April 26, 1960 M. C. YEASTING 2,934,170

AUTOMATIC ZONING CONTROL

Filed Jan. 21, 1959 5 Sheets-Sheet 1

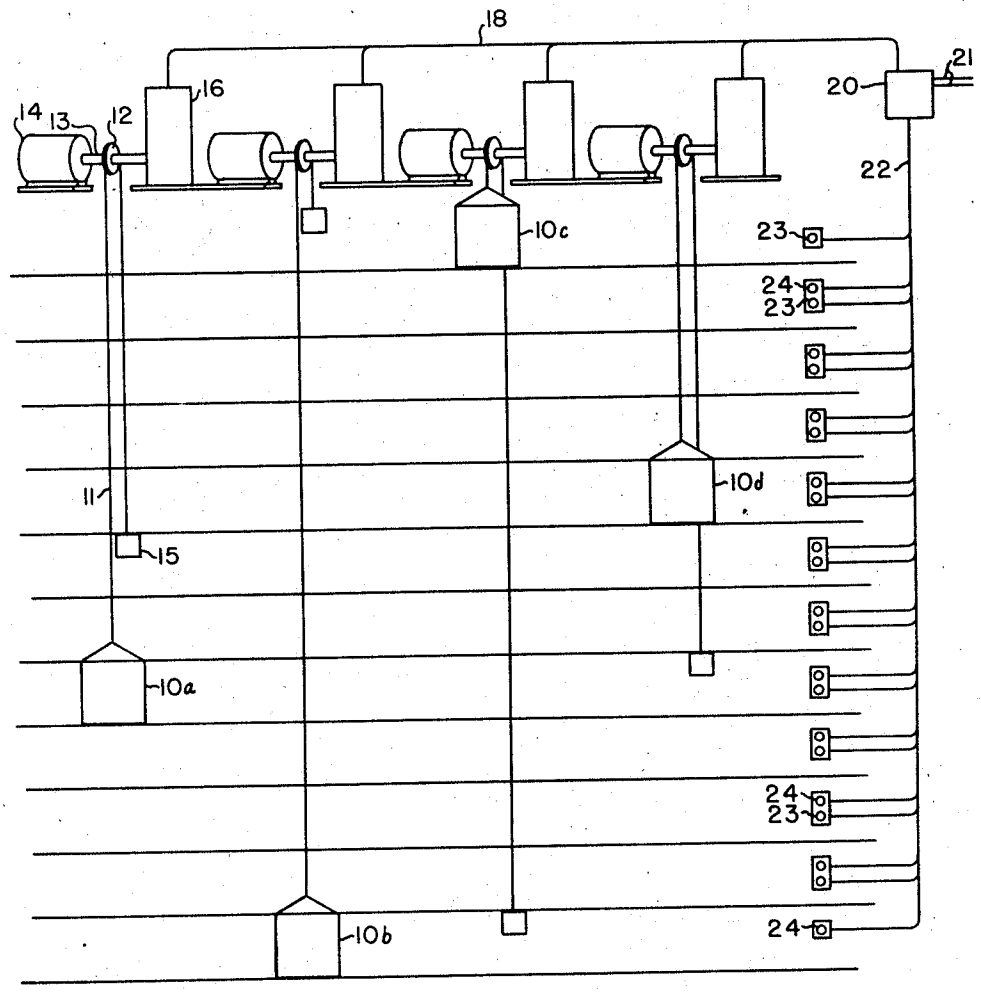


Fig. 1

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AUTOMATIC ZONING CONTROL

