

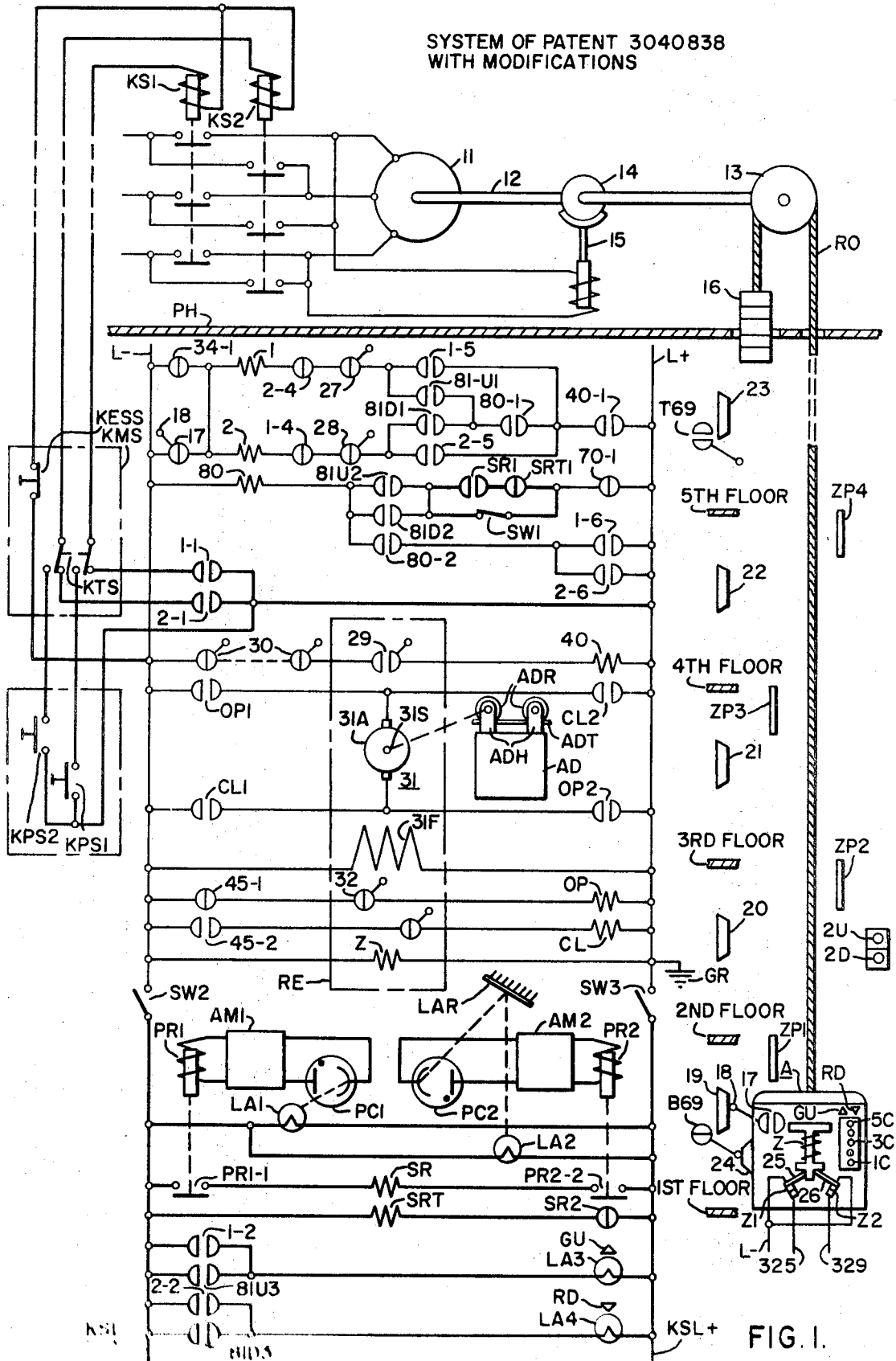
July 7, 1970

A. F. KIRSCH ET AL
VEHICULAR TRANSPORTATION SYSTEM WITH
VEHICLE MOUNTED CONTROLS

3,519,103

Filed Jan. 22, 1965

4 Sheets-Sheet 1



