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ELEVATOR SYSTEMS HAVING DISPATCHING DEVICES
AND INFORMATION ANNOUNCING MEANS

2,722,672

Filed May 15, 1953

7 Sheets-Sheet 1

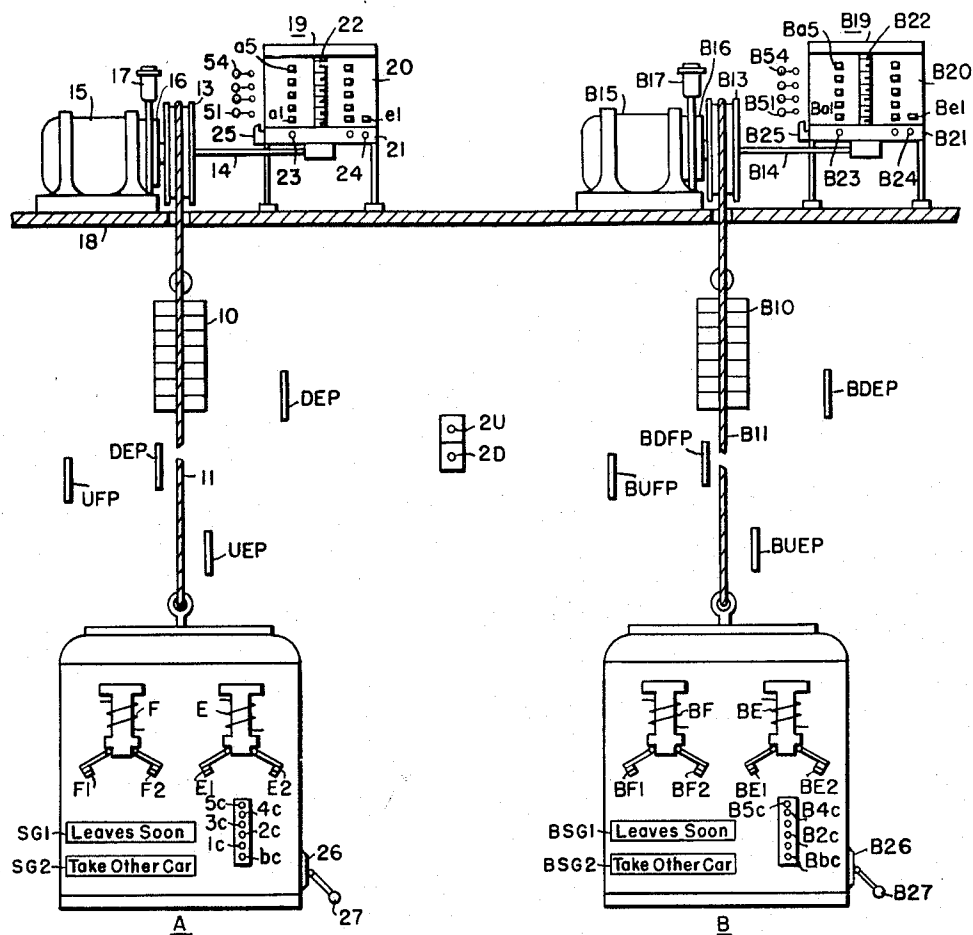


Fig. 1.

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7 Sheets-Sheet 4

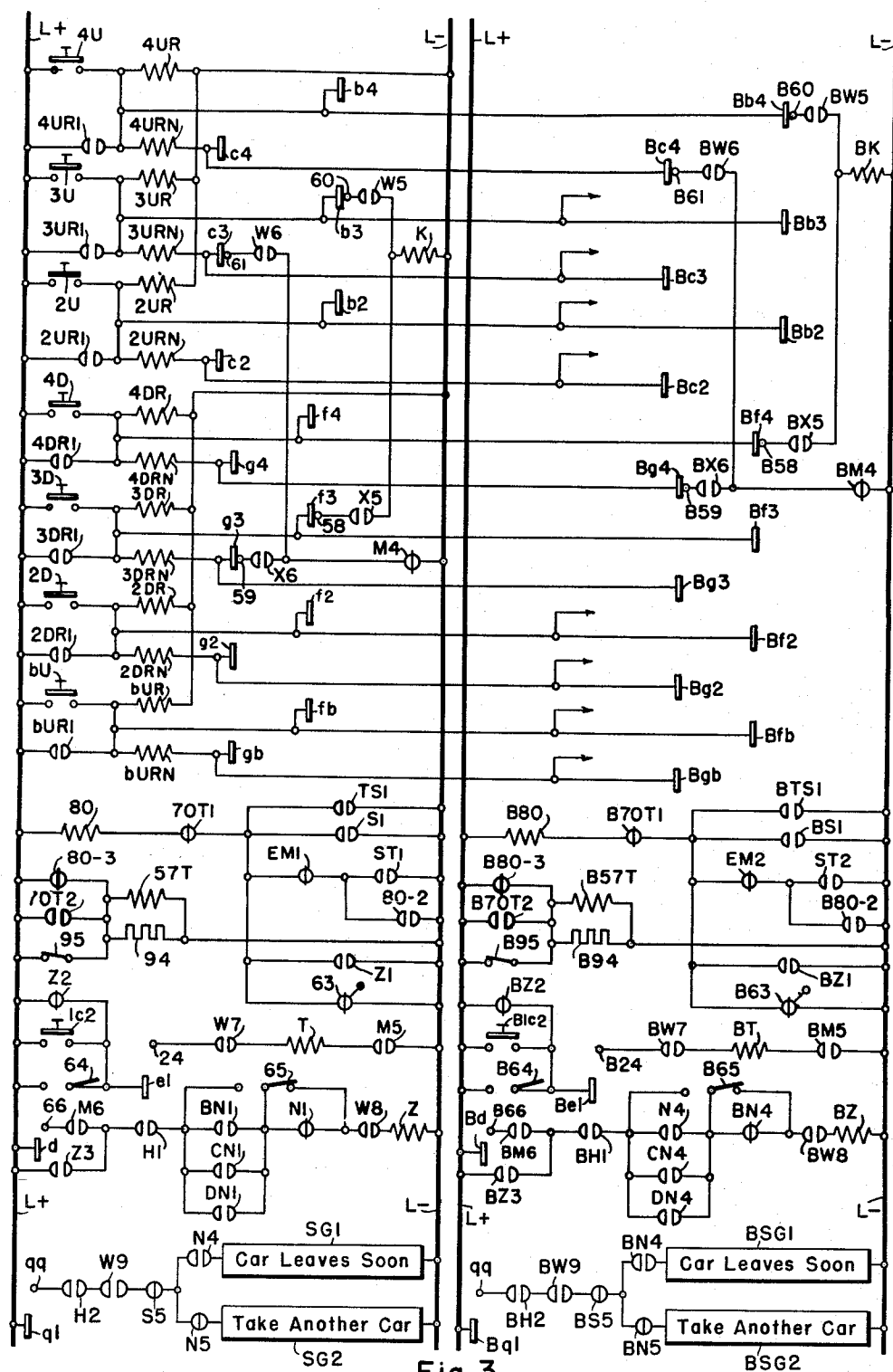


Fig. 3.

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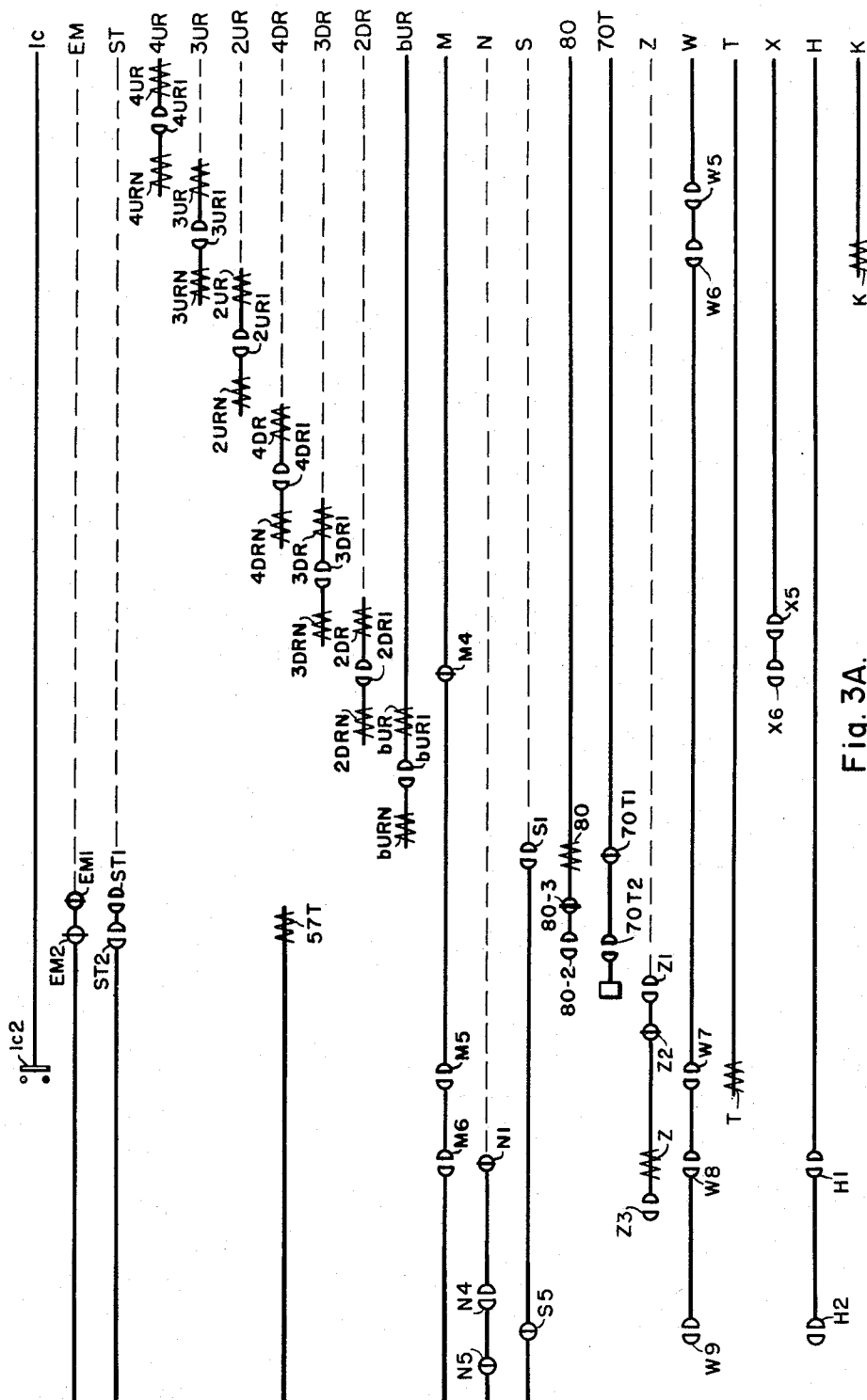


Fig. 3A.

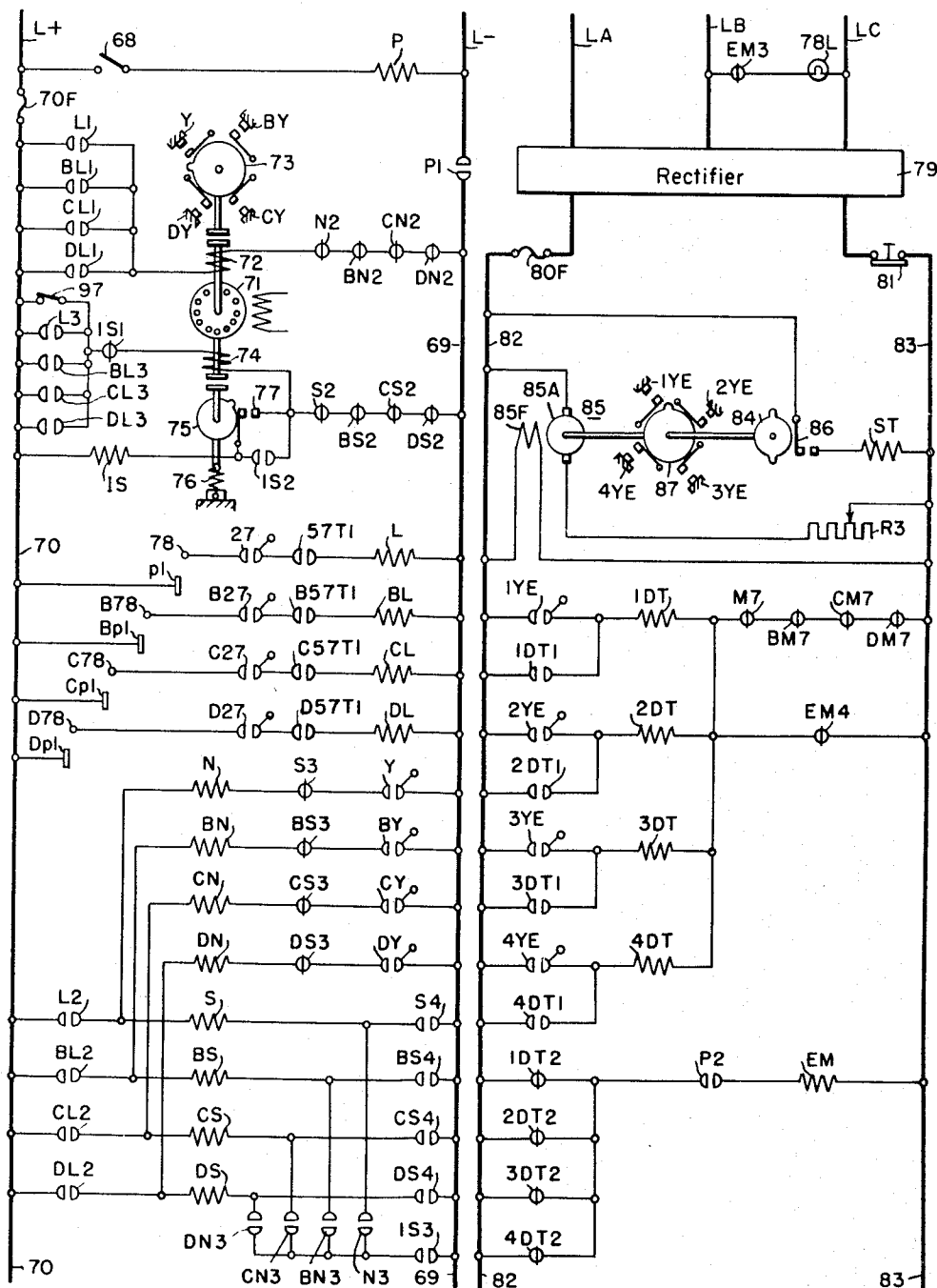
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7 Sheets-Sheet 6



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Fig. 4.