Filed Jan. 21, 1959 5 Sheets-Sheet 2

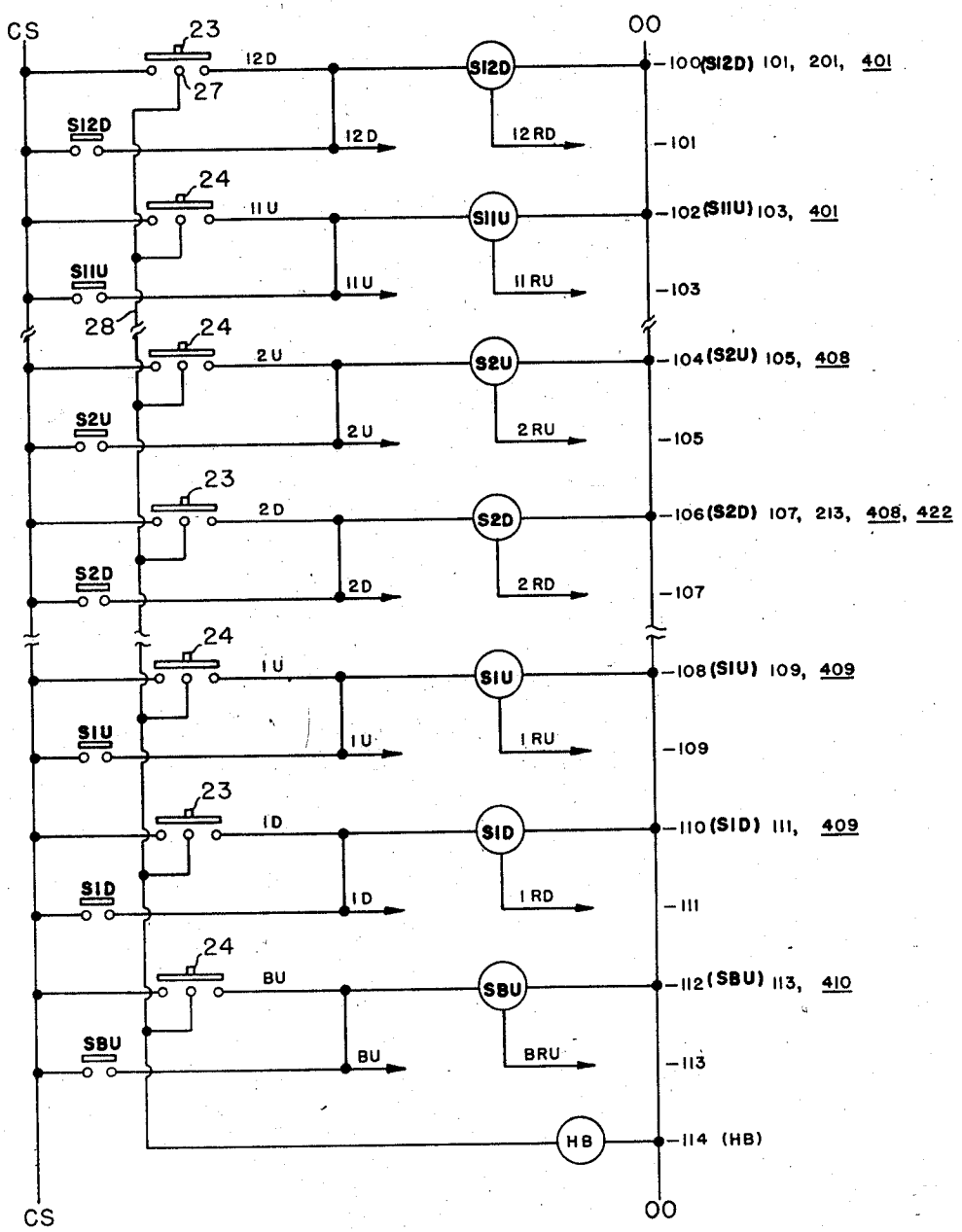


Fig. II

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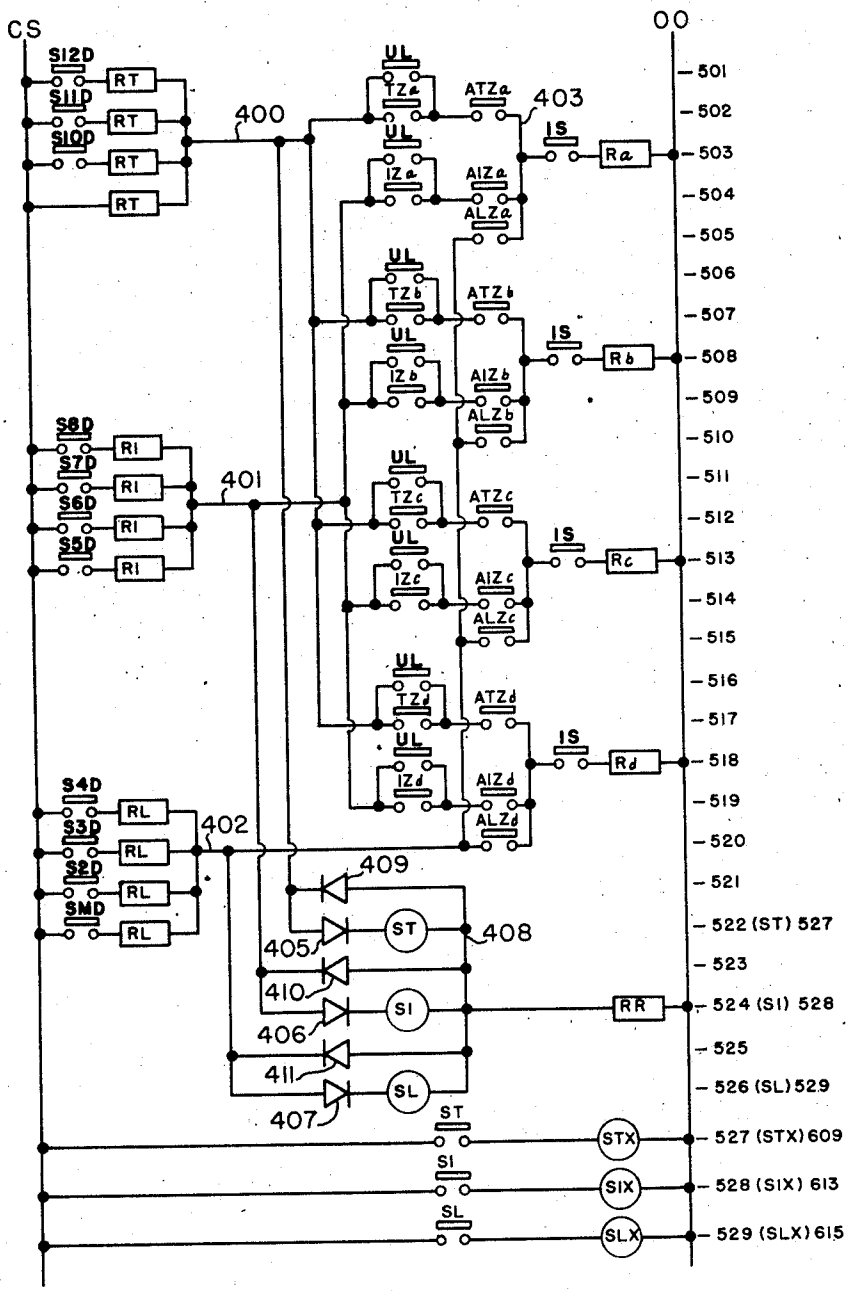