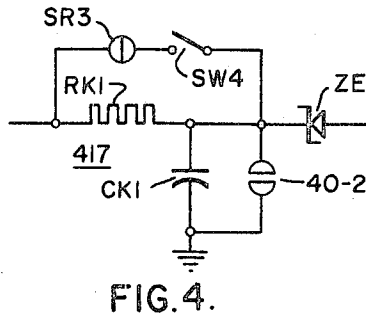
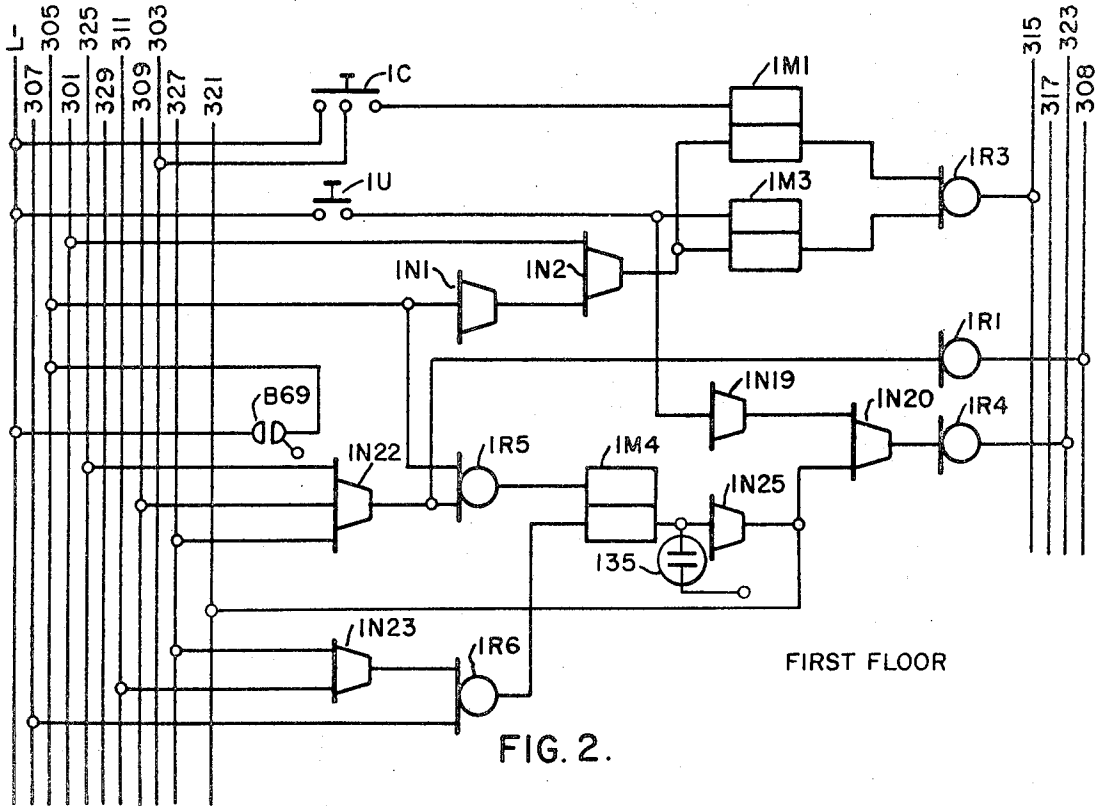
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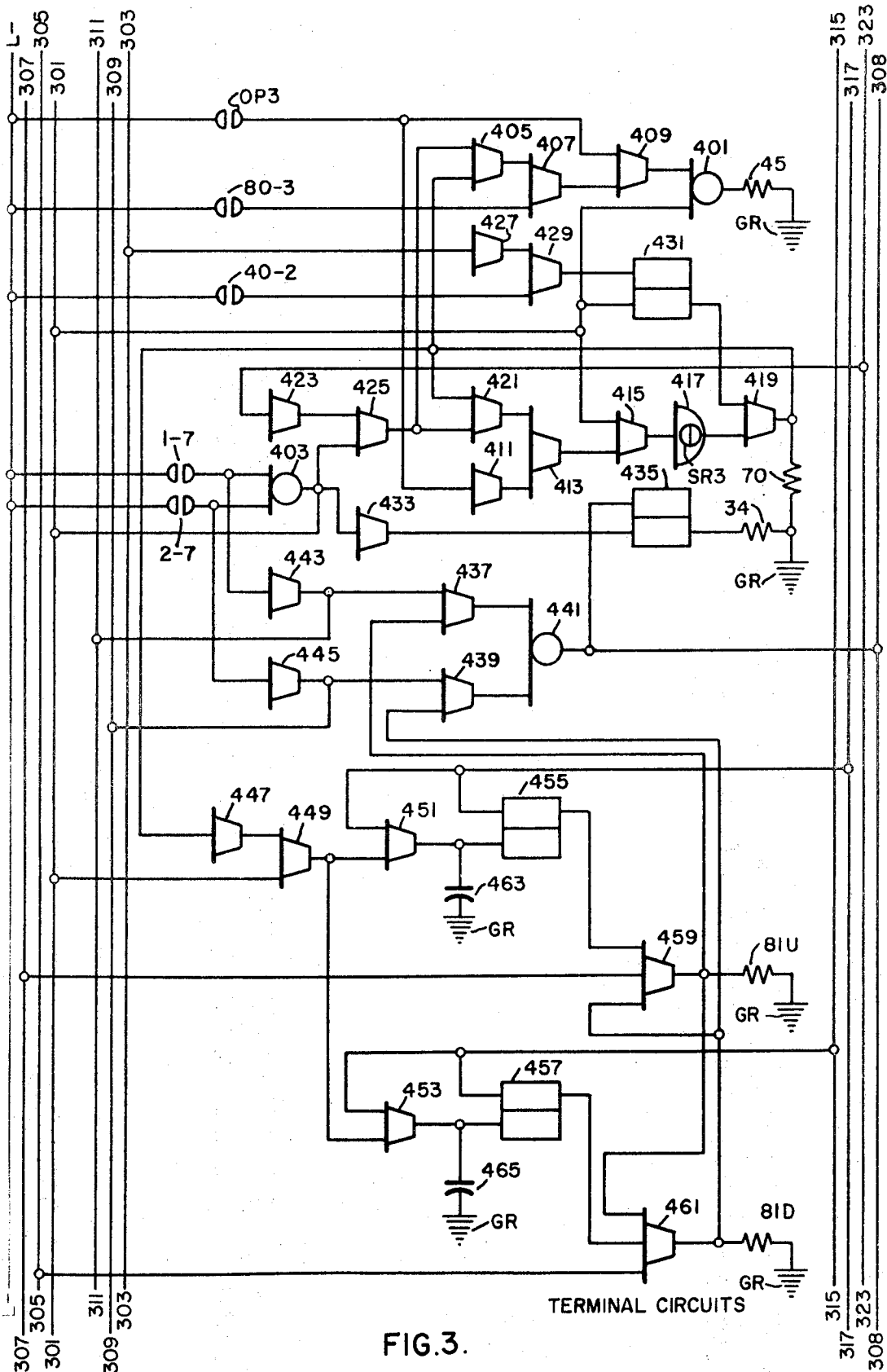


FIG. 3.