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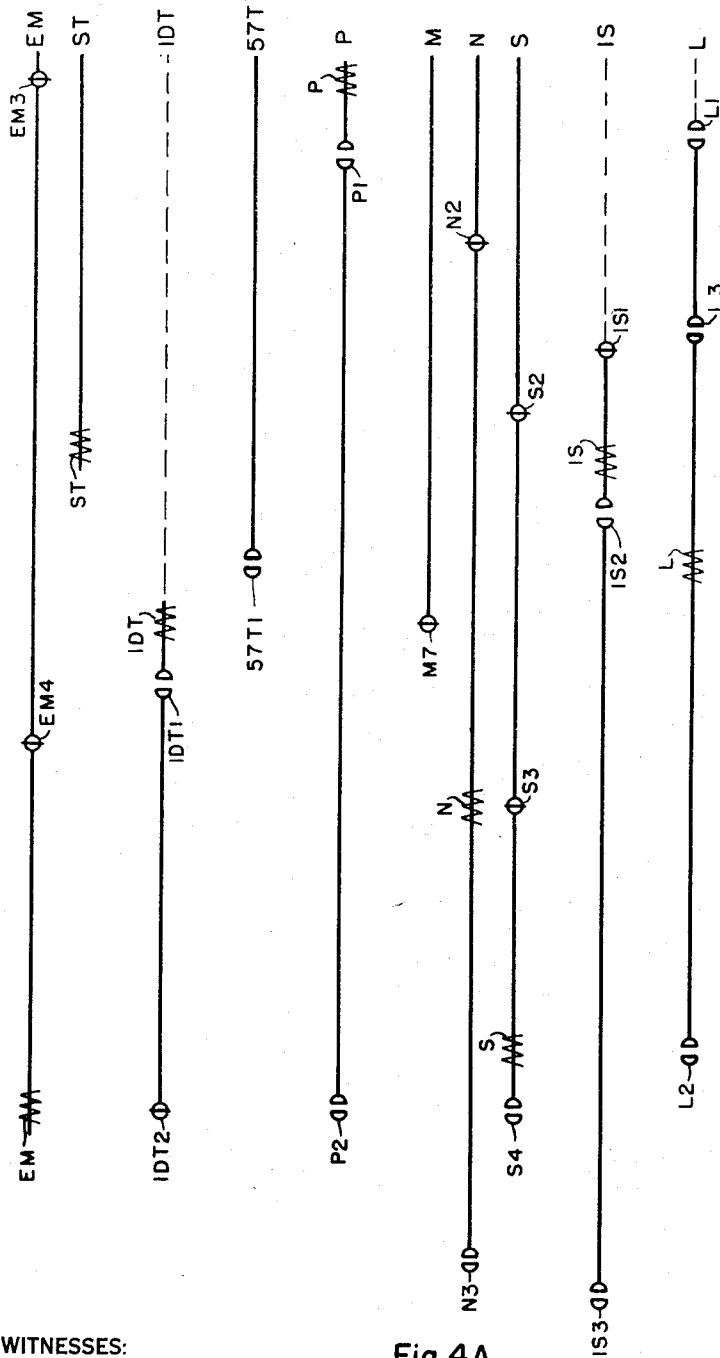


Fig. 4A.

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2,722,672

ELEVATOR SYSTEMS HAVING DISPATCHING DEVICES AND INFORMATION ANNOUNCING MEANS

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Application May 15, 1953, Serial No. 355,348

19 Claims. (Cl. 340—20)

This invention relates to elevator systems having dispatching devices and it has particular relation to elevator systems wherein a plurality of automatically-operated cars are dispatched from a dispatching floor.

In large building structures it is common practice to provide an elevator system wherein a plurality of elevator cars are arranged for operation in a bank. The cars may be operated by attendants or they may be automatically operated. In order to insure efficient service, dispatching devices may be provided for dispatching elevator cars successively from a dispatching floor.

Delays in providing elevator service for passengers or prospective passengers of an elevator car cause confusion and decrease the efficiency of the elevator system. This is true in some cases for elevator systems employing a single elevator car and it is true in some cases for elevator systems employing attendants in the elevator cars for supervising the operation of the elevator cars. However, the effect of such delays is particularly troublesome in elevator systems employing a plurality of elevator cars arranged for operation in a bank and for elevator systems wherein no attendants are employed in the elevator cars for supervising the operation of the elevator cars.

In order to illustrate the nature of delays encountered in elevator systems attention may be directed to an elevator system employing a bank of elevator cars arranged for operation without attendants. It will be assumed that the elevator cars are successively dispatched from a dispatching floor which may be the street or first floor of a building.

In conventional dispatcher operation it is the practice to select each of the elevator cars to leave a dispatching floor. Following such selection the selected elevator car remains at the dispatching floor for a substantial time. This time is preferably sufficient to permit loading of the elevator car and may be of the order of 30 seconds or more. Upon the expiration of the loading time the elevator car is started from the dispatching floor.

If a person enters the elevator car immediately after the elevator car is selected as the next car to leave the dispatching floor he may be forced to wait for a substantial time before the elevator car is started. This delay may lead the person to believe that the elevator car is not in operating condition, particularly if no car attendant is present in the elevator car.

For a further example, let it be assumed that a person enters an elevator car at the dispatching floor before the elevator car is selected as the next car to leave the dispatching floor. Since a person will not receive reasonably prompt elevator service for the reason that one or more other elevator cars may be selected to leave the dispatching floor before his elevator car is selected.

In accordance with the invention, an elevator car is provided with information-conveying means for the guidance of persons desiring to use the elevator car. Thus, if the elevator car is selected as the next car to leave the dispatching floor the information-conveying means may

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advise persons entering the car that the car has been selected to leave the dispatching floor soon. Although the information-conveying means may be operating continuously following the selection of the elevator car, preferably it is brought into operation only after a person enters the elevator car. Such operation tends to call the person's attention to the information.

The invention also contemplates the provision of information-conveying means for advising a person entering an elevator car at the dispatching floor which is not selected to leave the dispatching floor that another elevator car has been selected to leave the dispatching floor. As a result of such information, the person may proceed to the selected elevator car for prompt transportation to his desired destination. Although such information may be conveyed continuously until an elevator car is selected to leave the dispatching floor, preferably the information is conveyed only after a person enters the elevator car.

It is, therefore, an object of the invention to provide an elevator system having improved supervision for persons desiring elevator service.

It is a further object of the invention to provide an elevator system wherein a person in an elevator car is advised that a desired operation will be provided.

It is another object of the invention to provide an elevator system wherein a person in an elevator car which will not provide prompt service is advised that another elevator car will provide the desired service.

It is a still further object of the invention to provide an elevator system wherein a person entering an elevator car at a dispatching floor which is selected to leave the dispatching floor will be so informed and a person entering an elevator car which is not selected to leave the dispatching floor will be advised that another elevator car has been selected to leave the dispatching floor.

Other objects of the invention will be apparent from the following description taken in conjunction with the accompanying drawings, in which:

Figure 1 is a schematic view with parts in elevation of an elevator system which may embody the invention;

Figs. 2, 3 and 4 are schematic views including circuits in straight-line form of a control system embodying the invention; and

Figs. 2A, 3A and 4A are key representations of electromagnetic relays and switches employed in the circuits of Figs. 2, 3 and 4. If Figs. 2, 3 and 4 are horizontally aligned respectively with Figs. 2A, 3A and 4A, it will be found that coils and contacts of the switches and relays appearing in the key representations are horizontally aligned with the corresponding coils and contacts shown in these circuits.

The invention herein presented is assumed to be incorporated in an elevator system of the general type disclosed in my copending patent application, Serial No. 303,506, filed August 9, 1952, issued as Patent No. 2,695,077 on November 23, 1954, and entitled Elevator System Having Dispatching Devices, of which the present patent application is a continuation-in-part.

Although the invention may be incorporated in an elevator system employing various numbers of elevator cars serving buildings or structures having various numbers of floors, the invention can be described adequately with reference to an elevator system having four elevator cars serving a building having six floors. The elevator cars may be dispatched from any desired floors. For present purposes, it will be assumed that the building includes a basement floor and five floors located above the basement floor. The elevator cars will be assumed to be dispatched between the first floor and the upper terminal or fifth floor. Although the elevator cars normally operate between the first and fifth floors, they

may be conditioned to proceed to the basement floor.

Because of the complexity of such systems, certain conventions have been adopted. The elevator cars will be identified by the reference characters A, B, C and D. Since the circuits for the cars are similar, substantially complete circuits are shown for the cars A and B. Components associated with the cars C and D are discussed only as required.

Components associated with the elevator cars B, C and D which correspond to a component of the elevator car A are identified by the same reference character employed for the component of the elevator car A preceded by the letters B, C and D, respectively. For example, the reference characters U, BU, CU and DU designate up switches, respectively, for the elevator cars A, B, C and D.

The various relays and switches employed in the circuits may have break or back contacts which are closed when the relay is deenergized and dropped out. The break contacts are open when the relays or switches are energized and picked up.

The relays and switches also may have front or make contacts which are opened when the switches and relays are deenergized and dropped out. These contacts are closed when the switches and relays are energized and picked up. In the drawings the various switches and relays are shown in so far as possible in their deenergized and dropped-out conditions.

Each set of the contacts associated with a relay or switch is identified by the reference character associated with the relay or switch followed by a numeral identifying the specific set of contacts. Thus, the reference characters U1, U2 and U3 designate, respectively, the first, second and third sets of contacts of the up switch U.

In order to facilitate the presentation of the invention, the apparatus shown in the figures will be briefly set forth, and the operation of the complete system thereafter will be discussed. The system includes in part the following apparatus:

Apparatus specific to car A:

V—speed relay
U—up switch
M—car-running relay
D—down switch
G—holding relay
E—slowdown inductor relay
F—stopping inductor relay
W—up-preference relay
X—down-preference relay
70T—timing relay
H—car-call-above relay
TT—car-call stopping relay
K—floor-call stopping relay
80—main starting relay
T—auxiliary stopping relay
Z—expediting relay
L—car-position relay
N—loading relay
S—auxiliary starting relay
57T—second timing relay

Apparatus common to all cars:

2DR to 5DR—down floor-call storing relays
bUR and 2UR to 4UR—up floor-call storing relays
EM—emergency relay
ST—emergency starting relay
1DT to 4DT—emergency control relays

Figure 1

Fig. 1 illustrates the structural relationships of the elevator cars A, B and associated apparatus with reference to the building structure which the elevator cars are intended to serve.

The elevator car A and a counterweight 10 are secured

to opposite ends of a rope or cable 11 which passes over a sheave 13. The sheave 13 is mounted on the shaft 14 of an elevator driving motor 15. The shaft 14 also carries a brake drum 16 with which a brake 17 of the conventional spring-applied electrically-released type is associated. The motor 15 is secured to the floor 18 of a penthouse located in the structure which the elevator car is intended to serve.

In order to simplify the association of control circuits with the elevator car A, a control device 19 is provided which is operated in accordance with a function of the movement of the elevator car A. In the specific embodiment of Fig. 1, the control device takes the form of a floor selector which includes an insulating panel 20 and a brush carriage 21. A screw 22 is mounted for rotation relative to the panel 20. This screw conveniently may be coupled through suitable gearing to the shaft 14 for rotation in accordance with movement of the elevator car A.

The brush carriage 21 is in threaded engagement with the screw 22. As the elevator car A moves upwardly, the brush carriage 21 is moved upwardly but at a rate much slower than the rate of movement of the elevator car. Similarly, when the elevator car A moves downwardly, the brush carriage 21 also moves downwardly at a slower rate.