Fig. III

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AUTOMATIC ZONING CONTROL

Filed Jan. 21, 1959 5 Sheets-Sheet 4

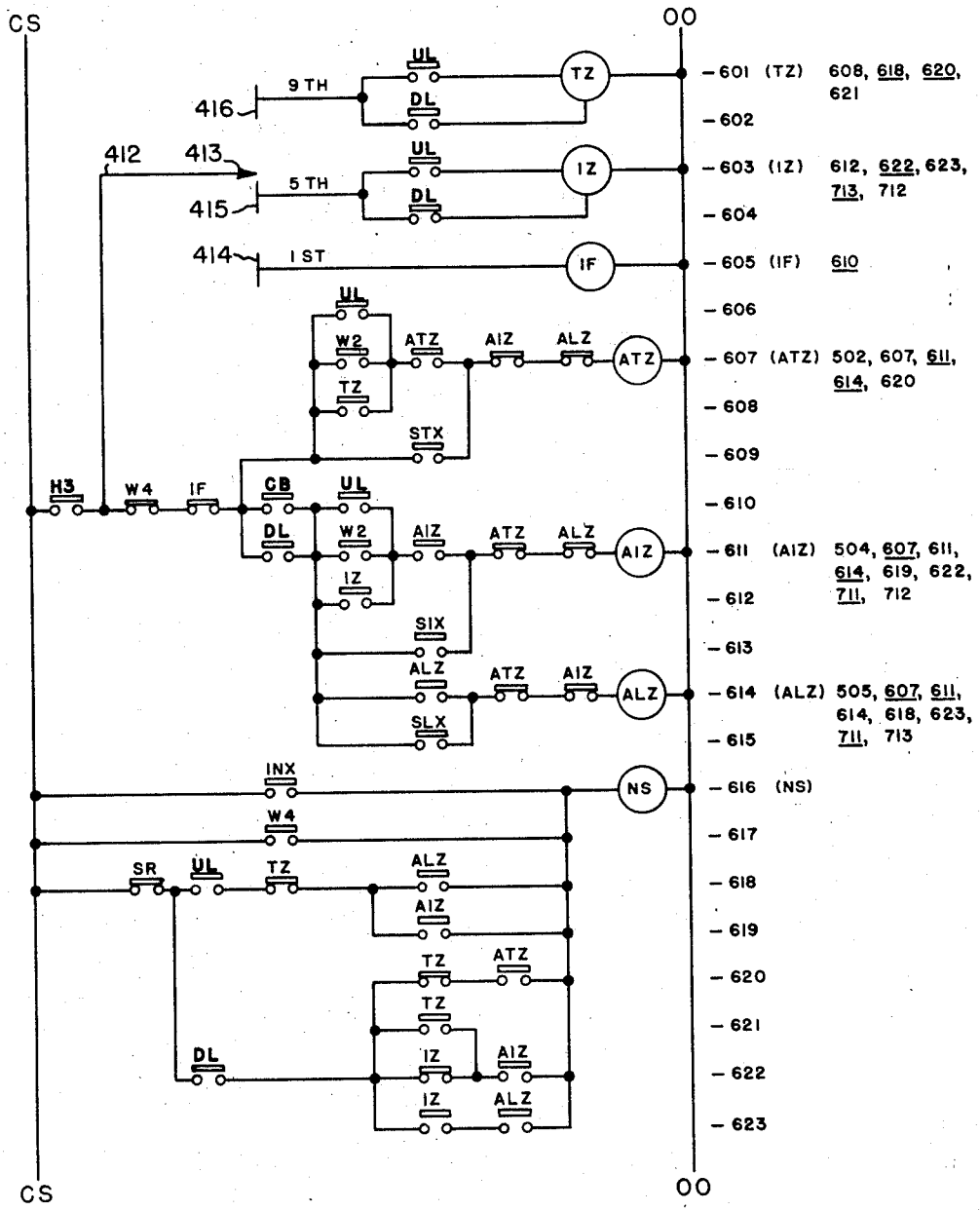


Fig. IV

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AUTOMATIC ZONING CONTROL

Filed Jan. 21, 1959 5 Sheets-Sheet 5

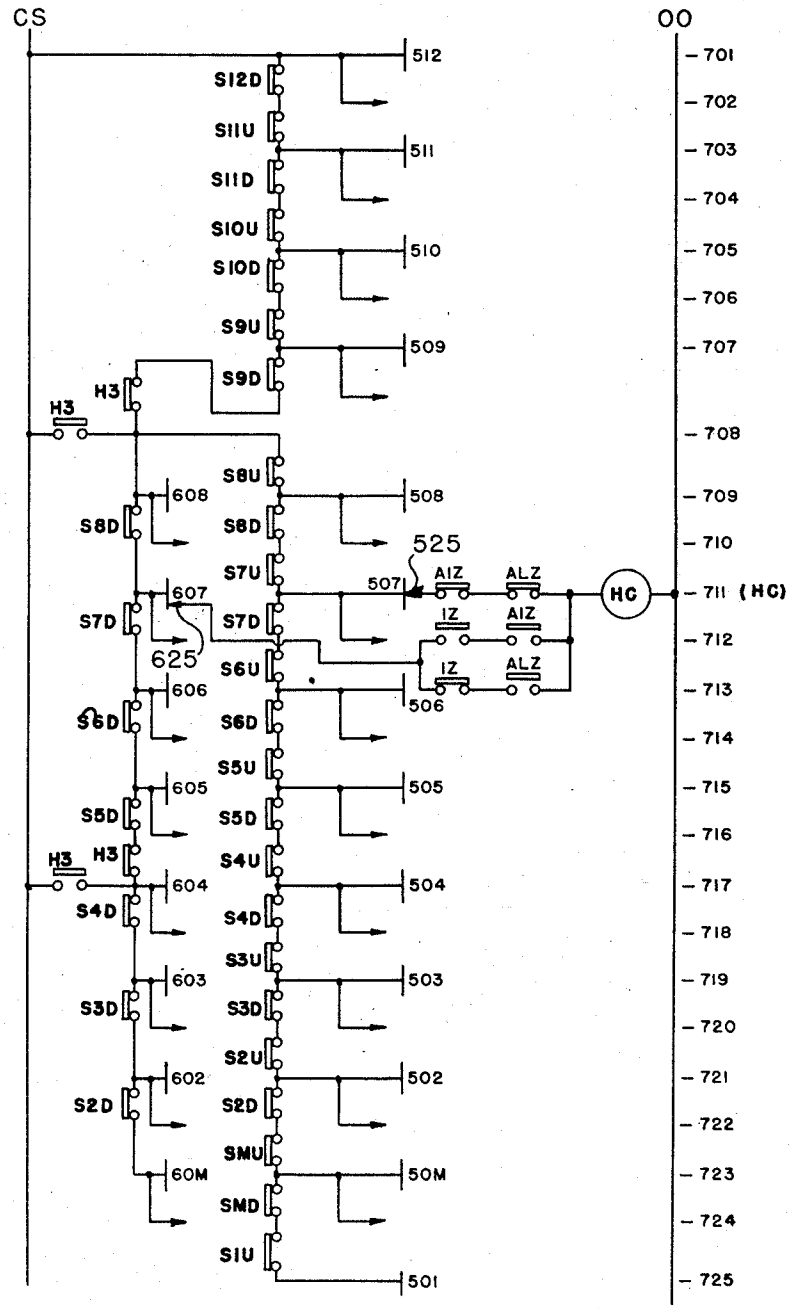


Fig V

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United States Patent Office 2,934,170
Patented Apr. 26, 1960

2,934,170

AUTOMATIC ZONING CONTROL

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Application January 21, 1959, Serial No. 788,086

10 Claims. (Cl. 187—29)

This invention relates to elevator systems and in particular to automatic elevators subject to automatic supervisory control.

One of the problems involved in the supervisory control of any group of automatic elevators is the scheduling or assigning of the cars to serve particular zones or groups of floors in accordance with the demand at such floors in order that certain floors of a building may not monopolize the elevators to the detriment of service for the remaining floors.

The principal object of this invention is to provide automatic control equipment that is responsive to the distribution of calls for service and the distribution of the elevator cars and which is effective to assign cars to those zones of floors in need of service.

Another object of the invention is to provide automatic control equipment for continually comparing the number of calls for service in a particular zone with the number of cars assigned to that zone for each of the various zones making up the building served by the elevator system and, as each car becomes available, assigning such car to the zone then in need of service.

A still further object of the invention is to provide an automatic control system that is operable during periods of heavy down traffic for assigning each car that is available for selection to either a high zone of floors or a low zone of floors depending upon the number of calls registered in such zone and the number of cars then in position to serve such zone.

These and other objects and advantages may be obtained from a control system constructed and operated according to the invention.

According to the invention the supervisory control system includes means responsive to the number of calls for service registered in particular zones and to the number of cars assigned to such zones for assigning cars to that zone then in need of service. The comparing means preferably comprises a voltage comparison circuit responsive to the number of calls registered in each zone and the number of cars then assigned to each zone. The comparison circuit is arranged to assign the cars, as they become available for assignment, to that zone having the higher proportion of calls to cars.

The comparison circuit preferably includes a branch circuit for each zone. Each branch circuit includes two portions connected in series, the first portion comprising a parallel combination of electrical impedance elements, one for each unanswered down hall call in the zone, and the second portion comprising a parallel combination of impedance elements, one for each car then assigned to that zone. The potentials at the junction points between the two portions of each branch circuit, which are proportional to the ratio of calls to assigned cars for the zone represented by that circuit, are compared and cars are assigned to the zone having the highest junction potential.