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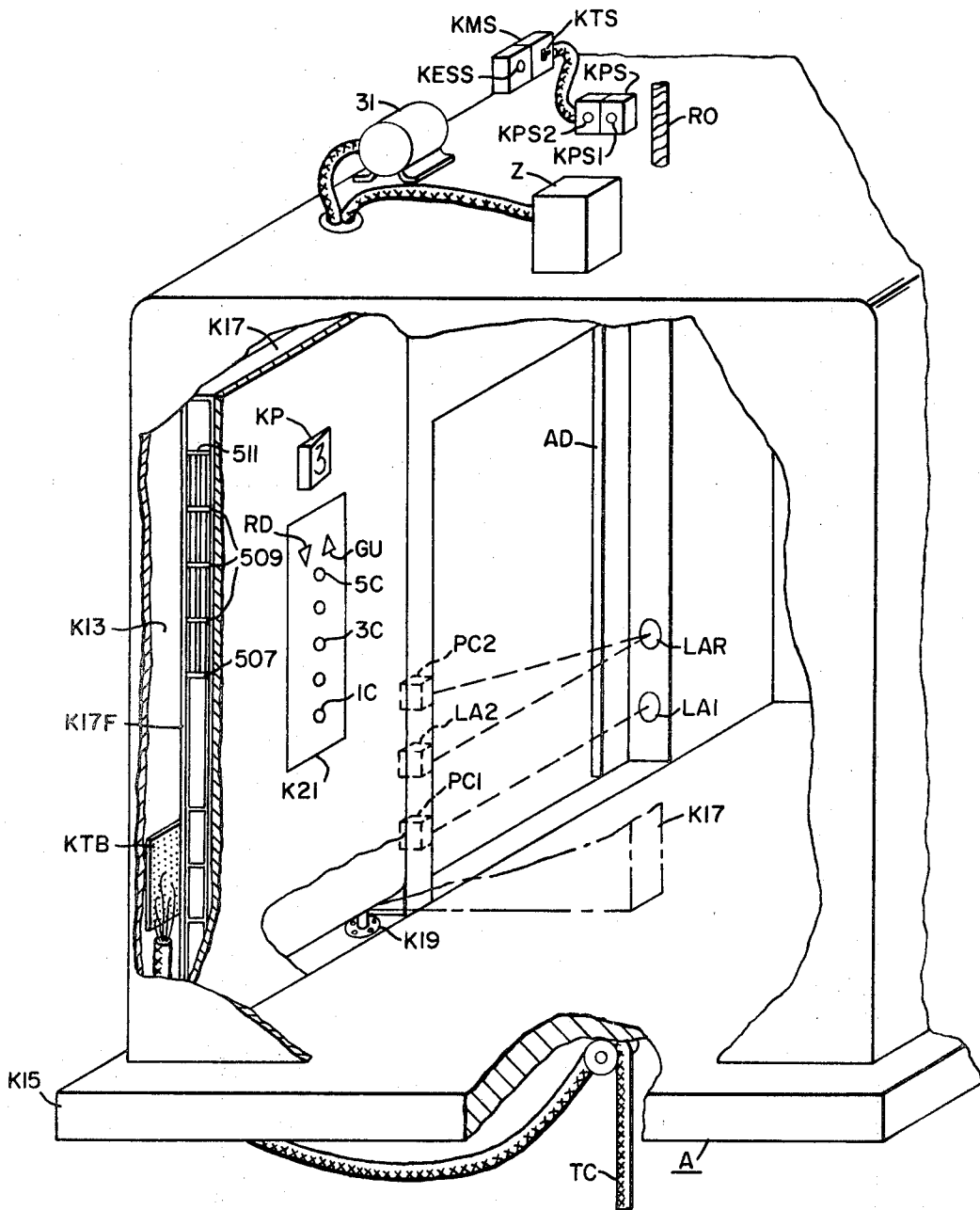


FIG. 5.

1

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VEHICULAR TRANSPORTATION SYSTEM WITH VEHICLE MOUNTED CONTROLS

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17 Claims

ABSTRACT OF THE DISCLOSURE

An elevator car carries conventional electrical equipment such as car-call push buttons, a door operator means for transmitting a light beam across a doorway to a light-sensitive detector, a car-position indicator, an inductor relay, and push buttons permitting a maintenance man on the roof to move and stop the car. According to the invention supervisory equipment is also mounted on the car to be controlled by the foregoing electrical equipment for the purpose of generating signals for starting the car, stopping the car, controlling the door operator, and operating the position indicator.

This invention relates to a transportation system and it has particular relation to a transportation system employing one or more vehicles for serving spaced landings of a fixed structure.

The invention is applicable to a transportation system wherein landings are spaced along a horizontal vehicular path or along an inclined path or along a vertical path. The invention is particularly suitable for an elevator system having one or more elevator cars. In such a system an elevator car may be arranged to move along a vertical path.

In prior art elevator systems it has been conventional to install supervisory control equipment for an elevator car in a machine room. Such a machine room has been located at various positions in a structure served by the elevator car but usually the machine room is located in a penthouse directly above the hoistway of the elevator car.