The panel 20 carries a plurality of contact segments which are insulated from each other. Thus, the contact segments a1 to a5 are arranged in a row on the panel 20. As the elevator car proceeds upwardly from the basement, a brush 23 mounted on the carriage 21 successively engages the contact segments a1 to a5, as the elevator car approaches respectively the floors 1 to 5 of the structure. It will be understood that the contact segments a1 to a5 are spaced from each other in accordance with the spacings of the floors. As will be pointed out below, these contact segments are employed with circuits controlling the stopping of the elevator car during up travel in response to car calls.

As a further example, the panel 20 has a single contact segment e1 which is engaged by a brush 24 mounted on the carriage 21 only when the elevator car A is adjacent the first or dispatching floor. As will be pointed out below, this contact segment is employed in controlling the operation of a dispatching device.

It will be understood that a number of rows of contact segments and a number of brushes may be employed in the floor selector. However, the foregoing discussion is believed sufficient to illustrate the mechanical relationships of these contact segments and brushes.

The brush carriage also may include a cam 25 which is positioned to operate mechanical switches, such as the switches 51 to 54, during movement of the brush carriage relative to the panel 20. The cam 25 has a length sufficient to bridge the operating members for two successive mechanical switches. These switches are employed in the car-call-above circuits for the elevator car A, which will be described in the discussion of Fig. 2.

Certain apparatus is mounted on or in the elevator car A. Thus, car-call buttons bc and 1c to 5c are provided for registering car calls for the basement and first to fifth floors, respectively.

A slowdown inductor relay E is provided for the purpose of initiating a slowdown of the elevator car A as it approaches a floor at which it is to stop. The inductor relay may be of conventional construction and includes two sets of break contacts E1 and E2. When the coil of the inductor relay E is energized, the contacts remain in the position illustrated in Fig. 1 until the relay is adjacent an inductor plate located in the hoistway of the elevator car A. For example, when the coil of the inductor relay E is energized and the inductor relay is adjacent the magnetic plate UEP for the second floor, the magnetic circuit is completed, which results in opening of the break contacts E1. When open, the contacts remain open until the coil of the inductor relay E is deenergized. The inductor

plate UEP is positioned to be reached by the inductor relay E as the elevator car approaches the second floor for the purpose of initiating slowdown of the elevator car. It will be understood that a similar inductor plate is similarly associated with each of the floors at which the elevator car is required to stop during up travel.

If the coil of the inductor relay E is energized during down travel of the elevator car, and if the relay reaches the inductor plate DEP for the second floor, a magnetic circuit is completed which results in opening of the break contacts E2. When opened, the contacts remain open until the coil is deenergized. The inductor plate DEP is so positioned that it initiates slowdown of the elevator car A a suitable distance from the second floor. A similar inductor plate would be similarly associated with each of the floors at which the elevator car A is to stop during down travel.

The elevator car A also carries a stopping inductor relay F which is similar in construction to the inductor relay E. This relay is employed for initiating a stopping operation of the elevator car A. The stopping inductor relay F cooperates with inductor plates UFP and DFP in a manner which will be clear from the discussion of the cooperation of the slowdown inductor relay with the inductor plates UEP and DEP. If the coil of the relay F is energized and if the elevator car is to stop at the second floor while traveling up, when the inductor relay F reaches the inductor plate UFP a magnetic circuit is completed which results in opening of the break contacts F1. This initiates a stopping operation of the elevator car. An inductor plate similar to the plate UFP is similarly associated with each of the floors at which the elevator car A is to stop during up travel thereof. If the elevator car A during down travel is to stop at the second floor, the coil of the stopping inductor relay F is energized, and when the inductor relay reaches the inductor plate DFP for the second floor, a magnetic circuit is completed which results in opening of the contacts F2. This initiates a stopping operation of the elevator car A. It will be understood that an inductor plate similar to the inductor plate DFP is similarly associated with each of the floors at which the elevator A is to stop during down travel thereof.

The elevator car A also carries a cam 26 which is positioned to operate a mechanical switch 27 located in the hoistway associated with the elevator car. The mechanical switch 27 normally is open and is closed by the cam 26 when the elevator car A is adjacent the first or dispatching floor. It will be understood that other mechanical switches may be operated in a similar manner by the elevator car A.

Certain information is conveyed to passengers within the elevator cars. For example, if the elevator car A is selected as the next car to leave a dispatching floor a sign SG1 is illuminated or is illuminated after one of the car-call push buttons is operated, to inform passengers that the car will leave shortly. Any suitable legend may be employed in the sign for this purpose. If the elevator car A is not selected as the next car to leave, another sign SG2 may be illuminated, or may be illuminated in response to operation of a car-call push button, to indicate by any suitable legend that another car will leave first or that the passengers should take another car. Similar signs are disclosed in the John Suozzo et al. copending applications, Serial Nos. 342,821 and 342,822 filed March 17, 1953, and entitled "Elevator Systems" of which this patent application is a continuation-in-part.

An intending passenger on the second floor may register a floor call for elevator car service in the up direction by pressing a button of a push-button switch 2U. A similar push-button switch is located at each of the floors from which an intending passenger may desire to proceed in an up direction.

If the intending passenger at the second floor desires to proceed in a down direction, he may press the button

of a push-button switch 2D located at the second floor. A similar push-button switch is located at each of the floors from which an intending passenger may desire to proceed in a down direction.

Figure 2

Fig. 2 shows circuits for the driving motor, the brake, the speed relay V, the up switch U, the down switch D, the car-running relay M, the holding relay G, the slowdown inductor relay E, the stopping inductor relay F, the up-preference relay W, the down-preference relay X, the timing relay 70T, the car-call above relay H and the car-call stopping relay TT. Energy for the various circuits is derived from direct-current buses L+ and L-.

Although various motor control circuits may be employed, it will be assumed that a control circuit of the variable-voltage type is employed. By inspection of Fig. 2, it will be noted that the armature 15A of the driving motor 15 and the armature 29A of a direct-current generator 29, together with a series field winding 29B for the generator, are connected in a series or loop circuit. The field winding 15B for the driving motor 15 is connected directly across the buses L+ and L-.

The magnitude and direction of energization of the driving motor 15 are controlled by the direction and magnitude of the energization of a separately-excited field winding 29C provided for the generator 29. It will be understood that the armature 29A of the generator is rotated at a substantially constant rate by a suitable motor (not shown).

When the elevator car A is conditioned for up travel, the generator field winding 29C is connected across the buses L+, L- through make contacts U2 and U3 of the up switch. When the elevator car A is conditioned for down travel, the generator field winding 29C is connected across the buses through the make contacts D2 and D3 of the down switch. The energizing circuit for the field winding may include a resistor R1 which is shunted by make contacts V1 of the speed relay V. By inspection of Fig. 2, it will be observed that the contacts U2, U3, D2 and D3 constitute in effect a reversing switch for controlling the direction of energization of the field winding. The resistors R1 and the contacts V1 are provided for controlling the magnitude of energization of the field winding.

The speed relay V may be energized through either of two circuits. One of the circuits includes make contacts U4 of the up switch U, a limit switch 30 which is normally closed and which is opened as the elevator car A nears the upper limit of its travel and the break contacts E1 of the slowdown inductor relay E. The other circuit is completed through make contacts D4 of the down switch D, mechanical limit switch 31 which is normally closed and which is opened as the elevator car nears the lower limit of its travel in the down direction, and break contacts E2 of the slowdown inductor relay.

As previously pointed out, the brake 17 normally is spring-biased into engagement with the brake drum 16 and is released by energization of a brake coil 17B. The coil may be energized either through make contacts U1 of the up switch U or through make contacts D1 of the down switch D.

In order to energize the car-running relay M, certain safety devices 33 must be in their safe conditions. Such safety devices may include switches which are open when the doors of the elevator car and the associated hoistway doors are open, and which are closed when the doors are closed. Such safety devices are well known in the art. The car-running relay M may be energized through either of two circuits. One of the circuits includes the make contacts 80-1 of the starting relay 80, make contacts W1 of the up-preference relay W, break contacts F1 of the stopping inductor relay, normally-closed contacts of a mechanical limit switch 34 which are opened when the car nears the upper limit of its travel, and the

coil of the up switch U. When energized, the up switch U closes its make contacts U5 to complete a holding circuit around the contacts 80-1 and W1.

The second circuit for energizing the car running relay M includes the contacts 80-1 of the starting relay, make contacts X1 of the down-preference relay X, break contacts F2 of the inductor stopping relay, normally-closed contacts of a mechanical limit switch 35 which are opened as the elevator car nears the lower limit of its travel in the down direction and the coil of the down switch D. When the down switch D is energized, make contacts D5 are closed to provide a holding circuit around the contacts 80-1 and X1.

Before the holding relay G and the inductor relays E and F can be energized, make contacts M1 of the car-running relay must be closed. In addition, any one set of make contacts TT1 of the car-call stopping relay, T1 of the auxiliary stopping relay and K1 of the floor-call stopping relay must be energized. A holding circuit around these contacts is established upon closure of the make contacts G1. Energization of the inductor stopping relay F further requires closure of the break contacts V2 of the speed relay.

The up-preference relay W is energized only if the elevator car is not operating in the down direction (break contacts D6 are closed); the elevator car is not conditioned for down travel (break contacts X2 are closed); and normally-closed contacts of a mechanical limit switch 36 are closed. The mechanical limit switch 36 is opened as the elevator car reaches its upper limit of travel.

Energization of the down-preference relay X requires closure of the break contacts U6 of the up switch, closure of the break contacts W2 of the up-preference relay, and closure of the normally-closed contacts of a mechanical limit switch 37. The mechanical limit switch 37 is open when the elevator car A is adjacent the first or dispatching floor.

If the elevator car is to serve a basement floor, the energizing circuit for the down-preference relay also includes normally-closed contacts of a mechanical limit switch 38. This switch is opened as the elevator car reaches the basement floor. In order to permit the elevator car to pass the first floor during its down travel to serve the basement floor, the limit switch 37 may be shunted by contacts bc1 of a basement car-call button or by make contacts bUR2 of a basement up floor-call storing relay. Similar shunting contacts Bbc1 and bUR4 are associated with the limit switch B37 for the elevator car B.

When the elevator car A comes to a stop at a floor, it is prevented from restarting for a time determined by the time required for a timing relay 70T to drop out when deenergized. The time delay in dropout may be provided in any suitable manner as by connection of a resistor R2 across the coil of the electromagnetic relay 70T. The relay is energized through make contacts M2 of the car-running relay.

The car-call push buttons 1c to 5c and bc normally are biased into their open positions. Each of the push buttons is provided with a holding coil 1cc to 5cc and bcc, which is effective for holding the associated push button in its operated condition following a manual operation of such push button. To this end, the push buttons may be made of magnetic material. Such construction of the push buttons is well known in the art.

Each of the push buttons 1c to 4c controls the connection of contact segments to the bus L+. Thus, when operated, the push button 1c connects the contact segment h1 to the bus L+. When operated, the push button 2c connects the contact segments a2 and h2 to the bus L+. The push buttons 3c and 4c similarly connect contact segments for the third and fourth floors to the bus L+. As will be pointed out below, the push button 1c also operates an additional set of contacts 1c2 which are employed in circuits shown in Fig. 3. The push button 1c

operates not only the contacts bc2 which assist in controlling connections of the contact segment h1 but the previously mentioned contacts bc1 which are associated with the down preference relay. Inasmuch as the elevator car is assumed to stop at the fifth floor or upper terminal floor at all times during up travel, the contact segment a5 is permanently connected to the bus L+. Similarly, during down travel, the elevator car A always stops when it reaches the basement floor, and the contact segment hb for the basement is permanently connected to the bus L+.

It will be understood that the contact segments a1 to a5 are arranged in a row on the floor selector 19 of Fig. 1 and are successively engaged by a brush 23 as the elevator car moves from its lower limit to its upper limit of travel. In a similar manner, the contact segments h4 to hb are arranged in a row in the order of the floors for successive engagement by a brush 40 as the elevator car moves from the upper terminal to its lower limit of travel.

During up travel of the elevator car A, the car-call stopping relay TT is connected between the brush 23 and the bus L- through make contacts W3 of the up-preference relay and make contacts M3 of the car-running relay. Consequently, when the brush 23 reaches one of the contact segments a1 to a5 which is connected to the bus L+, the car-call stopping relay TT is connected for energization across the buses L+ and L- for the purpose of stopping the elevator car at the next floor reached by the car. As the elevator car stops, the brush 23 preferably passes slightly beyond the associated contact segment.

When the elevator car A is conditioned for down travel, the car-call stopping relay TT is connected between the brush 40 and the bus L- through the make contacts X3 of the down-preference relay and the make contacts M3 of the car-running relay. Consequently, when the brush 40 reaches one of the contact segments h4 to hb which is connected to the bus L+, the car-call stopping relay TT is energized to initiate a stopping operation of the elevator car at the next floor reached by the car. As the elevator car stops, the brush 40 preferably passes slightly beyond the associated contact segment.

The mechanical switches 51 to 54 are connected in a circuit for energizing the car-call above relay H only if a car-call exists for a floor above the position of the elevator car. In order to prevent energization of the relay H by calls registered for floors below the position of the elevator car, the cam 25 maintains open any of the mechanical switches corresponding to the floor at which the elevator car is located and to a floor immediately below the position of the elevator car. It will be noted that the relay H is connected between the bus L- and a brush 56. The brush 56 is mounted on the carriage 21 of the floor selector shown in Fig. 1, and has a length sufficient to bridge successive contact segments in the row a1 to a5. The elevator car in Fig. 2 is assumed to be at the third floor. The brushes 23 and 40 engage contact segments associated with the third floor, whereas the brush 56 engages the contact segment a4 which is associated with the fourth floor. The connections of the mechanical switches 51 to 54 will be clear by inspection of Fig. 2.