A preferred embodiment of the invention is illustrated in the accompanying drawings.

In the drawings:

Fig. I is a schematic diagram illustrating a bank of elevators with hall call registering means and indicating the general type of system that may employ automatic supervisory control.

Fig. II is a schematic diagram of the electrical means for registering hall calls.

Fig. III is a schematic wiring diagram of means for comparing the calls per car for each of a plurality of zones greater than two.

Fig. IV is a schematic wiring diagram showing circuits for assigning cars to various zones of a multi-zone system in accordance with the demand for service.

Fig. V shows a high call reverse circuit arranged to cooperate with the circuits shown in Fig. IV.

These specific figures and the accompanying description are intended merely to illustrate the invention and not to impose limitations on its scope.

A typical elevator system in which the invention may be employed is illustrated generally in Fig. I as comprising a plurality of cars **10***a*, **10***b*, **10***c* and **10***d* each of which is suspended on a cable **11** that runs over a sheave **12** on an armature shaft **13** of an elevator drive motor **14** and is connected to a counterweight **15** adapted to counter-balance the weight of the car and a portion of the full load of the car. Ordinarily the counterweight is selected so that with an average load in the car the counterweight will balance the weight of the car and load.

A floor selector machine **16** is associated with each elevator and may be driven directly from the armature shaft **13** or by a separate cable directly from the elevator car **10**. If the machine is driven directly from the armature shaft **13** suitable correcting means are employed to insure synchronism between the movement of the floor selector machine and the car **10** and thus correct for creepage of the cable **11** over the sheave **12**.

The floor selector machines **16** are individually connected through an electrical cable **18** to a supervisory control panel **20** that may be energized from a source of power through leads **21** and which is also connected through a cable **22** to a series of down push buttons **23**, one for each floor, for registering down hall calls and to a plurality of push buttons **24**, one for each floor, for registering up calls for service. The uppermost and lowermost floors are provided with a single button since there can be no travel beyond such floors.

The supervisory control mechanism in the panel **20** together with the individual floor selector machines **16** provide means for controlling the operation of the elevator car so that the cars respond to calls registered by the hall buttons **23**, **24** or to car buttons, not shown, mounted in the respective cars for registering destination calls. The control system also includes means for governing the starting and stopping of the cars as they answer registered calls.

Typical hall call registering circuits are illustrated in Fig. II. These comprise in addition to the push buttons **23** and **24** a series of double coil relays, one for each button, that is energized by operation of the associated push button and that seals itself to register a stopping call until a car stops in response to such call and energizes its second or neutralizing coil. For convenience the hall call relays for up calls are given numbers in the S—U series and the down hall call relays are given numbers in the S—D series.