In accordance with the invention supervisory control equipment formerly mounted in a machine room is positioned on an elevator car. Supervisory control equipment constructed of static logic elements is particularly suitable for location on the elevator car.

It is therefore an object of the invention to provide an improved vehicular transportation system having vehicle-mounted supervisory control equipment.

It is a further object of the invention to provide an elevator system having an elevator car on which is mounted a substantial part of the supervisory control equipment for the elevator car.

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

FIG. 1 is a schematic view with parts broken away and parts not shown of an elevator system including control circuits shown in straight line form in which the invention may be incorporated;

FIG. 2 is a schematic view in single line form of control circuits suitable for the elevator system in FIG. 1 and employing static elements;

FIG. 3 is a further schematic view in single line form of control circuits suitable for the elevator system in FIG. 1 and embodying static elements;

FIG. 4 is a schematic view of a delay circuit suitable for incorporation in the elevator system of FIG. 1; and

FIG. 5 is a view in perspective with parts broken away of an elevator car suitable for the elevator system of FIG. 1.

In order to simplify the presentation of the invention it will be assumed that the elevator system of FIGS. 1, 2 and 3 is similar to that shown in the Suozzo and Caputo Pat. 3,040,838 which issued June 26, 1962, except for certain changes which are shown in heavy lines and which will be discussed below.

In order to facilitate an understanding of the system herein disclosed a list of some of the system components is presented as follows:

SYSTEM COMPONENTS

- 1—Up switch
- 2—Down switch
- 11—Elevator car motor
- 13—Sheave
- 14—Brake drum
- 15—Car brake
- 16—Counter weight
- 17—Stop control switch
- 31—Car door motor
- 34—Stopping relay
- 40—Door safety relay
- 45—Door master relay
- 70—Non-interference relay
- 80—Master call relay
- 81U—Up direction preference relay
- 81D—Down direction preference relay
- 1C-5C—Car call push buttons
- A—Elevator car
- Z—Inductor notching relay
- AD—Elevator car door
- CL—Door release relay
- OP—Door open relay
- ZP1-ZP4—Inductor plates

The components in this list are similar to components bearing the same reference characters in the aforesaid Suozzo et al. patent except as follows. In the Suozzo et al. patent contacts of the up switch 1 and the down switch 2 are employed as a reversing switch for the elevator car motor 11. In the present case the switches 1 and 2, which may be car-mounted contactors or relays control two auxiliary switches or contactors, KS1 and KS2 respectively, which are mounted in the machine room. When the auxiliary switch KS1 is energized and picked up the motor 11 is connected to move the car in the up direction. When the auxiliary switch KS2 is energized and picked up the motor 11 is connected to move the car in the down direction. It will be noted that the auxiliary switches KS1 and KS2 together with the elevator car motor 11, the brake drum 14 and the brake 15 are all located above a penthouse floor PH.

The door safety relay 40 in the present case is similar to the corresponding relay of the aforesaid Suozzo et al. patent except for the addition of a set of make contacts 40-2 (FIG. 4) in the present case.

The up direction preference relay 81U and the down direction preference relay 81D are similar to the corresponding components of the aforesaid Suozzo et al. patent except that in the present case each of these relays has an additional set of make contacts 81U3 and 81D3, respectively.

FIG. 2 is similar to FIG. 6A of the aforesaid Suozzo et al. patent except for the addition of a lamp 135 for indicating by its illumination that the associated memory element 1M4 is in set condition. Thus, when the lamp 135 is illuminated it indicates that the elevator car is located at the first floor. The connections for such a lamp are shown in FIG. 3B of the aforesaid Suozzo et al.

patent. A similar lamp is associated with each of the M4 memory elements for the various floors or landings of the building or structure served by the elevator car. Consequently these lamps serve to indicate the position of the elevator car in its hoistway.

FIG. 3 of the present drawings is similar to FIG. 6F of the aforesaid Suozzo et al. patent except for the addition of break contacts SR3 which are employed under certain conditions to terminate the time delay of the delay element 417 as will be discussed below.

With these exceptions, reference characters common to the present drawings and to the aforesaid Suozzo et al. patent identify similar components. If the switch SW1 in FIG. 1 is closed, and if the switches SW2 and SW3 together with the switch SW4 in FIG. 4 are opened the present system operates in precisely the same manner discussed in the aforesaid Suozzo et al. patent except for the fact that the up switch 1 and the down switch 2 here control the direction of rotation of the elevator car motor 11 through the auxiliary switches KS1 and KS2. Consequently the complete operation of this arrangement can be ascertained by reference to the aforesaid Suozzo et al. patent.

When the switch SW1 is opened and the switches SW2, SW3 and SW4 are closed certain additional features are incorporated in the system. Thus, the opening of the switch SW1 places the pickup of the master call relay 80 additionally under control of the make contacts SR1 of a detector relay SR and the break contacts SRT1 of a time delay relay SRT. The relays SR and SRT correspond to relays identified by the same reference characters in the Santini et al. Pat. 2,785,771 which issued Mar. 19, 1957. The control circuits for these relays now will be considered.

By reference to FIG. 5 it will be noted that a radiant-energy transmitter such as a lamp LA1 is mounted in the elevator car A to a direct radiant energy such as a light beam across the passage of the elevator car through which persons normally enter or leave the elevator car. This light beam impinges on a photocell PC1. The photocell PC1 through an amplifier AM1 (FIG. 1) controls relay contacts PR1-1 of a relay PR1 in the same manner discussed for components bearing the same reference characters in the aforesaid Santini et al. patent.