The coils 1cc to 5cc and bcc are connected in series for energization either through make contacts W4 of the up-preference relay or make contacts X4 of the down-preference relay. When the elevator car reverses its direction of travel, the make contacts W4 and X4 both are momentarily opened to deenergize the associated holding coils for the purpose of resetting the car-call push buttons.

Figure 3

In Fig. 3, circuits are illustrated for the purpose of controlling the energization of the floor call stopping relay K, the starting relay 80, the auxiliary stopping relay T and the expediting relay Z.

When the down floor-call push button 2D is operated, the down floor-call storing relay 2DR is connected there-through across the buses L+ and L- for energization. Upon energization, the relay closes its make contacts 2DR1 to establish a holding circuit around the push button. The contact segment f2 now is connected (and corresponding contact segments for the remaining elevator cars are connected) through the contacts 2DR1 to the bus L+. The contact segments f4, f3 and fb similarly are connected to the bus L+ by operation of the down floor-call push buttons 4D, 3D and bU. The contact segments f4, f3, f2 and fb for the fourth, third, second and basement floors are positioned in a row on the floor selector 19 of Fig. 1 for successive engagement by a brush 58 as the elevator car A moves from the upper terminal in a down direction.

The floor-call stopping relay K is connected between the bus L+ and the brush 58 through make contacts X5 of the down preference relay. Consequently, if the elevator car A approaches the second floor during a down trip while a down floor call is registered for such floor, the engagement of the contact segment f2 by the brush 58 completes an energizing circuit for the floor-call stopping relay K.

Each of the down floor-call storing relays 4DR, 3DR, 2DR and bUR has an operating coil and a cancelling coil, respectively, 4DRN, 3DRN, 2DRN and bURN, which is energized in opposition to the energization of the operating coil. The cancelling coil 2DRN is connected between a contact segment g2 (and similar contact segments Bg2 etc. for the other elevator cars) and the bus L+ through the make contacts 2DR1. As the elevator car A reaches the second floor, the following energizing circuit for the cancelling coil is established:

L+, 2DR1, 2DRN, g2, 59, X6, M4, L-

Energization of the coil 2DRN opposes energization of the relay by the operating coil and resets the relay. It will be understood that the contact segments g4, g3, g2 and gb are arranged in a row for successive engagement by the brush 59 as the elevator car proceeds downwardly from the upper terminal floor to control the energization of the cancelling coils 4DRN, 3DRN, 2DRN and bURN.

The down floor-call storing relays together with the up floor-call registering relay bUR all cooperate with the brushes 58 and 59 in substantially the same manner to control the energization of the floor-call stopping relay during down travel of the elevator car. Although the basement floor-call storing relay registers a call for the up direction, it stops the elevator car during down travel and consequently is associated with the brushes 58 and 59.

When the up floor-call push button 2U is operated, the up floor-call storing relay 2UR is connected for energization there-through across the buses L+ and L-. Upon operation, the relay closes its make contacts 2UR1 to establish a holding circuit around the push button 2U. As a result, a contact segment b2 is connected (and contact segments Bb2 etc. for the other elevator cars are connected) to the bus L+ through such make contacts.

As the elevator car during up travel approaches the second floor, the brush 60 engages the contact segment b2 to establish the following energizing circuit for the floor-call stopping relay:

L+, 2UR1, b2, 60, W5, K, L-

This conditions the elevator to stop at the second floor. As the elevator car stops at the second floor, a brush 61 engages the contact segment c2 to establish the following circuit for the cancelling coil of the storing relay 2UR:

L+, 2UR1, 2URN, c2, 61, W6, M4, L-

Such energization of the cancelling coil results in resetting of the storing relay which has its main coil acting

in opposition to the cancelling coil. The up floor-call push buttons 3U and 4U similarly control the associated storing relays and contact segments. It will be understood that the contact segments c2, c3 and c4, and contact segments b2, b3 and b4 are arranged in rows on the floor selector for engagement successively by the brushes 61 and 60, as the elevator car A proceeds upwardly.

The starting relay 80 can be energized only if the timing relay 70T is deenergized and dropped out to close its break contacts 70T1. When the elevator car is positioned at the lower dispatching floor, the energizing circuit for the starting relay normally is completed through the make contacts S1 of an auxiliary starting relay. At the upper terminal or dispatching floor, make contacts TS1 may operate in a manner similar to the operation of the contacts S1 for the lower dispatching floor to start the elevator car from the upper terminal floor. Between the dispatching floors, the make contacts S1 are shunted by the contacts of a mechanical switch 63. This switch is open when the elevator car is adjacent the upper terminal or dispatching floor and the lower dispatching floor. For all other positions of the elevator car A, the switch 63 is closed.

If the elevator car is located at the lower dispatching floor, an emergency starting circuit under certain conditions may be established through break contacts EM1 of an emergency relay EM and make contacts ST1 of an emergency starting relay ST. The latter contacts are shunted by make contacts 80-2 of the starting relay.

The energization of the main starting relay 80 further is controlled by make contacts Z1 of an expediting relay. Under certain conditions, the relay Z operates to expedite movement of the elevator car in an up direction past the first floor.

When the elevator car A is at the basement floor, the auxiliary stopping relay T controls the stopping of the elevator car at the first floor. For the auxiliary stopping relay T to be energized, the elevator car A must be conditioned for movement (make contacts M5 are closed); the elevator car must be conditioned for up travel (make contacts W7 are closed); and the elevator car A must have reached the basement floor (the brush 24 engages the contact segment e1 as the elevator car A leaves the basement floor).

In addition, the energization of the auxiliary stopping relay has three additional controls. If the manually-operated switch 64 is closed, the conditions set forth in the preceding paragraph suffice to energize the auxiliary stopping relay. However, if the manually-operated switch 64 is open, as illustrated in Fig. 3, the conditions set forth in the preceding paragraph suffice to energize the auxiliary stopping relay only if break contacts Z2 of the expediting relay Z are closed, or if a car call for the first floor is registered in the elevator car A, which results in closure of the push-button contacts 1c2. When energized, the auxiliary stopping relay causes the elevator A to stop at the first floor.

The conditions under which the expediting relay Z may be energized are controlled in part by a manually-operated switch 65. Conveniently, the switches 64 and 65 may be connected for simultaneous operation from the positions illustrated in Fig. 3 to their alternate positions. When the switch 65 occupies the position illustrated in Fig. 3, shunting the break contacts N1 of the loading relay, the expediting relay Z may be energized, provided the elevator car is conditioned for up travel (make contacts W8 are closed); one of the other cars has been selected as the next car to leave the lower dispatching floor (make contacts BN1, CN1 or DN1 are closed); a car call is registered for a higher floor (make contacts H1 are closed); the elevator car is conditioned to move (make contacts M6 are closed); and the elevator car A is adjacent the basement floor (a brush 66 engages a contact segment d when the elevator

car A is adjacent the basement floor. These components are located on the floor selector). Upon energization, the expediting relay closes its make contacts Z3 to establish a shunt around the contacts M6, the contact segment *d* and the brush 66.

When the switch 65 is operated into its alternate position, it shunts the contacts BN1, CN1 and DN1. Under these circumstances, it is immaterial whether one of the remaining cars has or has not been selected as the next car to leave the dispatching floor. However, energization of the expediting relay now takes place only if the elevator car A has not been selected as the next car to leave the dispatching floor (break contacts N1 of the loading relay for the elevator car A are closed).

When a starting operation of an elevator car is initiated, the elevator car may fail to start for various reasons. For example, in an automatic system, the door of an elevator car may be held open. Because of the safety devices associated with the elevator door, the elevator car is prevented from starting until the door is released.

When an elevator car is prevented from starting, it may be desirable to modify the operation of the system. Such modification may be introduced by a second timing relay 57T which is provided in any suitable manner with a delay in dropout. For example, the time delay in dropout may be provided by a resistor 94 which is connected across the coil of the second timing relay.

If the modification in system operation introduced by the relay 57T is not required, the relay may be connected continuously across the buses L+ and L- through a manually-operated switch 95. This switch is connected in parallel with break contacts 80-3 of the main starting relay and make contacts 70T2 of the timing relay.

If the switch 95 is opened, and if a starting operation of the elevator car A is initiated, the main starting relay picks up to open its break contacts 80-3. Such opening deenergizes the coil of the second timing relay 57T and the relay starts to time out. If the elevator car starts before the relay has timed out, the timing relay 70T picks up to close its make contacts 70T2. Such closure re-energizes the coil of the second timing relay 57T to prevent dropout thereof.

However, if the elevator car A is prevented from starting for any reason for a sufficient time, the second timing relay 57T drops out to modify the operation of the system in a manner which will be discussed below.

For present purposes, it will be assumed that the manually-operated switch 95 is closed.

It will be recalled that signs SG1 and SG2 are provided in the elevator car A of Fig. 1 for the purpose of conveying suitable information to persons entering the elevator car at the dispatching floor. Circuits for operating these signs are illustrated in the lower portion of Fig. 3.

It will be understood that the information-conveying means SG1 and SG2 may be of any suitable construction. For example, a sound record may be employed which when operated conveys the desired intelligence to the persons within the elevator car. However, in a preferred embodiment of the invention, the information-conveying means takes the form of signs which are not noticeable in one condition of the sign but which are noticeable in the operating condition of the sign. This sign preferably takes the form of a legend having illuminating means associated therewith. In non-operated condition, the illuminating means is deenergized. In operated condition, the illuminating means is energized to bring the legend to the attention of persons within the elevator car.

The sign SG1 is intended to be illuminated only if the elevator car A is selected to leave the lower dispatching floor. To this end, the sign can be illuminated only if the make contacts N4 of the load relay N (shown in Fig. 4) are closed.

Although the sign SG1 may be illuminated as long as the contacts N4 are closed, preferably the energizing circuit for the sign is designed to permit illumination of the

sign only if the elevator car is at the lower dispatching floor. To this end, a contact segment *q1* is provided which is engaged by a brush *qq* only when the elevator car A is at the lower dispatching floor. It will be understood that the contact segment *q1* and the brush *qq* may be incorporated in the floor selector 19 of Fig. 1.

Further improvement in the operation of the sign may be obtained by provision of break contacts S5 (Fig. 3) of the auxiliary starting relay S (shown in Fig. 4). As soon as the elevator car A is conditioned to start from the lower dispatching floor in the up direction, the break contacts S5 open to prevent energization of the signs SG1 and SG2.

To assure that the sign can be energized only when the elevator car A is set for up travel at the lower dispatching floor, make contacts W9 of the up-preference relay W are included in the energizing circuit for the sign.

Although the sign SG1 may be maintained in its operated or illuminated condition as long as the elevator car A is selected to leave the lower dispatching floor, preferably the sign is illuminated only after a person enters the elevator car. To this end, make contacts H2 are provided in the energizing circuit for the sign. These contacts may be closed in any suitable manner when a person enters the elevator car. For example, the elevator car may have a load-weighing platform which is operated by the entry of a passenger into the car to close the contacts H2. However, in a preferred embodiment of the invention, the make contacts H2 are operated by the car-call-above relay H which is illustrated in Fig. 2.

From the foregoing description, it will be clear that if the elevator car is at the lower dispatching floor, the brush *qq* is in engagement with the contact segment *q1*. If the elevator car is set for up travel, the make contacts W9 are closed. If the elevator car A is selected as the next car to leave the lower dispatching floor, the make contacts N4 are closed. Since the elevator car has not yet been started from the lower dispatching floor, the break contacts S5 are closed. Under these circumstances, if a passenger enters the elevator car and registers a car call for a floor above the position of the elevator car, the make contacts H2 close to complete the following circuit:

L+, *q1*, *qq*, H2, W9, S5, N4, SG1, L-

The sign SG1 now is illuminated to advise the passenger that the elevator car will leave the dispatching floor shortly. Consequently, even though the elevator car A fails to leave for the full loading interval, which may be of the order of 30 seconds, the passenger remains in the elevator car and is ultimately carried to his destination.

In the event that elevator car A is not selected to leave the dispatching floor, the sign SG2 may be illuminated for the purpose of directing the person within the elevator car A to another elevator car.

If the elevator car A is not selected to leave the lower dispatching floor, the break contacts N5 are closed. If desired, the sign SG2 may be energized continuously through these contacts until the elevator car is selected to leave the dispatching floor. Preferably, however, the sign SG2 is illuminated only if a person enters the elevator car A. To this end, the energizing circuit for the sign SG2 is completed through the previously mentioned contacts H2, W9 and S5 and through the brush *qq* and the contact segment *q1*. The circuits for the signs SG1 and SG2 are clearly illustrated in Fig. 3.

Figure 4

On the left half of Fig. 4, a dispatching device is illustrated which normally controls the dispatching of the elevator cars employed in the system. On the right half of Fig. 4, an emergency dispatching device is illustrated which is automatically effective if the main dispatching device fails to operate.