Only those relays, of the many used in a complete elevator system, that are employed in or cooperate with the assignment circuits are shown. Those relays that are individual to a car are, where several appear in the same

circuit, identified by lower case letter subscripts. The relays are:

CB (*a, b, c, d*)____ High car call relay.
DL (*a, b, c, d*)____ Down directional memory relay.
HB_____ Hall button relay.
HC_____ High hall call relay.
H3_____ Down peak relay (coil not shown.)
INX (*a, b, c, d*)_ Inspection relay.
IS (*a, b, c, d*)____ In service relay (coil not shown).
NS (*a, b, c, d*)____ Non stop relay.
S1D–S12D_____ Down hall call relays.
SBU–S11U_____ Up hall call relays.
UL (*a, b, c, d*)___ Up directional memory relay.
W2 (*a, b, c, d*)___ Load relay, 40% load.
W4 (*a, b, c, d*)___ Load relay, 80% load.

Relays used in the selection and assignment circuits include:

AIZ_____ Assignment relay, intermediate zone.
ALZ_____ Assignment relay, low zone.
ATZ_____ Assignment relay, top zone.
SI_____ Selection relay, intermediate zone.
SL_____ Selection relay, low zone.
ST_____ Selection relay, top zone.
SIX_____ Auxiliary selection relay, intermediate zone.
SLX_____ Auxiliary selection relay, low zone.
STX_____ Auxiliary selection relay, top zone.
IZ_____ Intermediate zone relay.
TZ_____ Top zone relay.

In the description relay contacts are given the same reference characters as the relay and the particular circuits are identified by the line numbers. A code along the right of each figure at each relay location lists the lines where its contacts are shown. An underscored line number signifies normally closed contacts.

To register to call a push button, for example the button **24** in line **108**, is pressed so that current may flow from a supply lead CS through the energizing coil of the first floor up relay S1U to a return lead **00**. The relay thereupon closes its contacts S1U in line **109** to provide a sealing or by-pass circuit around the push button, and through a branch lead **1U**, to energize appropriate contacts on each of the floor selector machines **16** so that a car approaching the floor while traveling in the up direction may stop at the floor. A third lead **26** from the relay S1U is connected to its reset coil so that when the car answers a call and completes a circuit through up reset lead 1RU to the return lead **00** the relay S1U is released to open its contacts S1U in line **109** thus canceling the indication of an up call at that floor.

Latch relays may be employed instead of the indicated relays to eliminate the sealing contacts shown along the left side of the diagram.

A third contact **27** in each of push buttons **23**, **24** is arranged to energize a lead **28** whenever a button is held down to transmit current from the supply lead CS through the lead **28** to a hall button relay coil HB shown in line **114**. This relay operates circuits to provide indications that a hall call button is being held down and is particularly useful during intermittent service in systems in which an operator is provided so that he may be alerted by operation of this relay.

To serve heavy down traffic it is desirable to divide the number of floors served by an elevator system into three or more zones. Circuits suitable for sensing the demand for service from three or more zones and assigning cars to such zones in accordance with the demand for service are illustrated in Figs. III, IV and V. While the circuits are shown for a three zone system the principles of operation are such that they may easily be expanded to cover any number of zones that may be found desirable.

For purposes of illustration a system having 12 floors above a main or terminal floor has been selected and is

divided into three zones of four floors each. Circuits are shown in which, for each zone, the ratio of the number of calls to the number of cars assigned is sensed and suitable selection relays are energized to assign cars, as they become available for assignment, to that zone having the greatest number of calls per car. Since low or intermediate zone cars do not answer up hall calls the circuit is further arranged so that in the event there are no calls in the top zone a car will nevertheless be assigned to that zone during its upward travel and therefore respond to any up hall calls that may be registered. Such an up traveling car assigned to the upper zone, in the absence of any calls in such zone, stops at the lowest floor in the zone, reverses, and starts down. As soon as it leaves the upper zone in its downward travel, being unloaded, it loses its high zone assignment and is then available for reassignment to whichever of the lower zones is then in greatest need for service.

Fig. III shows the circuits for comparing among the various zones the ratio of calls registered in a zone to cars assigned to that zone and for selecting according to such ratios the zone requiring service. In the comparing circuit, resistors RT, one for each floor of the high zone, are connected through down hall call relay contacts S12D to S10D inclusive to a supply lead CS. The other terminals of the resistors RT are connected to a common lead **400**. The resistor RT for the ninth floor, the lowest floor of the top zone, is connected directly to the positive supply lead CS so that this resistor is in the circuit at all times while the others are in the circuit only as long as a call is registered at the floor.

Similar sets of resistors RI and RL for the intermediate and low zones are provided. These are connected to the supply lead through down hall call relay contacts and, for the intermediate zone, are connected to a common lead **401** and, for the low zone, a common lead **402**. In these lower zones all of the resistors are connected through hall call relay contacts so that none of the resistors are in the circuit unless a call is actually registered at the corresponding floor.

The lead **400**, the common lead for the top zone resistors, is connected to return lead **00** through car resistors R*a*, R*b*, R*c*, or R*d* depending upon which of the cars is in service with its in service relay contacts IS closed, is assigned to the top zone, and is either moving up or is still in the top zone during movement down. Thus from the lead **400**, assuming that car A is assigned to the top zone, the circuit may be traced through the parallel combination of contacts UL*a*, line **501**, and top zone relay contacts TZ*a* for car A in line **502**, thence through top assignment zone relay contacts ATZ*a* for car A to a common junction lead **403** that is connected through in-service relay contacts IS, and the resistor RA for car A to the return lead **00**. Thus any car assigned to the top zone has its resistor connected to the common lead **400** for the top zone.

In like manner any car assigned to the intermediate zone has its resistor connected to the lead **401** as long as the car is traveling up or is in or above the intermediate zone.

Cars assigned to the low zone have their resistors connected to the lead **402**.

