insure the discharge thereof sufficiently to drop out said switch in the event of failure of said disconnecting means.

12. An elevator system comprising; an elevator car serving a plurality of landings; closure means controlling access to the car at a landing; means for operating said closure means; means adapted upon operation to cause operation of said closure operating means to open said closure means; means responsive to the arrival of the car at a certain distance from the landing for causing the transitory operation of said first named means to initiate the opening of said closure means; and closure control means operable as the car arrives at a less distance from said landing and adapted upon operation prior to the end of said transitory operation to maintain said first named means operated to continue the closure means opening operation.

13. An elevator system comprising; an elevator car serving a plurality of landings; closure means controlling access to the car at a landing; means for operating said closure means; means adapted upon operation to cause operation of said closure operating means to open said closure means; means responsive to the arrival of the car at a certain distance from the landing for causing the

transitory operation of said first named means to initiate the opening of said closure means and to cause the opening of said closure means to be at a slow speed; and closure control means operable as the car arrives at a less distance from said landing and adapted upon operation prior to the end of said transitory operation to maintain said first named means operated to continue the closure means opening operation and upon operation after the end of said transitory operation to cause reoperation of said first named means to cause opening of said closure means, and acting to cause said opening operation to take place at a faster speed.

14. An elevator system comprising; an elevator car serving a plurality of landings; closure means controlling access to the car at a landing; means for operating said closure means; means including an electromagnetic switch adapted upon operation to cause operation of said closure operating means to open said closure means; means responsive to the arrival of the car at a certain distance from the landing for causing the transitory supply of current to the coil of said switch to cause transitory operation of said switch to initiate the opening of said closure means; and closure control means operable as the car arrives at a less distance from said landing and adapted upon operation prior to the end of said transitory operation to maintain the supply of current to said coil and thus said switch operated to effect the completion of the closure means opening operation.

15. An elevator system comprising; an elevator car serving a plurality of landings; closure means controlling access to the car at a landing; means for operating said closure means; means including an electromagnetic switch adapted upon operation to cause operation of said closure operating means to open said closure means; closure control means responsive to the arrival of the car at a certain distance from the landing for causing current to be supplied to the coil of said switch to cause operation of said switch to cause the opening of said closure means; and means operable as the car arrives at a greater distance from said landing for causing transitory supply of current to said coil and thus the transitory operation of said switch to effect the initiation of the closure means opening operation prior to the operation of said closure control means, said closure control means acting if its operation occurs prior to the end of said transitory operation to maintain the operation of said switch.

16. An elevator system comprising; an elevator car serving a plurality of landings; closure means controlling access to the car at a landing; means for operating said closure means; means including an electromagnetic switch adapted upon operation to cause operation of said closure operating means to open said closure means; means responsive to the arrival of the car at a certain distance from the landing for causing the transitory supply of current to the coil of said switch to cause the transitory operation of said switch to initiate the opening of said closure means; means for causing said initial opening of said closure means to occur at a slow speed; closure control means operable as the car arrives at a less distance from said landing for causing current to be supplied to said coil, thus maintaining said switch operated if the car arrives at said less distance before the end of the transitory operation of said switch and causing reoperation of said switch if said car arrives at said less distance after the end of the transitory operation of said switch to cause the closure means to be moved to full open position; and means for closing the closure means opening operation under the control of said closure control means to take place at a faster speed.

17. An elevator system comprising; an elevator car serving a plurality of landings; closure means controlling access to the car at a landing; means for operating said closure means; means including an electromagnetic switch adapted upon operation to cause operation of said closure operating means to open said closure means; a condenser; means responsive to the arrival of the car at a certain distance from the landing for causing the discharge of said condenser into the coil of said switch to cause the transitory operation of said switch to initiate the opening of said closure means; and closure means operable as the car arrives at a less distance from said landing for causing current to be supplied to said coil, thus maintaining said switch operated if the car arrives at said less distance before the end of the transitory operation of said switch and causing reoperation of said switch if said car arrives at said less distance after the end of the transitory operation of said switch, thereby causing the closure means to be moved to full open position.

18. An elevator system comprising; an elevator car serving a plurality of landings; closure means controlling access to the car at a landing; means for operating said closure means; means including an electromagnetic switch adapted upon operation to cause operation of said closure operating means to open said closure means; a condenser; means responsive to the arrival of the car at a certain distance from the landing for causing the discharge of said condenser into the coil of said switch to cause the transitory operation of said switch to initiate the opening of said closure means; closure control means operable as the car arrives at a less distance from said landing for causing current to be supplied to said coil, thus maintaining said switch operated if the car arrives at said less distance before the end of the transitory operation of said switch and causing reoperation of said switch if said car arrives at said less distance after the end of the transitory operation of said switch thereby causing the closure means to be moved to full open position; and means responsive to the arrival of the car at a still less distance from said landing for disconnecting said condenser from across said coil of said switch.

19. An elevator system comprising; an elevator car serving a plurality of landings; closure means controlling access to the car at a landing; means for operating said closure means; closure opening control means adapted upon operation to cause operation of said closure operating means to open said closure means; leveling mechanism operable within a certain zone with respect to each landing at which a stop is being made to cause the car in stopping to be brought to the landing level; means responsive to the arrival of the car at a certain distance from the landing ahead of said zone for causing the transitory operation of said closure opening control means to initiate the opening of said closure means prior to the arrival of said car in said zone; and closure control means operable in said zone and adapted upon operation prior to the end of said transitory operation to maintain said closure opening control means operated to continue the closure means opening operation to open said closure means as the car is being brought to the landing by said leveling mechanism.

20. An elevator system comprising; an elevator car serving a plurality of landings; closure means controlling access to the car at a landing; means for operating said closure means; means including an electromagnetic switch adapted upon operation to cause operation of said closure operating means to open said closure means; leveling mechanism operable within a certain zone with respect to each landing at which a stop is being made to cause the car in stopping to be brought to the landing level; a condenser; means responsive to the arrival of the car at a certain distance from the landing ahead of said zone for connecting said condenser across the coil of said switch to cause operation thereof by the discharge of said condenser and thus operation of said closure opening control means to initiate the opening of said closure means prior to the arrival of said car in said zone; closure control means operable in said zone at a certain distance from the landing and adapted

upon operation prior to the end of said transitory operation to cause current to be supplied to said coil to maintain said switch and thus said closure opening control means operated to continue the closure means opening operation to open said closure means as the car is being brought to the landing by said leveling mechanism; and means operable in said zone at a less distance from the landing to disconnect said condenser from across the coil of said switch.

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