When the dispatching device is to be employed, a

manually-operated switch 68 is closed to connect a relay P across the buses L+ and L-. Upon energization of the relay P, the make contacts P1 close to connect a conductor 69 to the bus L-. Conductor 70 may be connected to the bus L+ through a fuse 70F.

The selection and timing mechanism include as one component a motor 71 which operates substantially at constant speed. This may be of any suitable type, but for the present purposes it will be assumed that the motor is a squirrel-cage alternating-current motor which is energized from a suitable source of alternating current. The motor 71 is connected through a spring-released electromagnetically-applied clutch 72 to a cam 73 having a protuberance for successively operating mechanical switches Y, BY, CY and DY which are associated with the respective elevator cars. The electromagnetic clutch can be energized only if one or more elevator cars are located at the dispatching floor which is assumed to be the first floor (one or more of the contacts L1, BL1, CL1, DL1 are closed), and if no elevator car has been selected as the next car to leave the dispatching floor (break contacts N2, BN2, CN2 and DN2 all are closed).

The motor 71 also may be coupled through a spring-released electromagnetically-applied clutch 74 to a cam 75 which is biased towards a predetermined position by a spring 76. The cam 75, when coupled to the motor 71, is rotated against the bias of the spring to close normally-open contacts 77 a predetermined time after the cam 75 is coupled to the motor 71. The clutch 74 can be electrically energized only if no elevator car is being started (break contacts S2, BS2, CS2 and DS2 are closed), and if the break contacts 1S1 of the holding relay 1S are closed. The energization of the clutch 74 assumes that the manually-operated switch 97 is closed. If this switch is open, one of the sets of make contacts L3, BL3, CL3 and DL3 of the car position relays must be closed before the clutch can be energized. For present purposes, it will be assumed that the manually-operated switch 97 is closed. The holding relay 1S is energized upon closure of the contacts 77 to close its make contacts 1S2 for the purpose of establishing a holding circuit around the contacts 77.

The presence of an elevator car at the dispatching floor is determined by the energization of a car-position relay for each of the elevator cars. Thus, a car-position relay L for the elevator car A is energized when a brush 78 engages a contact segment p1, when a normally-open mechanical switch 27 is closed and when the make contacts 57T1 of the second timing relay are closed. For present purposes, it will be assumed that the contacts 57T1 are continuously closed. The mechanical switch 27 is closed only when the elevator car A is adjacent the dispatching floor.

The brush 78 is operated by the floor selector for the elevator car A to engage the contact segment p1 when the elevator car is at the dispatching floor. Although unlikely, it is conceivable that the floor selector may be out of step with the associated elevator car A. Under such circumstances, the brush 78 does not engage the contact segment p1 when the elevator car A is at the dispatching floor. Consequently, if the floor selector is out of step, the car position relay L cannot be energized, and the elevator car A will not be dispatched from the dispatching floor.

If the elevator car A is at the dispatching floor (make contacts L2 are closed), if it has been selected as the next car to leave the dispatching floor (switch Y is closed), and if it is not being started (break contacts S3 are closed), the loading relay N for the elevator car A is energized. The loading relay may be employed in a conventional way to permit loading of the elevator car A. For example, the loading relay when energized may operate a loading signal, such as a lamp, which indicates that passengers may enter the elevator car.

If desired, the loading relay N when energized may open the normally-closed doors of the elevator car A to permit entry of passengers into the elevator car.

After the expiration of a time sufficient for cam 75 to close the contacts 77 and energize the relay 1S, the make contacts 1S3 close to complete the following circuit:

70, L2, S, N3, 1S3, 69

The relay S when energized closes its make contacts S4 to establish a holding circuit around the contacts N3 and 1S3, and starts the elevator car A from the dispatching floor.

As previously pointed out, an emergency dispatching device also is illustrated in Fig. 4. Although the same source of power may be employed for the dispatching devices, preferably a separate source is employed for the emergency device. This source is illustrated in Fig. 4 as a three-phase alternating-current source represented by conductors LA, LB and LC. When the emergency dispatching device controls the starting of the elevator cars, break contacts EM3 close to connect a signal device, such as a lamp 78L across the conductors LB and LC to indicate the failure of the main dispatching device.

Energy from the three-phase conductors LA, LB, LC may be rectified by a conventional rectifier 79. The direct current output of the rectifier is supplied through a fuse 80F and a manually-operated switch 81 to conductors 82 and 83.

The emergency dispatching device includes a timer in the form of a cam 84 which is continuously rotated by a suitable motor, such as a direct-current motor 85 having an armature 85A connected across the conductors 82 and 83 through an adjustable resistor R3. The motor has a field winding 85F which is connected directly across the conductors 82 and 83. The continuously rotating cam 84 closes contacts 86 at suitable intervals. For example, the contacts may be biased normally open and may be closed at thirty-second intervals. The contacts 86 control the energization of an emergency starting relay ST.

The motor 85 also rotates a cam 87 which successively closes normally-open contacts 1YE, 2YE, 3YE and 4YE.

If the main dispatching device fails, the elevator cars soon come to a stop at the dispatching floor. Under these circumstances, the car-running relays for all of the cars are deenergized and the break contacts M7, BM7, CM7 and DM7 all are closed. As the cam 87 rotates, the associated switches 1YE, 2YE, 3YE and 4YE are successively closed to complete energizing circuits for the emergency control relays 1DT, 2DT, 3DT and 4DT. For example, when the contacts 1YE close, an energizing circuit is completed for the relay 1DT which closes its make contacts 1DT1 to establish a holding circuit around the contacts 1YE.

Break contacts 1DT2, 2DT2, 3DT2 and 4DT2 of the emergency control relay are connected in parallel for the purpose of controlling the energization of the emergency relay EM. If all of the emergency control relays are energized, the emergency relay EM is deenergized to condition the emergency dispatching device to dispatch the elevator cars. Under such circumstances, the break contacts EM3 are closed to illuminate the signal 78 which indicates that the main dispatching device has failed. The break contacts EM4 are closed to by-pass the contacts M7, BM7, CM7 and DM7. The contacts EM1 and EM2 (of Fig. 3) are closed to place the starting relays 80 and B80 under the control of the emergency starting relay contacts ST1 and ST2 at the dispatching floor.

The emergency dispatching device now operates to dispatch all of the elevator cars from the dispatching floor. Thereafter, the dispatching device operates at intervals determined by the energization and pick up of relay ST

to dispatch any of the elevator cars which is at the dispatching floor.

If desired, make contacts (not shown) of the emergency relay EM may be included in the energizing circuit for each of the signs SG1, SG2, BSG1, BSG2. As long as the system is under control of the emergency dispatcher such make contacts are open to prevent energization of the signs.

Referring again to the emergency relay EM of Fig. 4, it should be noted that this relay can be energized only if the make contacts P2 are closed. If the power source for the main dispatching device fails, the relay P is de-energized and the make contacts P2 promptly open to deenergize the emergency relay EM. Consequently, the emergency dispatching device is placed into operation promptly for the purpose of dispatching the elevator car.

When the emergency device once takes control of the dispatching functions, it continues in operation until the main dispatching device is repaired, and the switch 81 is manually opened for a short time to reset the emergency dispatching device (which is accomplished by the drop out of relays 1DT, 2DT, 3DT and 4DT).

Normal dispatcher operation

In order to explain the overall operation of the elevator system, it will be assumed first that the elevator cars are at the first or dispatching floor when the system initially is energized. The cars will be assumed to be conditioned for operation in the up direction. For example, the elevator car A has its up-preference relay W energized. Consequently, make contacts W1, W3, W4, W5, W6, W7, W8 and W9 of the relay are closed, whereas break contacts W2 of the relay are open.

Referring to Fig. 4, closure of the switch 68 energizes the relay P. This relay closes its make contacts P1 to connect the conductors 69 and L—. The relay also closes its make contacts P2 to energize the emergency relay EM through the closed contacts 1DT2 to 4DT2.

The energized emergency relay EM opens its make contacts EM1 and EM2 (Fig. 3) and opens its break contacts EM3 and EM4 (Fig. 4).

The motor 71 is energized to rotate at a substantially constant rate.

Inasmuch as the elevator cars are assumed to be at the dispatching floor, the car-position relays are energized. For example, the car-position relay L is energized through the circuit:

70, p1, 78, 27, L, 69

It should be noted at this point that the energization of the relay L does not take place if the floor selector for the car A is out of step. Should the floor selector be out of step, the brush 78 would be displaced from the contact segment p1 when the elevator car A is at the dispatching floor. Under these circumstances, the car-position relay L could not be energized, and the elevator car A would remain at the dispatching floor.

As a result of its energization the carposition relay L closes its make contacts L2 to prepare certain circuits for subsequent energization. In addition, the make contacts L1 close to complete the following circuit for the clutch 72:

70, L1, 72, N2, BN2, CN2, DN2, 69

The clutch now couples the motor 71 to the cam 73 for the purpose of successively closing and opening the associated mechanical switches. It will be assumed that the first switch reached by the cam is the switch Y for the elevator car A. Closure of this switch completes the following energizing circuit for the loading relay of the elevator car A:

70, L2, N, S3, Y, 69

It will be assumed that the loading relay N upon energization initiates opening of normally-closed doors of the elevator car A to permit intending passengers on the

dispatching floor to enter the elevator car. In addition, the loading relay N opens its break contacts N1 (Fig. 3) without affecting operation of the system at this time. Opening of the break contacts N2 (Fig. 4) deenergizes the clutch 72. Consequently, the cam 73 is uncoupled from the motor 71. The make contacts N3 close to prepare the starting relay S for subsequent energization.

Referring to Fig. 3, it will be noted that the pickup of the loading relay results in opening of the break contacts N5 to prevent energization of the sign SG2. Closure of make contacts N4 prepares the sign SG1 for subsequent energization.

Since the elevator car A is at the first floor, the brush qq is in engagement with the contact segment ql. If at this stage a passenger enters the elevator car A and registers a car-call for a higher floor, the car-call-above relay H (Fig. 2) is energized and closes its make contacts H2 (Fig. 3) to complete the following circuit:

L+, ql, qq, H2, W9, S5, N4, SG1, L—

The sign SG1 consequently is illuminated to inform the passenger that the elevator car will leave soon. However, it will be assumed that a car call is not registered at this time.

When the system was placed in operation, the clutch 74 was energized through the circuit:

70, 1S1, 74, S2, BS2, CS2, DS2, 69

As a result of its coupling to the motor 71, the cam 75 rotates against the bias of its spring 76 until at the expiration of the time interval allowed for loading elevator cars the contacts 77 close. Closure of these contacts completes the following circuit:

70, 1S, 77, S2, BS2, CS2, DS2, 69

The energized relay 1S closes its make contacts 1S2 to establish a holding circuit around the contacts 77. Also, the break contacts 1S1 open to deenergize the clutch 74, and the spring 76 now rotates the cam to its starting position. Also, the make contacts 1S3 close to energize the auxiliary starting relay S through the following circuit:

70, L2, S, N3, 1S3, 69

Energization of the auxiliary starting relay S closes the make contacts S4 to establish a holding circuit around the contacts N3 and 1S3. Break contacts S3 open to deenergize the loading relay N. Break contacts S2 open, and this opening causes relay 1S to drop out. This has no immediate effect on the system operation. Opening of the break contacts S5 (Fig. 3) interrupts the illumination of the signs SG1 and SG2 if either is illuminated at the time.

The loading relay when deenergized closes its break contacts N1 and N5 (Fig. 3) and opens its make contacts N3 (Fig. 4) and N4 (Fig. 3) without immediate effect on the operation of the system. In addition, break contacts N2 close to prepare the clutch 72 for subsequent energization.

Turning now to Fig. 3, it will be noted that closure of the make contacts S1 results from energization of the auxiliary starting relay S. Inasmuch as the elevator car A is assumed to have remained at the dispatching floor for a time sufficient to permit closure of the break contacts 70T1, an energizing circuit now is complete for the main starting relay 80.

The starting relay 80 closes its make contacts 80-2, but such closure has no immediate effect on the operation of the system. In addition, it is assumed that the starting relay 80 controls the closure of the doors of the elevator car in a conventional manner. Closure of the doors places the safety devices 33 of Fig. 2 in condition to pass current and this coupled with closure of the make contacts 80-1 of the starting relay completes the following circuit for the up switch and the car-running relay:

L+, 80-1, W1, F1, 34, U, M, 33, L—

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The energized up switch U closes its make contact U1 to release the brake 17, and contacts U2 and U3 close to energize the generator field winding 29C with proper polarity for up travel of the elevator car. Make contacts U4 close to complete through the limit switch 30 and the contacts E1 an energizing circuit for the speed relay V. The speed relay closes its make contact V1 to shunt the resistor R1 and condition the elevator car A for full speed operation in the up direction. Also, the speed relay opens its break contacts V2 to prevent energization therethrough of the stopping inductor relay F.

Returning to the up switch U, it will be noted that closure of the make contacts U5 establishes a holding circuit around the contacts 80-1 and W1. Opening of the break contacts U6 prevents energization therethrough of the down preference relay. The elevator car A now is in condition for full speed operation in the up direction and departs from the dispatching floor.

It will be recalled that the car-running relay M was energized with the up switch U. The car running relay closed its make contacts M1, M3, M5 and M6 (Fig. 3) without immediate effect on the operation of the system. However, closure of the make contacts M2 (Fig. 2) energizes the timing relay 70T. This relay opens its break contacts 70T1 (Fig. 3) which causes the starting relay 80 to become deenergized.