This circuit thus comprises a plurality of branches, one for each zone, in which each branch is composed of two series connected portions a first of which comprises the parallel combination of the resistors representing the various floors at which calls are registered and a second portion which comprises the parallel combination of resistors representing the cars that are assigned to such zone. If there is only one car assigned to a zone there is only one resistor in the second portion of the branch circuit. The potentials on the leads **400**, **401**, or **402**, the midpoints of the various branches of the circuit, vary according to the number of calls registered for the zone and the number of cars assigned to that zone. If

there are no cars assigned to a zone the potential on the corresponding lead tends to approach or be equal to the potential of the supply lead CS. Likewise if there are no calls registered in the intermediate or lower zones and a car is assigned to such zone the potential of the leads **401** or **402** tends to be the same as the return lead **00**. Thus the potential at the intermediate junction points, the leads **400**, **401**, or **402**, varies according to the demand for service from the zone.

Potentials on these leads are compared by a circuit that includes sensitive selection relay ST for the top zone, SI for the intermediate zone, and SL for the lower zone. These sensitive selection relays, one for each zone, are connected through rectifiers **405**, **406** and **407** to the leads **400**, **401**, and **402** respectively. The other terminals of the coils of the selection relays are tied to a common junction lead **408**. The rectifiers **405**, **406** and **407** are polarized to pass current from the leads **400**, **401** or **402** through the coils of the selection relays to the common lead **408**. Additional rectifiers, **409**, **410** and **411** are connected between the common lead **408** and leads **400**, **401** and **402** so as to pass current from the lead **408** to such branch circuits whenever the potential of the branch circuit is less than that of the lead **408**. Lead **408** is also connected through a return resistor RR to the return lead **00** so that the selection relays may be operated even though there are no cars assigned at the moment.

In this arrangement one of the selection relays ST, SI and SL is energized as long as its branch circuit has a potential that is greater than the potential of the other branch circuits.

Preferably the selection relay ST, shown in line **522**, for the top zone has greater sensitivity than the others so that in the event there is one car assigned to each zone and there are the same number of calls in each zone, thus resulting in an exactly balanced condition, the selection relay for the top zone will be energized by current flowing from the lead **400** through the rectifier **405** and coil of the selection relay and thence through the resistor RR to the return lead **00**. Any unbalance between the branch circuits however will result in a predominant current flow through one of the relay coils thus allowing only one to be energized.

The selection relays ST, SI and SL for the top, intermediate and lower zones, respectively, when energized close their contacts in lines **527**, **528** or **529** to energize auxiliary selection relays STX, SIX, and SLX for the various zones. Each of these relays has a set of normally open contacts for each car in the system which are effective to condition assignment selection circuits shown in Fig. IV individual to each of the cars.

The selection and assignment circuits individual to each of the cars in the system are shown in Fig. IV. These include a top zone relay TZ shown in line **601**, an intermediate zone relay IZ shown in line **603** for each intermediate zone, and a first floor relay IF shown in line **605**. The intermediate and top zone relays are latch relays either of the mechanical latch type or magnetic latch type. These relays are arranged to be in their energized or latched condition as long as the car is in or above the corresponding zone. Thus in a three zone system two such latch relays are employed, one for the intermediate zone and one for the top zone. If the system is divided into more zones additional latch relays are required. These relays are energized from supply lead CS by way of down peak program contacts H3 in line **610**, a lead **412**, and a selector machine brush **413** that cooperates with stationary selector machine segments **414**, **415** and **416** for the first, fifth and ninth floors. The first floor segment **414** is connected directly to the coil of the first floor relay **1F** in line **605**. The fifth floor segment **415**, the segment for the bottom floor of the intermediate zone, is connected through up memory contact UL, line **603**, to a latching coil of the intermediate zone relay IZ and through down memory relay contacts DL to the release coil of the intermediate zone relay IZ. In similar manner the ninth floor segment **416** is connected through up memory relay contacts UL, line **601** to a latch coil of the top zone relay TZ and through down memory relay contacts DL, line **602**, to a release coil of the top zone relay TZ. Thus in this circuit with the car standing at the first floor the first floor relay 1F is energized. As the car moves upwardly and arrives at or passes the fifth floor the intermediate zone relay is latched in and when a car arrives at or passes the ninth floor the top zone relay is latched in. Thus the zone relays are latched in as long as the car is in or above the zone represented by such relay. On the down trip with the down memory relay contacts DL closed the top zone relay is unlatched or released as the car arrives at or passes the ninth floor and the intermediate zone relay is released as the car arrives at or passes the fifth floor. If the segments **415** and **416** of the selector machine are arranged to be engaged by the brush **413** when the car is at the fifth and ninth floors respectively the zone relays are latched in when the car enters the zone and are unlatched or released when the car arrives at or passes the bottom floor of the zone on its way down. If this is undesirable, in other words if the zone indication is to be held until the car is actually leaving the zone, then the segments **415** and **416** should be located on the selector machines just below the fifth and ninth floor positions respectively. Thus, the intermediate zone relay is latched in as the car runs from the fourth to the fifth floor and the top zone relay is latched in as the car runs from the eighth to the ninth floor. Likewise on the down trip the relays are unlatched as the car runs from the ninth to the eighth and from the fifth to the fourth floors, respectively.

The assignment relays for a car are shown in lines **607**, **611** and **614**. The top zone assignment relay ATZ in line **607** is energized if there is a demand for service in the top zone as indicated by closure of contacts ST in line **527** to energize auxiliary top zone selection relays STX so that it closes its contacts in line **609**. Thus when the car becomes available for selection, which is indicated by closure of down peak program contacts H3, line **610**; the car is unloaded as indicated by the closure of normally closed load relay contacts W4; is not at the first floor as indicated by closure of contacts 1F; and is not assigned to other zones, a circuit is completed in lines **610**, **609** and **607** from the supply lead CS to the coil of the top zone assignment relay ATZ. This relay immediately seals itself in through its contacts ATZ, line **607**, which are in series with a parallel combination of up directional memory relay contacts UL, line **606**, half load relay contacts W2, line **607**, and normally open top zone relay contacts TZ in line **608**.