As shown in FIG. 1 the lamp LA1 is connected across buses KSL- and KSL+ which are connected through the switches SW2 and SW3, respectively, to the buses L- and L+. For present purposes it will be assumed that contacts PR2-1 (discussed below) are closed. As long as the photocell PC1 is illuminated by the beam from the lamp LA1 in FIG. 5 the contacts PR1-1 of FIG. 1 are closed to pick up the detector relay SR. However, if a person in entering or leaving the elevator car interrupts the beam the contacts PR1-1 open to deenergize and drop out the detector relay SR.

As long as the relay SR is picked up its contacts SR2 are open to maintain the time delay relay SRT deenergized. When a person interrupts the beam extending across the passage of the elevator car, the relay SR drops out to close its break contacts SR2 and these contacts complete an energizing circuit for the relay SRT. When the person clears the beam, the detector relay SR again picks up to open its break contacts SR2 which interrupt the energizing circuit for the relay SRT. This relay SRT has a time delay in drop out which is slightly longer than the time required for one person to follow another person into or out of the elevator car A. For example, the time delay in drop out of the relay SRT may be of the order of one-half second.

As stated in the aforesaid Suozzo et al. patent the non-interference relay 70 in conjunction with the time delay element 417 provides a substantial time delay. Thus, as pointed out in the aforesaid Suozzo et al. patent if the elevator car A stops at a landing the non-interference relay 70 maintains its contacts 70-1 open for a

substantial time such as four seconds to prevent pickup of the master call relay 80. This maintains the elevator car at the landing for a time sufficient to permit entry of persons into the car or departure of persons from the car.

In the present case provision is made for terminating the time delay of the non-interference relay 70 under certain conditions. This is represented in FIG. 3 by the break contacts SR3 of the detector relay SR.

The time delay of the relay 70 may be controlled in any desired manner. For illustrative purposes the time delay may be controlled as shown in FIG. 4. In FIG. 4 the time delay element 417 includes a capacitor CK1 which is charged through a resistor RK1. The voltage across the capacitor CK1 slowly builds up in a suitable time, such as four seconds, to a value sufficient to break over a threshold device such as a Zener diode ZE. However, if the switch SW4 is closed and a person enters or leaves the elevator car the break contacts of the detector relay SR close to shunt the resistor RK1. Such shunting rapidly builds up the voltage across the capacitor CK1 to a value sufficient to break over the Zener diode ZE. Thus, the closure of the break contacts SR3 has terminated the time delay otherwise introduced by the non-interference relay 70 in conjunction with the time delay element 417. When the elevator car door is closed and the door safety relay 40 (FIG. 1) picks up, the make contacts 40-2 (FIG. 4) close to shunt the capacitor. Thus, the capacitor is promptly discharged in preparation for another delay operation.

The operation of the elevator system with the components thus far added may be reviewed briefly as follows. Let it be assumed that the elevator car A stops at the third floor or landing in the manner discussed in the aforesaid Suozzo et al. patent. The contacts 70-1 (FIG. 1) are open and the time delay element 417 (FIG. 3) starts to measure a time period of the order of four seconds. Inasmuch as a light beam is established across the passage through which persons enter or leave the elevator car the photocell PC1 (FIG. 1) is illuminated and the detector relay SR is energized and picked up. Therefore, the make contacts SR1 are closed to permit energization therethrough at a subsequent time of the master call relay 80. In addition the break contacts SR2 are open to maintain the time delay relay SRT deenergized. Finally the break contacts SR3 (FIG. 4) are open to leave the resistor RK1 in a condition effectively in series with the capacitor CK1. As the car doors start to open, the door safety relay 40 (FIG. 1) is deenergized to open its make contacts 40-1. This prevents energization of the up switch 1 and the down switch 2. In addition the door safety relay opens its make contacts 40-2 (FIG. 4) for the purpose of permitting a charging operation of the capacitor CK1.

It will be assumed that a call registered for the fourth landing requires car travel in the up direction. If no person enters or leaves the elevator car A within four seconds, the time delay element 417 (FIG. 3) finally times out and the non-interference relay 70 thereupon drops out to complete the following energizing circuit (FIG. 1):

L-, 80, 81U2, SR1, SRT1, 70-1, L+

The pickup of the relay 80 initiates a starting operation of the elevator car A in a manner which will be clear from the aforesaid Suozzo et al. patent.

Let it be assumed next that one second after the elevator car A stops at the third landing a person enters the elevator car. In entering the car the person briefly interrupts the light beam produced by the lamp LA1. This results in opening of the make contacts PR1-1 (FIG. 1) to deenergize the detector relay SR. The detector relay opens its make contacts SR1 to prevent energization therethrough of the master call relay 80. In addition, the break contacts SR2 close to energize the time delay relay SRT. Finally the detector relay SR

closes its break contacts SR3 (FIG. 4) to shunt the resistor RK1.

The capacitor CK1 promptly charges to a voltage sufficient to break over the Zener diode ZE and thus dropout the non-interference relay 70. The non-interference relay 70 closes its break contacts 70-1 (FIG. 1). However, since the contacts SR1 and SRT1 are both open at this time the master call relay 80 cannot be picked up.

When the person entering the elevator car A clears the beam produced by the lamp LA1 the contacts PR1-1 reclose to pickup the detector relay SR. This relay closes its make contacts SR1, but the break contacts SRT1 remain open to prevent energization of the master call relay 80. In addition, the break contacts SR2 open to start a timing out operation of the time delay relay SRT. It will be recalled that this relay is assumed to have a time delay in dropout of the order of one-half second. Opening of the break contacts SR3 (FIG. 4) has no immediate effect on the operation of the system.