It will be assumed now that the passenger in the elevator car operates the car-call push button 3c (Fig. 2) to register a car call for the third floor. Such operation energizes the relay H and connects the contact segments a3 and h3 to the bus L+. As the elevator car nears the third floor, the cam 25 opens the switch 53 to deenergize the relay H, and the brush 23 engages the contact segment a3 to complete the following circuit for the car-call stopping relay TT:

L+, 3c, a3, 23, W3, TT, M3, L-

(The cam 25 opens the switches 52 and 53 to permit energization of the contact segment a3 only through the push button 3c while the brush 23 engages the contact segment.) The car-call stopping relay now closes its make contacts TT1 to energize the holding relay G and the slowdown inductor relay E through the closed contacts M1. Energization of the holding relay G completes through the make contacts G1 a holding circuit around the contacts TT1.

When the elevator car A in its upward travel reaches the inductor plate UEP (Fig. 1) for the third floor, the break contacts E1 are opened to deenergize the speed relay V (Fig. 2). The speed relay opens its break contacts V1 to introduce the resistor R1 in series with the generator field winding 29C. The resultant reduction in field current slows the elevator car to a landing speed. In addition, the speed relay V closes its break contacts V2 to complete through the contacts G1 and M1 an energizing circuit for the stopping inductor relay F.

Shortly before the elevator car A in its continued upward movement at the landing speed reaches the third floor, the inductor plate UFP for the third floor is adjacent the stopping inductor relay and completes a magnetic circuit which results in opening of the contacts F1. Opening of the contacts F1 (Fig. 2) deenergizes the up switch U and the car-running relay M.

The up switch U opens its make contacts U1 to deenergize the brake 17, and the brake is promptly forced against the brake drum 16 by its associated spring. Contacts U2 and U3 open to deenergize the generator field winding 29C. Consequently, the elevator car A stops accurately at the third floor. Opening of the make contacts U4 and U5 and closure of the break contacts U6 have no immediate effect on the operation of the system. As the elevator car comes to a stop the brush 23 may pass the contact segment for a slight distance to deenergize the relay TT.

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The previously-mentioned deenergization of the car-running relay resulted in opening of the make contacts M1 to deenergize the inductor relays E and F and the holding relay G. The holding relay G opened its make contacts G1 without immediately affecting the operation of the system.

The car running relay also opened its make contacts M2 to start a timing-out operation of the timing relay 70T. This relay has a time delay in drop out sufficient to permit discharge of passengers or entry of passengers into the elevator car A. Opening of the make contacts M3 and M5 and closure of the break contacts M4 have no immediate effect on the operation of the system.

Let it be assumed that instead of a car call, an up floor call was registered for the third floor by operation of the push button 3U (Fig. 3). Such operation energizes the up floor call storing relay 3UR which closes its makes contacts 3UR1 to establish a holding circuit around the push button. The contacts 3UR1 also serve to connect the contact segment b3 and corresponding contact segments for the remaining elevator cars of the system to the bus L+.

As the elevator car approaches the third floor, the brush 60 engages the contact segment b3 to energize the floor-call stopping relay K through the following circuit:

L+, 3UR1, b3, 60, W5, K, L-

Upon energization, the floor call stopping relay closes its make contacts K1 (Fig. 2) to energize through the contacts M1 the holding relay G and the slowdown inductor relay E. These relays operate in the same manner previously discussed to stop the elevator car accurately at the third floor.

As the elevator car A slows down to stop at the third floor, the brush 61 engages the contact segment c3 to complete the following cancelling circuit:

L+, 3UR1, 3URN, c3, 61, W6, M4, L-

It will be recalled that the break contacts M4 close as the elevator car stops at the third floor. As a result of its energization, the cancelling coil 3URN resets the up floor-call storing relay for the third floor.

Referring to Fig. 3, it will be recalled that the mechanical switch 63 is closed only at the dispatching floor and the upper terminal floor positions of the elevator car. Since the elevator car is now at the third floor, the switch 63 is closed. Consequently, as soon as the timing relay 70T drops out, the break contacts 70T1 close to complete an energizing circuit for the starting relay 80. This operates in the manner previously discussed to start the elevator car upwardly. In this way, the elevator car A continues to the upper terminal floor, answering all registered car calls and all registered up floor calls during its upward trip.

As the elevator car A approaches the upper terminal or fifth floor, the brush 23 (Fig. 2) engages the contact segment a5 to complete the following energizing circuit for the car-call stopping relay:

L+, a5, 23, W3, TT, M3, L-

The car-call stopping relay operates in the manner previously discussed to stop the elevator car accurately at the upper terminal floor.

As the elevator car A reaches the upper terminal floor, the mechanical switch 63 (Fig. 3) opens. Consequently, the elevator car A cannot start from the upper terminal floor until it is started by its upper terminal dispatching device represented by the contacts TS1. It will be understood that the upper terminal dispatching device may be similar to the dispatching device discussed for the first floor. For present purposes it will be assumed that the contacts TS1 operate for the upper terminal dispatching

floor in the same manner by which the contacts S1 operate for the lower dispatching floor.

As the elevator car reaches the fifth floor, the limit switch 36 (Fig. 2) opens to deenergize the up-preference relay W. This relay opens its make contacts W1, W3, W5, W6, W7, W8 and W9 without immediately affecting the operation of the system. However, opening of the make contacts W4 deenergize the holding coils for the car-call push buttons, and these are reset. In addition, closing of the break contacts W2 completes the following energizing circuit for the down-preference relay:

L+, U6, W2, X, 37, 38, L—

The down-preference relay X closes its make contacts X1, X3, X4, X5 and X6 and opens its break contacts X2 to condition the elevator car for down travel.

It will be assumed next that the dispatching device for the upper terminal floor closes its contacts TS1 (Fig. 3) and that the timing relay has closed its break contacts 70T1 to complete an energizing circuit for the starting relay 80. This relay operates to close the doors of the elevator car and closes its make contacts 80-2 which have no immediate effect on the operation of the system. The closing of the doors coupled with the closing of the make contacts 80-1 completes the following circuit for the down switch D and the car-running relay M:

L+, 80-1, X1, F2, 35, D, M, 33, L—

The car-running relay M operates in the manner previously described to prepare certain circuits for subsequent operation.

Upon energization, the down switch D closes its make contacts D1 to release the brake 17. In addition, make contacts D2 and D3 close to energize the generator field winding 29C in the proper direction for down travel of the elevator car. Closure of the make contacts D4 completes an energizing circuit for the speed relay V. This relay closes its make contacts V1 to shunt the resistor R1 and opens its break contacts V2. The elevator car now is conditioned for movement in the down direction at full speed and moves away from the upper terminal floor.

Closure of make contacts D5 establishes a holding circuit around the contacts 80-1 and X1. Opening of break contacts D6 has no immediate effect on the operation of the system.

It will be understood that as the elevator car leaves the upper terminal floor, the limit switch 36 (Fig. 2) and the switch 63 (Fig. 3) reclose.

It will be assumed next that a passenger in the elevator car operates the car-call push button 3c for the purpose of registering a car call for the third floor. This button connects the contact segments a3 and h3 to the bus L+. It will be understood that as the elevator car approaches the third floor the cam 25 opens the switches 52 and 53 to permit energization of the contact segments a3 and h3 only through the push button 3c.

When the brush 40 reaches the contact segment h3, an energizing circuit is established for the car-call stopping relay TT as follows:

L+, 3c, h3, 40, X3, TT, M3, L—

Consequently, the relay closes its make contacts TT1 to energize through the contacts M1 the holding relay G and the inductor relay E. The holding relay G closes its make contacts G1 to establish a holding circuit around the contacts TT1.

When the slowdown inductor relay E reaches the inductor plate DEP for the third floor (Fig. 1), the contacts E2 open to deenergize the speed relay V (Fig. 2). The speed relay opens its make contacts V1 to introduce the resistor R1 in series with the generator field winding 29C. The elevator car now slows to a landing speed. In addition, the break contacts V2 close to complete an energizing circuit for the stopping inductor relay F.

When the stopping inductor relay F reaches the in-

ductor plate DFP for the third floor, the contacts F2 open to deenergize the down switch D and the car-running relay M. The down switch D opens its make contacts D1 to permit reapplication of the brake 17. Make contacts D2 and D3 open to deenergize the generator field winding, and the elevator car A stops accurately at the third floor. Opening of the make contacts D4 and D5 and closing of the break contacts D6 have no immediate effect on the operation of the system. As the elevator car comes to a stop the brush 40 may pass the contact segment h3 slightly to deenergize the relay TT.

The car-running relay M opens its make contacts M1 to deenergize the inductor relays and the holding relay G. The holding relay G in turn opens its make contacts G1 to prevent subsequent energization therethrough of the inductor relays.

The car-running relay M also opens its make contacts M2 to start a timing-out operation of the timing relay 70T. Opening of make contacts M3 and M5 and closing of break contacts M4 have no immediate effect on the operation of the system.

It will be assumed that deenergization of the car-running relay results in opening of the elevator car doors for a predetermined time in a conventional manner. The passenger now leaves the elevator car. At the end of the time interval measured by the timing relay 70T, the break contacts 70T1 (Fig. 3) close to energize through the switch 63 the starting relay 80. The starting relay operates in the manner previously described to start the elevator car down from the third floor.

Let it be assumed that instead of a car call a down floor call was registered for the third floor by operation of the push button 3D (Fig. 3). Such operation energizes the down floor-call storing relay 3DR which closes its make contact 3DR1 to establish a holding circuit around the push button 3D. The contact segment f3 and corresponding contact segments for the remaining elevator cars of the system are connected through the make contacts 3DR1 to the bus L+.

As the elevator car A approaches the third floor in the down direction, the brush 58 reaches the contact segment f3 to complete an energizing circuit for the floor call stopping relay K as follows:

L+, 3DR1, f3, 58, X5, K, L—

The relay K closes its make contacts K1 (Fig. 2) to energize the holding relay G and the slowdown inductor relay E through the contacts M1. These relays operate in the manner previously described to stop the down traveling elevator car at the third floor.

During the stopping operation, the following cancelling circuit (Fig. 3) is established:

L+, 3DR1, 3DRN, g3, 59, X6, M4, L—

As a result of energization of the cancelling coil 3DRN, the down floor call storing relay 3DR is reset.

When the elevator car in its down travel nears the first or dispatching floor, the brush 40 (Fig. 2) engages the contact segment h1 to complete the following circuit.

L+, bc2, bUR3, h1, 40, X3, TT, M3, L—

The energization of the car-call stopping relay TT stops the elevator car at the first floor in the same manner discussed with reference to the stopping of the elevator car at the third floor.

As the elevator car A stops at the first floor, the mechanical switch 37 opens to deenergize the down-preference relay X. This relay opens its make contacts X1, X3, X5 and X6 without immediately affecting the operation of the system. However, closure of the break contacts X2 completes an energizing circuit for the up preference relay W. This operates in the manner previously discussed to condition the elevator car for up travel.

It will be noted that as the relay X is deenergized the make contacts X4 and W4 both are open until the up

preference relay W is again energized. During this momentary opening of both sets of contacts, the holding coils for the car-call push button are deenergized to reset the buttons.

Emergency dispatcher operation

It now will be assumed that the main dispatching device becomes defective. For example, the motor 71 (Fig. 4) may become defective and come to a stop. Under such conditions, the elevator cars will continue in operation until they reach the first or dispatching floor. When the elevator cars are all at the dispatching floor, the break contacts M7, BM7, CM7 and DM7 are all closed. Consequently, as the cam 87 closes the associated mechanical switches, the relays 1DT, 2DT, 3DT and 4DT are successively energized. For example, when the mechanical switch 1YE closes, the relay 1DT is energized through the circuit:

82, 1YE, 1DT, M7, BM7, CM7, DM7, 83

The relay 1DT closes its make contacts 1DT1 to establish a holding circuit around the mechanical switch 1YE.

As a result of the energization of the relays 1DT to 4DT, the parallel break contacts 1DT2 to 4DT2 all open to deenergize the emergency relay EM. This relay closes its break contacts EM1 (Fig. 3) to place the starting relay 80 under the control of the contacts ST1 of an emergency starting relay. In addition, the break contacts EM2 perform a similar operation for the elevator car B. Similar contacts are provided for each of the elevator cars of the system.

Referring again to Fig. 4, the emergency relay closes its break contacts EM3 to energize the signal 78L. Such energization calls attention to the fact that the main dispatching device is inoperative. Finally, break contacts EM4 establish a holding circuit around the contacts M7, BM7, CM7 and DM7.

At the end of an interval which cannot exceed say thirty seconds, the cam 84 momentarily closes the switch 86 to energize the emergency starting relay ST. This relay closes its make contacts ST1 (Fig. 3) for the elevator car A and similar contacts for the remaining elevator cars of the system to start all of the elevator cars from the dispatching floor. Thereafter, whenever an elevator car, such as the elevator car A, reaches the first or dispatching floor, it is dispatched by means of the emergency starting relay. Thus, if the elevator car A reaches the first dispatching floor and the timing relay thereafter drops out to close its contacts 70T1, the first closure of the contacts ST1 of the emergency starting relay (which occurs within a maximum time of say thirty seconds) completes an energizing circuit for the starting relay 80. In this way, reasonably satisfactory elevator service is provided until the main dispatching device is repaired. When the starting relay 80 is energized contacts 80-2 close to establish a holding circuit around the contacts ST1.