In like manner, a car may be assigned to the intermediate zone, when it becomes available, by current flow from the first floor contacts 1F, line **610**, through intermediate zone selection relay SIX, line **613**, provided the car has no car calls and is not otherwise assigned. The intermediate zone assignment relay AIZ, line **611**, when energized closes its contacts AIZ, line **611**, to complete a sealing circuit which includes a parallel combination of up memory relay contacts UL, half load relay contacts W2, and intermediate zone relay contacts IZ, lines **610–612**.

In like manner, if the selection relays call for an assignment of the next car to the low zone, contacts SLX of the auxiliary low zone selection relay are closed in line **615** so that the car is assigned, when available, to the low zone. This relay, when energized, completes a sealing circuit through its contacts ALZ, line **614**, to maintain its assignment until it returns to the first floor or becomes more than 80 percent loaded as indicated by the opening of the load relay contacts W4, line **610**.

In this arrangement, each car maintains its assignment after it becomes available for assignment and is assigned as long as it is traveling up unloaded and without

higher car calls; is in or above the zone to which it is assigned; or is traveling down in a zone below that to which it is assigned but has more than a half load. In the event it is traveling down lightly loaded it loses its assignment as soon as it passes downwardly out of the assigned zone.

In this circuit the selection of the car and the assignment to a particular zone is delayed until after the car is away from the first floor and, except for assignment to the high zone, has no high car call registered. It can easily happen that an up traveling car has a car call requiring travel into the top zone when the demand for service is in the intermediate or low zone. Therefore, when the car becomes available for assignment after having served its highest car call, it is assigned to the intermediate or low zone. Such assignment causes it to immediately reverse and by-pass all calls in zones above the assigned zone so as to move directly to the top of the assigned zone and then pick up any down calls requiring service in such assigned zone.

The circuits for providing the non-stop operation are illustrated in lines **616–623** of Fig. IV. These include a non-stop relay NS in line **616** which when energized causes the car to ignore hall calls in either direction of travel. While non-stopping the car nevertheless stops when it reaches its highest call and also serves any car calls that may be registered. The non-stop relay NS is energized as long as the car is being operated during inspection, which is indicated by the closure of the contacts INX in line **616**. It is also energized to cause the car to operate non-stop when it is fully loaded as indicated by closure of load contacts W4, line **617**, because it is undesirable to stop a car unless it has capacity available to receive intending passengers. A car also operates non-stop when in a zone other than the one to which it is assigned by the circuits illustrated in lines **618** to **623** which include, for up travel, normally closed stopping relay contacts SR and up direction memory relay contacts UL, line **618**, normally closed top zone relay contacts TZ in the same line and a parallel combination of low and intermediate zone assignment relay contacts ALZ and AIZ, lines **618** and **619**. Thus during up travel as long as the car is in the low or intermediate zones and is assigned to one of those zones it operates nonstop. Under this condition it runs to the highest down call in the particular zone to which it is assigned. If the car is traveling up and is assigned to the top zone neither of the assignment relay contacts ALZ or AIZ in lines **618** or **619** are closed so that the car then stops for any up hall calls that it may encounter.

During down travel the up memory relay contacts UL are open and the down memory relay contacts DL are closed so the car having an assignment operates nonstop whenever it is in any zone to which it is not assigned. This is accomplished by the contacts illustrated in lines **620** to **623** which include in line **623** normally open contacts of the intermediate zone relay IZ and normally open contacts ALZ of the low zone assignment relay so that the car by-passes calls in the down direction as long as it is assigned to the low zone and is in or above the intermediate zone. If the car is assigned to the intermediate zone and is in the top zone as indicated by closure of top zone relay contacts TZ in line **621** the car will not stop until it gets into the intermediate zone. Likewise if the car is assigned to the intermediate zone and is traveling down with more than a half load so that its load relay contacts W2, line **611**, are closed to hold its assignment the nonstop relay is energized through the circuit in line **622**.

The combination of contacts in lines **621** and **622** are illustrative of any intermediate zone circuit whether there be one or more such intermediate zones. Thus, each intermediate zone circuit includes, in parallel, normally closed contacts of the zone relay for that particular zone and normally open contacts of the zone relay for the next above zone, this parallel combination being connected in series with the assignment relay contacts for that particular zone. Since the top zone circuit, line **620**, has no zone above it, it includes only the normally closed top zone relay contacts TZ and the assignment relay contacts ATZ for the top zone.

This circuit thus provides down nonstop operation as long as the car is assigned to a zone other than the zone in which it is then located. If the car is above the zone to which it is assigned it notstops down to the assigned zone regardless of its condition of loading. If it is in a zone below the zone to which it is assigned and is more than half loaded, to maintain its assignment, it by-passes down hall calls and proceeds directly to the lower terminal to discharge its load and be assigned to whichever zone then requires service.

Fig. V shows the high hall call circuits for signaling each of the elevator cars when it has reached the highest call to which it should respond. This circuit includes a chain of series connected normally closed or back contacts of the hall call relays which, starting from a power lead CS, includes, in order, the down hall call relay contacts for the twelfth or top floor, the up contacts for the eleventh floor, down contacts for the eleventh floor, up contacts for the tenth floor, down contacts for the tenth floor, etc., to and including up call contacts for the basement floor. Selector machine segments **512** for the top or twelfth floor, **511** for the eleventh floor, etc., are provided on each of the selector machines and are connected to the junction point between the contacts of the up and down floor call relays for that particular floor. A brush **525** engaging the series of segments **512**, etc., is connected through series connected normally closed contacts AIZ and ALZ of the intermediate and low zone assignment relays to a coil of a high hall call relay HC in line **711**. As long as the system is not operating on the down peak this circuit energizes the high hall call relay HC as long as the car is at or above the highest hall call requiring no further upward travel. When the system is conditioned for down peak traffic a downpeak relay H3 is energized to open its contacts H3 shown connected between the up eighth floor contacts and down ninth floor contacts of the series chain of contacts so as to break the circuit at this point thus insuring that any car assigned to the high zone or having no assignment while traveling up will travel at least to the ninth floor.