At the end of its one-half second time delay the relay SRT drops out to close its break contacts SRT1 (FIG. 1). This completes the pickup circuit for the master call relay 80 as follows:

L—, 80, 81U2, SR1, SRT1, 70-1, L+

Consequently the elevator system initiates a door closing and starting operation in the manner discussed in the aforesaid Suozzo et al. patent. In this manner the relays SR and SRT produce a saving of 2½ seconds in the time required to start the elevator car from the landing and materially improve the efficiency of the elevator system.

In FIG. 1 direction arrows GU and RD are provided for indicating the direction of travel of the elevator car A. The direction arrow GU for indicating up travel may take the form of a green window or jewel behind which a lamp LA3 is located. This lamp is connected across the buses KSL— and KSL+ either through make contacts 81U3 of the up direction preference relay 81U or make contacts 1-2 of the up switch 1. The down direction arrow may take the form of a red glass window or jewel behind which a lamp LA4 is located. This lamp is connected across the buses KSL— and KSL+ through either the make contacts 81D3 of the down direction preference relay 81D or the make contacts 2-2 of the down switch 2. The down direction arrows are positioned in the elevator car to be visible to passengers standing within the elevator car.

All relays and switches employed in the elevator system may be of static construction. Such construction is particularly desirable for components to be mounted on the elevator car. However, for present purposes it will be assumed that certain of the relays and switches such as the relays 34, 40, 45, 70, 81U, 81D, OP and CL are of electromechanical construction. The switches KS1 and KS2 also are assumed to be of electromechanical construction but it will be noted that these are mounted in the penthouse. The relays SR and SRT also are assumed to be of electromechanical construction.

As previously pointed out the supervisory control equipment preferably is mounted on the elevator car A. A preferred construction is illustrated in FIG. 5. As shown in FIG. 5 the front wall of the elevator car to one side of the doorway is provided with a recess K13 which extends in a vertical direction from the floor K15 of the elevator car to the top of the elevator car. This recess thus provides a wire way for receiving wiring extending between the supervisory control equipment mounted on the elevator car A and other parts of the system.

The recess is closed by a panel K17 which is mounted on a shaft K19 for pivotal rotation about a vertical axis from the operating position illustrated in full lines in FIG. 5 to a service position illustrated in broken lines.

The surface of the panel K17 which is exposed to passengers within the elevator car carries a car station K21 on which the car call registering buttons 1C to 5C are positioned. These car buttons may be of the conventional electromechanical type or they may be of a static type well known in the art. In addition the car station carries the direction arrows RD and GU. The same surface of the panel K17 also carries a position indicator KP for indicating to persons within the elevator car the position of the elevator car in its hoistway. The lamps 135 (e.g. FIG. 2) are located in the position indicator KP and each lamp is illuminated when the elevator car is adjacent the landing corresponding to the illuminated lamp. Position indicators of this type are well known in the art.

The supervisory control equipment other than the switches KS1 and KS2 preferably is mounted at the rear of the panel K17 within the recess K13. Although this equipment may be mounted directly on the panel K17, preferably they are mounted on a frame K17F which is mounted for independent rotation about the axis of the shaft K19, or if desired another axis. When the frame is pivoted away from its operating position equipment thereon may be accessible from both sides of the frame. Thus, the components illustrated in FIG. 7 of the aforesaid Suozzo et al. patent all may be mounted at the rear of the panel K17. In FIG. 5 the lower terminal floor board 507, the upper terminal floor board 511 and the intermediate floor boards 509 correspond to components bearing the same reference characters in the aforesaid Suozzo et al. patent. This mounting of the supervisory control equipment greatly facilitates connections from the equipment to the position indicator KP, the lamps of the direction arrows RD and GU, the car call push buttons 1C to 5C and the photocell PC1. Furthermore, the traveling cable TC customarily provided for effecting electrical connections between components within the elevator car and components in the penthouse or other parts of the building or structure associated with the car may be terminated within the wire way provided by the recess K13. Suitable connections may be effected between the traveling cable conductors and a terminal board KTB located within the recess K13 and connected to components of the supervisory control equipment mounted on the panel K17, or some or all connections may be made directly from the traveling cable conductors to this supervisory control equipment.

The wire way formed by the recess K13 also facilitates connections between the supervisory control equipment mounted on the panel K17 and components mounted on the elevator car such as the door operator 31 and the inductor notching relay Z.

When the elevator system is in its normal operating condition the panel K17 is locked in the position illustrated in full lines in FIG. 5. When the supervisory control equipment is to be inspected or serviced the panel K17 is unlocked and pivoted to the position shown in broken lines. It will be understood that the electrical connections to the supervisory control equipment mounted on the panel K17 desirably may be sufficiently flexible to permit the desired pivotal movement of the panel K17 without necessitating any disconnections of conductors from such supervisory control equipment. With the panel K17 open or removed, the frame K17F may be pivoted around its axis to facilitate access to equipment mounted thereon.

Besides the advantage apparent from the foregoing discussion it should be noted that the panel K17 together with all of the components mounted thereon may be fabricated, assembled and tested at the factory thus assuring optimum accuracy. This saves a substantial amount of time formerly required to make temporary set-ups of portions or sub-assemblies of the supervisory control equipment for testing. The completely fabricated assembly then may be shipped for installation on the elevator car as a unit. In addition to material reduction

in cost of fabrication and installation the assembly is easier to install and service.