Following repair of the main dispatching device, the switch 81 (Fig. 4) may be opened momentarily to deenergize the relays 1DT to 4DT. These relays reclose their break contacts 1DT2 to 4DT2 to reenergize the emergency relay EM. Contacts 1DT1 to 4DT1 also open but have no immediate effect on system operation.

Upon reenergization, the emergency relay EM opens its break contacts EM1 (Fig. 3) and similar contacts associated with the remaining elevator cars of the system. The emergency relay opens its break contacts EM3 (Fig. 4) to deenergize the signal 78L and opens its break contacts EM4 to complete the removal of the emergency dispatching device from active service.

Had the power supply for the main dispatching device failed the relay P would have been deenergized. The prompt opening of the make contacts P2 would have deenergized the emergency relay EM to place the emergency dispatching device in effective operation.

Basement service

Thus far, the operation of the elevator system has been based on the assumption that the elevator cars operate between the first or dispatching floor and the upper terminal floor. The operation of the system when service is desired for a basement floor now will be considered. For the purpose of simplification, it will be assumed further that not elevator service is provided directly from the first floor to the basement floor.

Let it be assumed first that the elevator car A is traveling down towards the first floor in the manner previously described and that a passenger in the elevator car operates the car-call push button *bc* (Fig. 2) for the purpose of registering a car call for the basement floor. As a result of its operation, the push button *bc* closes its contacts *bc1* to shunt the switch 37 and prevent deenergization of the down-preference relay X as the elevator car reaches the first floor. Consequently, the elevator car will remain conditioned to proceed in the down direction below the first floor. In addition, contacts *bc2* open to prevent energization therethrough of the contact segment *h1*. Consequently, if no car call is registered for the first floor, the elevator car proceeds directly to the basement floor.

As the elevator car approaches the basement floor, the brush 40 reaches the contact segment *hb* to complete an energizing circuit for the car-call stopping relay TT. This relay initiates the stopping of the elevator car A at the basement floor in a manner which will be clear from the preceding discussion of the stopping of a down traveling elevator car at the third floor.

If instead of a car call, a floor call for the basement floor had been registered by operation of the push button *bU* (Fig. 3), the basement call storing relay would have been energized to close its contacts *bUR1*. The contacts connect the contact segment *fb* and similar contact segments for the remaining cars to the bus *L+*.

In addition, the contacts *bUR2* close to shunt the mechanical switch 37 (Fig. 2). Consequently, the down-preference relay X remains energized as the elevator car A reaches the first floor. Finally, the break contacts *bUR3* open to prevent energization therethrough of the contact segment *h1*. This permits the elevator car to pass the first floor unless a car call is registered for the first floor.

As the elevator car A nears the basement floor, the brush 58 (Fig. 3) engages the contact segment *fb* to complete the following circuit for the floor call stopping relay:

L+, *bUR1*, *fb*, 58, X5, K, *L-*

The car-call stopping relay initiates a stopping operation at the basement-floor which will be understood from the discussion of the stopping of a down-traveling elevator car at the third floor. It will be understood that as the elevator car stops, the cancelling coil *bURN* is energized to reset the call storing relay for the basement floor. (If desired, the contact segment *fb* may be omitted. The contact segment *hb* (Fig. 2) suffices to stop the down-traveling car at the basement floor.)

It will be assumed next that an intending passenger at the basement floor enters the elevator car and presses the car-call push button *3c* to register a call for the third floor. The response of the elevator system depends in part on the position of the switches 64 and 65 (Fig. 3), and it will be assumed first that the switches occupy the positions illustrated in Fig. 3.

When the elevator car leaves the basement floor, the relay T controls the stopping of the elevator car at the first floor. Since the elevator car at this time is conditioned for up travel, the make contacts W7 of the up-preference relay are closed. Furthermore, since the elevator car is leaving the basement floor, the car-running relay M is energized, and the make contacts M5 thereof are closed.

As the elevator car leaves the basement floor, the brush

24 engages the contact segment *e*1. Since the switch 64 is assumed to be open, further control of the energization of the relay T is exercised by the contacts 1c2 of the car-call push button 1c (see Fig. 2) located in the elevator car and by the break contacts Z2 (Fig. 3) of the expediting relay Z.

If a passenger entering the elevator car at the basement floor desires to stop at the first floor, he operates the appropriate car-call push button to close the contacts 1c2. This completes an energizing circuit for the relay T, and this relay, as the elevator car leaves the basement floor, closes its make contacts T1 (Fig. 2) to complete an energizing circuit for the holding relay G and for the slow-down inductor relay E. These initiate a stopping operation of the elevator car at the first floor in a manner which will be clear from the preceding discussion of the stopping of the elevator car during up travel.

Returning to Fig. 3, the control of the relay T by the break contacts Z2 now will be considered. While the elevator car is at the basement floor and while the elevator car is at the first floor, the brush 66 engages the contact segment *d*. It will be understood that the brush 66 and the contact segment *d* are associated with the floor selector in the same manner by which the brush 24 and the contact segment *e*1 are associated therewith.

If the elevator car A is leaving the basement floor, the make contacts W8 of the up-preference relay W are closed, and the make contacts M6 of the car-running relay M also are closed.

The energization of the expediting relay Z also requires closure of the make contacts H1 of the car-call-above relay H. Ry reference to Fig. 2, it will be noted that when the elevator car A is at the basement floor, the contact brush 56 is in engagement with the contact segment *a*1. Under these circumstances, the relay H is energized if a car call is registered for a floor above the first floor. For example, let it be assumed that a passenger entering the elevator car at the basement floor registers a car call for the first floor by operation of the car-call push button 1c. Since this push button does not control the energization of the car-call-above relay H, it follows that the relay remains de-energized, and the expediting relay Z of Fig. 3 cannot be energized.

Let it be assumed next that a passenger entering the elevator car A at the basement floor registers a car call for the third floor by pressing the car-call push button 3c. This completes the following energizing circuit for the relay H:

L+, 3c, 52, 51, *a*1, 56, H, L—

The relay H now is energized and closes its make contacts H1 (Fig. 3) to permit energization therethrough of the expediting relay Z.

Inasmuch as the switch 65 is assumed to be in the position illustrated in Fig. 3, the contacts N1 do not affect energization of the expediting relay. However, the energization of the relay requires closure of one of the sets of make contacts BN1, CN1 or DN1 to indicate that another elevator car of the bank has been selected as the next car to leave the dispatching floor.

If a passenger entering the elevator car A at the basement floor registers a car call for the third floor, and if the elevator car B has been selected as the next car to leave the dispatching floor, the following circuit is established as the elevator car A leaves the basement floor:

L+, *d*, 66, M6, H1, BN1, 65, W8, Z, L—

The energized expediting relay Z closes its make contacts Z3 to establish a holding circuit around the contact segment *d*, the brush 66 and the contacts M6. Closure of the make contacts Z1 has no immediate effect on the operation of the system. Opening of the break contacts Z2 prevents energization therethrough of the relay T.

The brush 66 is positioned to engage the contact segment *d* while the elevator car A is at the basement floor,

whereas the brush 24 is positioned to engage the contact segment *e*1 as the elevator car A leaves the basement floor. Consequently, the break contacts Z2 under the assumed conditions open before the brush 24 engages the contact segment *e*1, and the relay T remains deenergized. The elevator car A now proceeds directly to the third floor and stops in the normal manner to discharge the passenger at such floor. This by-passing of the first floor appreciably expedites transportation of the passenger from the basement floor to the third floor.

Next, it will be assumed that the switches 64 and 65 are moved from the position illustrated in Fig. 3 to their alternate positions. Under such circumstances, the switch 64 by-passes the contacts 1c2 and the break contacts Z2, and the elevator car A upon leaving the basement floor always is conditioned to stop at the first floor. However, the duration of the stop of the elevator car A at the first floor is determined in part by the condition of the expediting relay Z.

The assumed position of the switch 65 has transferred control of the energization of the expediting relay Z from the contacts BN1, CN1 and DN1 to the break contacts N1 of the loading relay for the car A. If the elevator car A is selected as the next car to leave the dispatching floor as it arrives at the dispatching floor from the basement floor, the loading relay N (Fig. 4) is energized by a sequence which will be clear from the preceding discussion. Consequently, the break contacts N1 (Fig. 3) are open, and since the switch 65 does not under the assumed conditions shunt the contacts N1, the expediting relay Z cannot be energized. At the expiration of its loading interval, the elevator car A is dispatched from the first floor in the customary manner.

Next, it will be assumed that as the elevator car A reaches the first floor it is not selected as the next car to leave the dispatching floor. Under these circumstances, the break contacts N1 are closed. If a passenger entering the elevator car A at the basement floor operated the car-call push button for the third floor, the make contacts H1 of the car-call-above relay H are closed, and the expediting relay Z is energized through the circuit.

L+, *d*, 66, M6, H1, 65, N1, W8, Z, L—

The expediting relay closes its make contacts Z3 to establish a holding circuit around the contact segments *d*, brush 66 and contacts M6. Since the switch 64 is closed, the condition of the contacts Z2 has no effect on the operation of the system, and the car A stops at the first floor.

The expediting relay also closes its make contacts Z1. (It will be recalled that the switch 63 is opened at the dispatching floor.) Upon reclosure of the break contacts 70T1 by the timing relay after the first-floor stop, the starting relay 80 is energized through the circuit

L+, 80, 70T1, Z1, L—

Upon energization, the relay 80 starts the elevator car in the customary manner.

From the foregoing discussion it is clear that a passenger desiring to proceed from the basement floor to a floor above the first floor cannot be held at the first floor for a time longer than the normal loading time allowed for an elevator car at the dispatching floor.

Modified operation

The foregoing discussion of the operation of the system has assumed that the manually-operated switch 95 (Fig. 3) and the manually-operated switch 97 (Fig. 4) are closed. The effect of the opening of the switch 95 now will be considered.

Assuming that the manually-operated switch 95 of Fig. 3 is open and that the elevator car A is stationed at the lower dispatching floor, the second timing relay 57T is energized through the break contacts 80-3 of the main starting relay.

When the elevator car A is to be started from the

lower dispatching floor, it will be recalled that the auxiliary starting relay S is energized and that this relay closes its make contacts S1 (Fig. 3) to energize the main starting relay 80 through the break contacts 70T1. The operation of the main starting relay 80 in starting the elevator car A has previously been set forth.

The energization of the main starting relay is accompanied by opening of the break contacts 80-3. The second timing relay 57T now starts to time out.

Under normal conditions of operation, the closure of the make contacts 80-1 (Fig. 2) is followed by energization and pick-up of the up-switch U and the car running relay M. The car running relay M, it will be recalled, closes its make contacts M2 to energize and pick up the timing relay 70T.

The timing relay 70T closes its make contacts 70T2 (Fig. 3) normally before the second timing relay 57T drops out.

Let it be assumed next that after closure of the make contacts 80-1 (Fig. 2), the door of the elevator car A fails to close. Under these conditions, the safety devices 33 prevent energization of the up switch U and of the car running relay M. The timing relay 70T under these conditions remains deenergized and dropped out.

The second timing relay 57T (Fig. 3) continues to time out and after the expiration of a predetermined time delay drops out to open its make contacts 57T1 (Fig. 4).

Opening of the make contacts 57T1 deenergizes the car position relay L. This relay opens its make contacts L1 without immediately affecting the operation of the system. Opening of the make contacts L3 also has no immediate effect on the operation of the system. However, opening of the make contacts L2 results in deenergization of the auxiliary starting relay S.

The deenergization of the auxiliary starting relay S is accompanied by opening of the make contacts S1 (Fig. 3). Since the elevator car A is prevented from starting, such opening has no effect on the immediate operation of the system. In addition, break contacts S2 close to permit energization of the clutch 74. Consequently, if another one of the elevator cars is available at the lower dispatching floor, the dispatching device is now free to start such other elevator car. Reclosure of the break contacts S3 and opening of the make contacts S4 have no immediate effect on the operation of the system. Reclosure of the break contacts S5 (Fig. 3) completes the following circuit if one or more car calls are registered for a higher floor:

L+, q1, qq, H2, W9, S5, N5, SG2, L-

Consequently, the resulting illumination of the sign SG2 advises passengers within the elevator car A to take another car.

From the foregoing it is clear that the second timing relay 57T temporarily removes from the control of the dispatching device the elevator car which is prevented from starting following initiation of a starting operation thereof, and permits the starting of another one of the elevator cars which is available at the lower dispatching floor. Inasmuch as the contacts 80-1 of the main starting relay remains closed, upon correction of the condition preventing starting of the elevator car A the car starts promptly. When the car thereafter returns to the dispatching floor it may be selected as the next car to leave the lower dispatching floor and a starting operation thereof may be initiated by the dispatching device.

To illustrate the operation of the system with the manually-operated switch 97 open, it will be assumed that all of the elevator cars have been away from the lower dispatching floor for an interval greater than the time required for the cam 75 to be driven by its motor 71 from the position illustrated in Fig. 4 to a position closing the contact 77.