Since it is desirable that cars assigned to the intermediate and low zones travel to the highest down hall call and ignore up hall calls that may be registered in the zone or zones and which are answered by a car assigned to the high zone, a second series of selector machine segments **608**, **607**, etc., are connected to a second series of normally closed down hall call relay contacts. This circuit, when on down peak operation, is separated from the series of up and down hall call relay contacts and is energized from the power lead CS directly at the eight floor point of the circuit through contacts H3 shown in line **708**. A brush **625** cooperating with this series of selector machine segments is connected through normally open intermediate zone relay contacts IZ and intermediate assignment zone relay contacts AIZ connected in series in line **712** to energize the high hall call relay HC when the car is assigned to the intermediate zone and reaches the highest hall call in the intermediate zone. Likewise, the brush **625** is connected through normally closed intermediate zone relay contacts IZ and normally open low zone assignment relay contacts ALZ to energize the high hall call relay HC whenever the car is assigned to the low zone and has reached the highest hall call in the bottom or lower zone. The lower zone segments **604**, **603** and so forth are separated from the series of segments for the intermediate zone by down peak relay contacts H3 interposed between the fourth and fifth floor hall call relay contacts. The lower series is then directly connected at the terminal point of segment

604 through normally open contacts H3 to the supply lead CS.

In this arrangement the car travels up, when assigned to the low or intermediate zone, until it reaches the highest down hall call in the particular zone.

In the event the system is to be divided into more than three zones the series circuit of down hall call relay contacts in the high hall call circuit is divided into more sections and additional zone relays and assignment zone relays are added so that the high hall call relay HC is energized only when the car is at the top down call in the zone to which it is assigned.

This circuit thus provides means to distribute, during down peak traffic conditions, elevator service among a plurality of zones in accordance with the demand for service from the various zones.

Various modifications of the circuit may be made without losing the advantages of the improved supervisory control circuit.

Having described the invention, I claim:

1. In a supervisory control system for a group of elevator cars serving a plurality of floors, in combination, means for registering calls for service from each of at least three zones of floors, means for assigning cars to selectively serve the zones, means for comparing the number of calls in a zone with the number of cars assigned to that zone, and indicating the zone having the greatest number of calls per car, said assigning means being responsive to said comparing means and adapted to assign the cars to the zones having the greatest number of calls per assigned car.

2. In a supervisory control system for a group of elevator cars serving a plurality of floors, in combination, means for registering calls for service from each of at least three zones of floors, means for assigning cars to selectively serve the zones, a branch circuit for each zone, each branch circuit comprising in series a first portion the impedance of which is a function of the number of calls in the zone and a second portion the impedance of which is a function of the number of cars assigned to the zone, means for comparing the ratios of said impedances for the various zones and indicating the zone having the greatest number of calls per assigned car, said assigning means being connected to said comparing means and adapted to assign cars to the zones having the greatest number of calls per assigned car.

3. In a supervisory control system for a group of elevator cars serving a plurality of floors, in combination, means for registering calls for service from each of at least three zones of floors, means for assigning cars to selectively serve the zones, a source of voltage, a branch circuit individual to each zone connected across said source of voltage, each branch circuit comprising in series a first portion the impedance of which is a function of the number of hall calls in the zone and a second portion the impedance of which is a function of the number of cars assigned to the zone, means for comparing the potentials at the junctions of the first and second portions, said assigning means being controlled by said potential comparing means for assignment of cars to the zone having the greatest number of calls per assigned car.

4. In a supervisory control system for a group of elevator cars serving a plurality of floors, in combination, means for registering calls for service from each of at least three zones of floors, means for assigning cars to selectively serve the zones, means for comparing the number of calls in a zone with the number of cars assigned to such zone and indicating the zone having the greatest number of calls per assigned car, said assigning means being responsive to said comparing and indicating means to assign cars to the indicated zones, and means for canceling each car assignment as the car returns toward the terminal from the assigned zone.

5. A supervisory control system according to claim 4 in which the canceling means for a nonloaded car is effective as the car leaves the zone to which it was assigned.

6. In a supervisory control system according to claim 4, means in each car for registering car calls, and means responsive to the registration of a car call in a car adapted to delay an assignment of such car to a lower zone until it has served such car call.

7. In a supervisory control system for a group of elevator cars serving a plurality of floors, in combination, means for registering calls for service from each of at least three zones of floors, means for assigning cars to selectively serve the zones of floors, means for comparing the number of calls in a zone with the number of cars assigned to such zone and indicating the zone having the greatest number of calls per assigned car, said assigning means being responsive to said indicating means to assign cars to the zones having the greatest number of calls per car, and means for each car when assigned to a zone for preventing response of such car to calls in other zones.

8. In a supervisory control system for a group of elevator cars serving a plurality of floors, in combination, means for registering calls for service from each of at least three zones of floors, said cars being assignable to selectively serve said zones, a source of voltage, a plurality of branch circuits, one for each zone connected across the source of voltage, each circuit comprising a parallel combination of resistors one for each call in the zone arranged in series with a parallel combination of resistors one for each car assigned to the zone, a plurality of detectors connected to the junctions between combinations of resistors for detecting the branch circuit having the least voltage across its combination of call resistors, and means responsive to the actuated detector for assigning cars to the zone associated with branch circuit exhibiting the least voltage.

9. A control circuit according to claim 8 having a common lead, said detectors being connected between the junctions of the branch circuits and the common lead, rectifiers in series with the detectors for passing current in a first direction between said junctions and said common lead, and rectifiers connected directly between said junctions and said common lead for passing current in a reverse direction.

10. A control circuit according to claim 9 having a resistor connected between said common lead and one end of said branch circuits.

No references cited.