It is conventional practice to provide a maintenance station KMS on top of the car. Such a station is shown in FIG. 5 and circuit components therefor, are shown in FIG. 1. For example, such a station may have a box containing a transfer switch KTS and an emergency stop switch KESS. A portable station KPS containing an "up" pushbutton KPS1 and a "down" pushbutton KPS2 may be connected to the box through flexible cable. When the transfer switch KTS is operated away from its position in FIG. 1 the pushbuttons KPS1 and KPS2 are connected respectively to control energizations of the switches KS1 and KS2. At the same time operation of the switch KESS assures deenergization of both switches KS1 and KS2 to stop the car. In this way a maintenance man is given full control of the car.

The arrangement of the supervisory control equipment and the wireway within the recess K13 greatly facilitates pre-wiring of the maintenance station KMS through the wireway to the supervisory control equipment.

The lamps LA1 and the photocell PC1 are shown on opposite sides of the doorway. By locating both of these components on the side of the doorway adjacent the supervisory control equipment pre-wiring of the components is further facilitated. This is illustrated in FIG. 5 by a lamp LA2 and a photocell PC2 which are located adjacent the supervisory control equipment on the same side of the doorway. Radiation energy or light from the lamp LA2 is transmitted across the doorway to a light reflector LAR. From the reflector LAR the light is again transmitted across the doorway to the photocell PC2. A person entering the doorway interrupts either or both of the beams of light incident on and reflected from the reflector LAR to interrupt the reception of light by the photocell PC2. The lamp LA2 is connected across the buses KSL- and KSL+ (FIG. 1). The photocell PC2 through an amplifier AM2 controls relay contacts PR2-1 of a relay RP2 in the same manner discussed for components bearing the same reference characters in the aforesaid Santini et al. patent. The contacts PR1-1 and PR2-1 control energization of the relay SR in the same manner discussed in the aforesaid Santini et al. patent.

With this approach, the lamp LA2, the photocell PC2 and the supervisory control equipment mounted on the frame K17F may be permanently associated, wired and tested at the factory in a compact unit.

In the embodiment of FIG. 1 the switches KS1 and KS2 may be operated manually in the penthouse or by temporary wiring to move the car. For example, such movement may be desired before installation of control equipment in the car.

Location of the supervisory control equipment on the car enables a maintenance man to ride the car to each floor for the purpose of checking the response of the system to each of the call registering means.

Although the invention has been described with reference to certain specific embodiments thereof numerous modifications falling within the spirit and scope of the invention are possible.

We claim as our invention:

1. In a transportation system having a base structure providing a plurality of landings between which transportation is to be provided, a vehicle for serving said landings, means mounting said vehicle for movement relative to said structure to serve said landings, motive means operable for moving said vehicle relative to the structure, landing call registering means positioned at each of said landings and operable for registering calls for service from the landings, vehicle call registering means positioned on the vehicle and operable for registering calls for landings at which the vehicle is to stop, said vehicle having a passage through which load may pass between the interior of the vehicle and any landing at which the vehicle is located, door means operable for

closing and opening said passage, and door operator means positioned on the car for operating the door means between closed and open conditions, the improvement which comprises control means positioned on said car, and coupling means for transmitting signals between said landing call registering means, said vehicle call registering means and said control means, said control means comprising means responsive to said signals for producing stop and start signals for said motive means and said door operator means, and coupling means for transmitting said stop and start signals to said motive means and said door operator means for moving said vehicle between said landings, for stopping the vehicle at landings for which calls are registered by the call registering means and for opening and closing the door means at a landing at which the vehicle stops.

2. A transportation system as claimed in claim 1 wherein said control means operates automatically to stop the vehicle at each landing approached by the vehicle for which a call is registered by the call registering means which may be served by the vehicle, to open the door means at the last-named landing, to reclose the door means after the lapse of a substantial time if a call requiring service remains registered by the call registering means, and to start the vehicle after such reclosure of the door means.

3. A transportation system as claimed in claim 2 wherein said control means includes detector means responsive to detection of load passage through said passage for replacing any remaining part of said substantial time by a lesser time, said control means initiating a closure operation of the door operator means after such detection within a time having a value less than said substantial time.

4. A transportation system as claimed in claim 1, said vehicle comprises a box structure for carrying load, said box structure having a wall providing a surface accessible to load carried by the vehicle and a space closed by said wall against access by load carried by the vehicle, said control means being located in said space, said vehicle call registering means being located on said wall for operation by load within the vehicle.

5. A transportation system as claimed in claim 4 wherein said space provides a wire-way extending in the direction of travel of the vehicle, said coupling means comprising a traveling cable for effecting electrical coupling between said control means and stations located on said base structure, said traveling cable terminating in said wire-way.

6. A transportation system as claimed in claim 4 in combination with pivot means mounting said wall for rotation about an axis parallel to the direction of travel of said vehicle to provide access to the control means normally located in said space.

7. In a transportation system having a base structure providing a plurality of landings between which transportation is to be provided, a vehicle for serving said landings, means mounting said vehicle for movement relative to said structure to serve said landings, motive means operable for moving said vehicle relative to the structure, landing call registering means positioned at each of said landings and operable for registering calls for service from the landings, vehicle call registering means positioned on the vehicle and operable for registering calls for landings at which the vehicle is to stop, said vehicle having a passage through which load may pass between the interior of the vehicle and any landing at which the vehicle is located, door means operable for closing and opening said passage, and door operator means positioned on the car for operating the door means between closed and open conditions, station means for producing successive signals as said vehicle passes predetermined points relative to said structure, the improvement which comprises control means positioned on said vehicle, and coupling means for transmitting signals between said landing

call registering means, said vehicle call registering means and said control means, said control means comprising means responsive to said signals for producing stop and start signals for said motive means and said door operator means, and coupling means for transmitting said stop and start signals to said motive means and said door operator means for moving said vehicle between said landings, for stopping the vehicle at landings for which calls are registered by the call registering means and for opening and closing the door means at a landing at which the vehicle stops, said control means including static means responsive to said successive signals for producing a plurality of position signals each corresponding to location of said vehicle adjacent a separate one of said landings.