If the elevator car A thereafter reaches the lower dispatching floor, the brush 78 engages the contact segment p1 to energize the car position relay L through the limit

switch 27 and the make contacts 57T1 of the second timing relay. As a result of its energization, the car position relay closes its make contacts L1. This results in a selection of the car A as the next car to leave the lower dispatching floor by a sequence which will be clear from the preceding discussion. In addition, the car position relay closes its make contacts L3 to complete an energizing circuit for the clutch 74. The clutch now connects the cam 75 to the motor 71 for the purpose of starting measurement of a loading time interval. Upon the expiration of this interval, the cam closes the contacts 77 to energize the relay 1S. This operates in the manner previously discussed for the purpose of dispatching the elevator car A. It should be noted that despite the late arrival of the elevator car A at the dispatching floor, it is held at the dispatching floor for the full loading interval measured by the cam 75. Consequently, if passengers are waiting at the lower dispatching floor, the elevator car A is dispatched with a useful load despite its late arrival.

Although the invention has been described with reference to certain specific embodiments thereof, numerous modifications are possible. Therefore, the description and illustrations are to be construed in an illustrative rather than a limiting sense.

I claim as my invention:

1. In an elevator system for a structure having a plurality of floors, an elevator car, motive means for moving the elevator car relative to the structure for providing elevator service for the floors, control means controlling the motive means for moving the elevator car from one of the floors after the elevator car has remained at such floor for a time, information-conveying means for the elevator car disposed to convey information to an occupant of the elevator car and operable for advising any passenger in the elevator car that the elevator car will leave a floor at which it is stopped, said control means including assigning means for assigning the elevator car to leave a floor at which it is stopped, means manually actuatable by a person within the elevator car, and means jointly responsive to actuation of the manually-actuatable means and to the operation of the assigning means for operating the information-conveying means.

2. In an elevator system for a structure having a plurality of floors, an elevator car, motive means for moving the elevator car relative to the structure for providing elevator service for the floors, control means operable into a first condition controlling the motive means for moving the elevator car from one of the floors in response to expiration of a time after the elevator car has stopped at such floor, said control means being operable into a second condition for stopping the elevator car at a floor displaced from the first-named floor, information-conveying means for the elevator car disposed to convey information to an occupant of the elevator car and operable for advising any passenger in the elevator car that the elevator car will leave a floor at which it is stopped, assigning means for assigning the elevator car to leave a floor at which it is stopped, and means jointly responsive to operation of the control means into said second condition while the elevator car is stopped at the first-named floor and to the operation of the assigning means for operating the information-conveying means to inform passengers in the elevator car that the elevator car will leave the floor at which it is stopped.

3. In an elevator system for a structure having a plurality of floors, an elevator car, motive means for moving the elevator car relative to the structure for providing elevator service for the floors, control means cooperating with the motive means for moving the elevator car and for stopping the elevator car at desired floors, said control means including call-registering means operable for registering calls for floors desired by passengers within the elevator car, and means responsive to the lapse of a substantial time after the elevator car has stopped at a predetermined one of said floors for moving the elevator

car away from such predetermined floor, information-conveying means for said elevator car operable from a first to a second condition for conveying information concerning the departure of the elevator car from the predetermined floor to a passenger in the elevator car, assigning means for assigning the elevator car to leave a floor at which it is stopped, and actuating means jointly responsive to operation of the call-registering means to register a call for any of a plurality of said floors while the elevator car is stopped at the predetermined floor and to operation of the assigning means for operating the information-conveying means to said second condition.

4. An elevator system as claimed in claim 3 wherein said actuating means is responsive to starting of the elevator car from said predetermined floor for returning the information-conveying means from the second to the first condition.

5. In an elevator system for a structure having a plurality of floors, an elevator car, motive means for moving the elevator car relative to the structure for providing elevator service for the floors, control means cooperating with the motive means for moving the elevator car and for stopping the elevator car at desired floors, said control means including floor-call registering means operable from at least part of said floors for registering calls for elevator service desired by prospective passengers at such floors, car-call-registering means operable for registering calls for floors desired by passengers within the elevator car, and means responsive to the lapse of a substantial time after the elevator car has stopped at a predetermined one of said floors for moving the elevator car away from such predetermined floor, information-conveying means for said elevator car operable from a first to a second condition for conveying information to a passenger in the elevator car that the elevator car will move, and actuating means responsive to operation of the car-call-registering means while the elevator car is stopped at the predetermined floor for operating the information-conveying means to said second condition, said actuating means being insensitive to operation of the floor-call-registering means.

6. In an elevator system for a structure having a plurality of floors, a plurality of elevator cars, motive means for moving each of the elevator cars relative to the structure to provide elevator service for the floors, control means for moving the elevator cars and stopping the elevator cars at desired floors of said structure, said control means being effective for stopping the elevator cars at a predetermined one of said floors and for starting only one of the elevator cars at a time from such predetermined floor in response to expiration of a substantial time after the elevator-car-to-be-started has arrived at such predetermined floor and has been selected to leave such floor, information-conveying means for each of the elevator cars, each of the information-conveying means being operable for advising any passenger in the associated elevator car that such associated elevator car will leave a floor at which the associated elevator car is stopped, separate actuating means for each of the elevator cars operable by a person entering the associated elevator car, and means responsive to the selection of one of the elevator cars to leave the predetermined floor and to the operation of the actuating means for such selected elevator car for operating the information-conveying means.

7. An elevator system as claimed in claim 6 wherein the separate actuating means comprise separate car-call-registering means operable from within each of the elevator cars for registering calls for floors desired by passengers in the elevator cars.

8. An elevator system as claimed in claim 6 in combination with means responsive to starting of each of the elevator cars from the predetermined floor with the associated information-conveying means in operated condition for restoring such information-conveying means to non-operated condition.

9. In an elevator system for a structure having a plurality of floors, a plurality of elevator cars, motive means for moving each of the elevator cars relative to the structure to provide elevator service for the floors, control means for moving the elevator cars and stopping the elevator cars at desired floors of said structure, said control means being effective for stopping the elevator cars at a predetermined one of said floors and for starting only one of the elevator cars at a time from such predetermined floor in response to expiration of a substantial time after the elevator-car-to-be-started has arrived at such predetermined floor and has been selected to leave such floor, information-conveying means for each of the elevator cars, each of the information-conveying means being operable for conveying predetermined information to any passenger in the associated elevator car, floor-call-registering means operable from at least part of the floors of the structure for registering calls for elevator service desired by prospective passengers at such floors, separate car-call-registering means for each of the elevator cars operable for registering calls for floors desired by passengers within the respective elevator cars, and actuating means responsive to the selection of one of the elevator cars to leave the predetermined floor and to the operation of the car-call-registering means for such selected elevator car to register a call for any of a plurality of said floors for operating the information-conveying means to convey said predetermined information, said actuating means being insensitive to operation of the floor-call-registering means.

10. An elevator system as claimed in claim 9 wherein said actuating means is effective for operating the information-conveying means for the selected elevator car only when the elevator car is set for travel away from the predetermined floor in a predetermined direction, and means responsive to starting of each of said elevator cars from the predetermined floor with the associated information-conveying means in operated condition for restoring such information-conveying means to non-operated condition.

11. In an elevator system for a structure having a plurality of floors, a plurality of elevator cars, motive means for moving each of the elevator cars relative to the structure to provide elevator service for the floors, control means for moving the elevator cars and stopping the elevator cars at desired floors of said structure, said control means being effective for stopping the elevator cars at a predetermined one of said floors and for starting only one of the elevator cars at a time from such predetermined floor in response to expiration of a substantial time after the elevator-car-to-be-started has arrived at such predetermined floor and has been selected to leave such floor, information-conveying means for each of the elevator cars operable for conveying car departure information to the occupant of the associated elevator car, and means effective for operating the information-conveying means in a first one of the elevator cars at the predetermined floor only if a second one of the elevator cars is selected to leave, but is still available to receive passengers at, such predetermined floor.

12. In an elevator system for a structure having a plurality of floors, a plurality of elevator cars, motive means for moving each of the elevator cars relative to the structure to provide elevator service for the floors, control means for moving the elevator cars and stopping the elevator cars at desired floors of said structure, said control means being effective for stopping the elevator cars at a predetermined one of said floors and for starting only one of the elevator cars at a time from such predetermined floor in response to expiration of a substantial time after the elevator-car-to-be-started has arrived at such predetermined floor and has been selected to leave such floor, information-conveying means for each of the elevator cars, separate actuating means for each of the elevator cars operable by a person entering

the associated elevator car, and means responsive to the operation of the actuating means of a first one of the elevator cars positioned at the predetermined floor and to the selection of a second one of the elevator cars to leave the predetermined floor for operating the information-conveying means.

13. An elevator system as claimed in claim 12 wherein the separate actuating means comprise separate car-call-registering means operable from within each of the elevator cars for registering calls for floors desired by passengers in the elevator cars.

14. An elevator system as claimed in claim 12 in combination with means responsive to selection of each of the elevator cars with the information-conveying means in operated condition as the next elevator car to leave the predetermined floor for restoring the information-conveying means of the last-named selected car to non-operated condition.

15. In an elevator system for a structure having a plurality of floors, a plurality of elevator cars, motive means for moving each of the elevator cars relative to the structure to provide elevator service for the floors, control means for moving the elevator cars and stopping the elevator cars at desired floors of said structure, said control means being effective for stopping the elevator cars at a predetermined one of said floors and for starting only one of the elevator cars at a time from such predetermined floor in response to expiration of a substantial time after the elevator-car-to-be-started has arrived at such predetermined floor and has been selected to leave such floor, information-conveying means for each of the elevator cars, floor-call-registering means operable from at least part of the floors of the structure for registering calls for elevator service desired by prospective passengers at such floors, separate car-call-registering means for each of the elevator cars operable for registering calls for floors desired by passengers within the respective elevator cars, and actuating means responsive to operation of the car-call-registering means in a first one of the elevator cars at the predetermined floor and to the selection of a second one of the elevator cars to leave the predetermined floor for operating the information-conveying means, said actuating means being insensitive to operation of the floor-call-registering means.

16. In an elevator system for a structure having a plurality of floors, a plurality of elevator cars, motive means for moving each of the elevator cars relative to the structure to provide elevator service for the floors, control means for moving the elevator cars and stopping the elevator cars at desired floors of said structure, said control means being effective for stopping the elevator cars at a predetermined one of said floors and for starting only one of the elevator cars at a time from such predetermined floor in response to expiration of a substantial time after the elevator-car-to-be-started has arrived at such predetermined floor and has been selected to leave such floor, first information-conveying means for each of the elevator cars, second information-conveying means for each of the elevator cars, means operable for actuating the first information-conveying means for each of the elevator cars only if the associated elevator car is selected to leave the predetermined floor and means operable for actuating one of the second information-conveying means while the associated elevator car is at the predetermined floor only if another one of the elevator cars is selected to leave the predetermined floor.

17. In an elevator system for a structure having a plurality of floors, a plurality of elevator cars, motive means for moving each of the elevator cars relative to the structure to provide elevator service for the floors, control means for moving the elevator cars and stopping

the elevator cars at desired floors of said structure, said control means being effective for stopping the elevator cars at a predetermined one of said floors and for starting only one of the elevator cars at a time from such predetermined floor in response to expiration of a substantial time after the elevator-car-to-be-started has arrived at such predetermined floor and has been selected to leave such floor, first information-conveying means for each of the elevator cars, second information-conveying means for each of the elevator cars, means operable by a passenger entering each of the elevator cars for actuating the first information-conveying means for each of the elevator cars only if the associated elevator car is selected to leave the predetermined floor and means operable by a passenger entering each of the elevator cars for actuating one of the second information-conveying means while the associated elevator car is at the predetermined floor only if another one of the elevator cars is selected to leave the predetermined floor.

18. In an elevator system for a structure having a plurality of floors, a plurality of elevator cars, motive means for moving each of the elevator cars relative to the structure to provide elevator service for the floors, control means for moving the elevator cars and stopping the elevator cars at desired floors of said structure, said control means comprising floor-call-registering means operable from at least part of the floors for registering calls for floors at which the elevator cars are desired to stop, separate car-call-registering means for each of the elevator cars operable for registering calls for floors at which passengers entering the respective elevator cars desire to stop, a dispatcher for selecting successive ones of the elevator cars to leave a predetermined one of the floors constituting a dispatching floor, said control means including means responsive to the lapse of a substantial time following said selection of each of the elevator cars for controlling the motive means to start the selected elevator car from the dispatching floor, separate first information-conveying means for notifying passengers in each of the elevator cars at the dispatching floor that the associated elevator car is selected to leave the dispatching floor, separate second information-conveying means for notifying persons in each of the elevator cars at the dispatching floor that another elevator car has been selected to leave the dispatching floor, and selection means responsive to operation of the car-call-registering means for any one of said elevator cars located at the dispatching floor for operating the first information-conveying means for the last-named elevator car provided that the last-named elevator car is selected to leave the dispatching floor and for operating the second information-conveying means for the last-named elevator car provided that the last-named elevator car is not selected to leave the dispatching floor.

19. An elevator system as claimed in claim 18 wherein said selective means is effective for operating one of the information-conveying means only if the associated elevator car is set for travel in a predetermined direction from the dispatching floor in combination with means responsive to starting of any of the elevator cars from the dispatching floor for maintaining the information-conveying means of such started elevator car in non-operated condition.

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