8. A transportation system as claimed in claim 7 wherein said control means includes static means for producing and maintaining a separate service signal in response to operation of each of said landing call registering means, and static means dependent on coincidence for one of said landings of a position signal and a service signal for producing a stopping signal.

9. In an elevator unit, an elevator car having a horizontal floor and a vertical wall, said vertical wall having a space therein extending vertically substantially from the floor to the top of the elevator car, car call registering means located on said wall for operation from the interior of said car, elevator control means located in said space, said control means including electro-responsive logic elements coupled to said car call registering means to produce signals dependent on the condition of said car call registering means, an electric conducting traveling cable terminating in said space, and means electrically coupling the cable to said control means.

10. An elevator unit as claimed in claim 9 in combination with an electro-responsive door operator disposed on said car, and electroconductive means extending from said door operator into said space to couple electrically the door operator to said control means.

11. An elevator unit as claimed in claim 10 wherein said elevator car has a passage permitting movement of persons therethrough into and out of said car, door means coupled to said door operator for opening and closing said passage under the control of said door operator, a detector for producing a change in an electric signal in response to passage of a person through said passage, and coupling means extending from said detector into the space for electrically coupling said detector to said control means, said control means having electro-responsive means responsive to said signals.

12. In an elevator unit having a structure having a plurality of vertically spaced landings, an elevator car mounted for movement relative to the structure to serve the landings, motive means controllable for moving and stopping the elevator or to serve the landings, said elevator car having a doorway through which a person may enter or leave the elevator car, a radiant-energy transmitter mounted on said car on a first side of the doorway for transmitting radiant energy towards a second side of the doorway, a reflector mounted on said car on said second side of the doorway for reflecting radiant energy towards said first side of the doorway, and a radiant energy detector mounted on said car on said first side of the doorway for detecting reflected radiant energy, the improvement which comprises control means mounted on said car on said first side for generating stop and start signals for said motive means, and means coupling said detector to said control means to render control means ineffective to produce a start signal for said motive means in response to interruption of the supply of said radiant energy to said detector.

13. In an elevator unit having a structure having a plurality of vertically spaced landings, an elevator car mounted for movement relative to the structure to serve the landings, motive means controllable for moving and stopping the elevator or to serve the landings, said eleva-

tor car having a doorway through which a person may enter or leave the elevator car, a radiant-energy transmitter mounted on said car on a first side of the doorway for transmitting radiant energy towards a second side of the doorway, a reflector mounted on said car on said second side of the doorway for reflecting radiant energy towards said first side of the doorway, and a radiant energy detector mounted on said car on said first side of the doorway for detecting said reflected radiant energy, the improvement which comprises control means mounted on said car on said first side for generating stop and start signals, door means operable for closing and opening said doorway, a door operator mounted on said elevator car and controllable to open and close said door means, coupling means coupling said door operator and detector to said control means, said control means comprising means responsive to generation of a start signal for controlling said door operator to close said door means, means responsive to closure of said door means for controlling the motive means to move said car, and means responsive to interruption of the reception of radiant energy by the detector for preventing a closing operation of the door means.

14. A unit as claimed in claim 13 in combination with a maintenance station on said car, and transfer means on said car operable for placing said maintenance station in charge of said control means, said maintenance station when in charge of said control means being manually operable for issuing start and stop signals to said motive means.

15. In a transportation system having a base structure providing a plurality of landings between which transportation is to be provided, a vehicle for serving said landings, means mounting said vehicle for movement relative to said structure to serve said landings, motive means operable for moving said vehicle relative to the structure, landing call registering means positioned at each of said landings, and operable for registering calls for service from the landings, and vehicle call registering means positioned on the vehicle and operable for registering calls for landings at which the vehicle is to stop, said vehicle having a passage through which load may pass between the interior of the vehicle and any landing at which the vehicle is located, the improvement which comprises control means positioned on said car, coupling means for transmitting signals between said landing call registering means, said vehicle call registering means and said control means, said control means comprising means responsive to said signals for producing stop and start signals for said motive means, coupling means for transmitting said stop and start signals to said motive means for moving said vehicle between said landings, and for stopping the vehicle at landings for which calls are registered by the call registering means, radiant-energy-transmitting means for directing radiant energy into said passage, detector means adjacent said transmitting means for detecting the presence of radiant energy reflected through said passage to the detector means, and connecting means connecting said detector means to the control means for preventing movement of said vehicle while load is in the path of radiant energy transmitted from said transmitting means into the passage.

16. In a system as claimed in claim 15, position means for generating position signals which are dependent on the position of the vehicle, said control means positioned on the vehicle comprising input means for receiving position signals from said position means, input means for receiving call signals from said call registering means corresponding to landings for which vehicle service is desired, and means responsive to the signals applied to said input means for generating a stop signal for initiating the stopping of the vehicle at each landing approached by the vehicle for which a call signal is received by the control means that can be answered by such stopping of the vehicle.

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17. A system as claimed in claim 15 wherein said control means, said vehicle call registering means, said radiant-energy transmitting means and said detector means are located on said vehicle on the same side of said passage.

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