

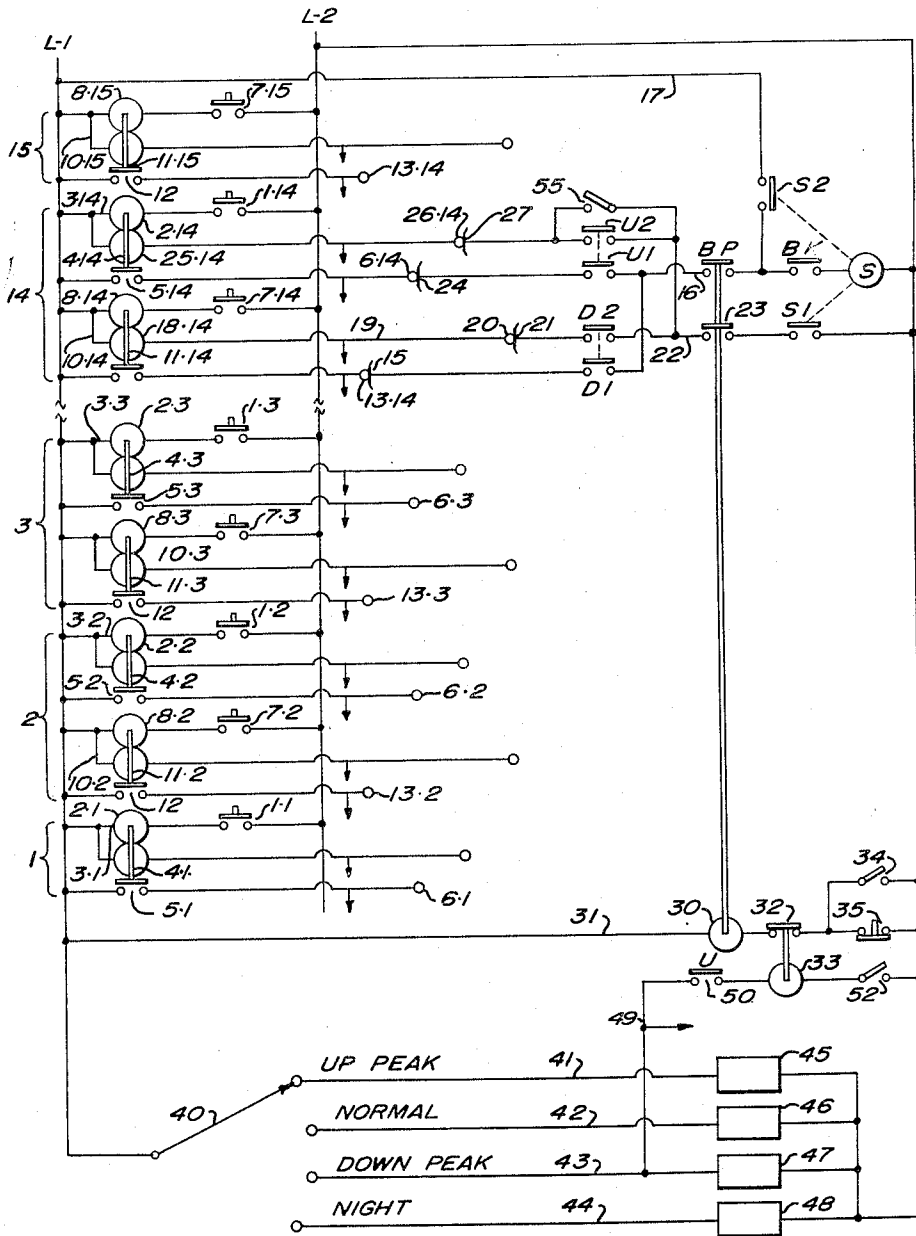
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UP BY-PASS DURING DOWN PEAK TRAFFIC CONDITION

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UP BY-PASS DURING DOWN PEAK TRAFFIC CONDITION

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This invention relates to elevator controls and in particular to means for improving elevator service during rush hours.

One of the problems often encountered in elevator operation during periods of heavy traffic toward one terminal, as when tenants of a building are leaving at quitting time or at noon, is that intending passengers on intermediate floors after having been passed by several fully loaded cars are apt to push an up button in the hope that they can board an up traveling car, ride to the top and thus being on the car be carried to the bottom terminal on the next down trip. This habit of intending passengers during rush hours actually delays the service rendered by the elevators tending to make the average passenger wait a still longer period of time before he can be carried to his destination floor. This difference in time or lost time results from the fact that the intending passenger desiring to go to the lower terminal floor has already registered a down call which remains registered when he boards the up traveling car. This call then becomes a false call if there are no other passengers at that floor. Furthermore a call is not canceled unless a car moving in the direction for which the call is registered stops. Therefore he has caused the elevator car, or elevator cars since the same car may not answer both times, to make two stops for one passenger. The two stops result even if he, having pushed the up button, enters a down traveling car that answers his call because the up signal remains registered to stop the next up traveling car. Thus, regardless of which car he enters he has caused the elevator system to make two stops at his floor to serve one passenger.

To serve heavy traffic it is known to divide floors of a building into groups or zones and to assign one or more cars to each zone and thus distribute the service during rush hours. However, this is not always satisfactory because the peak traffic from the different floors may not occur at the same time. It is therefore usually desirable to keep all of the cars operating throughout the entire height of the building and to so control the cars that they will answer the calls in the most expeditious manner.

The principal object of this invention is to provide an elevator control system in which most of the cars ignore hall calls in the direction opposite to the heavy traffic during periods of heavy traffic and cancel up and down calls when stopping in the direction of heavy traffic while one or at most two cars answer calls in each direction of travel.

Another object of the invention is to provide control circuits that are automatically operable during certain expected traffic conditions to cause most of the elevator cars to proceed directly to the terminal ahead of the heavy traffic, i. e. the top terminal if the peak traffic is down, and then answer down calls and cancel up and down calls during the down travel only.

More specific objects and advantages are apparent from the following description of a preferred form of the invention.

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According to the invention during periods of peak traffic in one direction the by-pass circuits of most, but not all, of the elevators are de-energized so that most of the cars ignore all calls while traveling in a direction opposite to the heavy traffic demand. The other car or cars serve traffic moving in either direction. As an auxiliary feature the cancellation of calls may be arranged so that as any car answers a call at a floor it cancels both the up and down calls that may be registered. In this way all false calls are canceled without requiring the stopping of another car. Should two bona fide calls be registered from a floor, one up and one down, the cancellation of both calls by the first car to answer is not a serious disadvantage because it is human nature to re-register the call as soon as a car traveling in the opposite direction has stopped. Alternatively the call cancellation circuit may be arranged so that a down stop cancels both calls while an up stop cancels only the up call.

A preferred form of the invention is illustrated in the accompanying drawing.

The accompanying drawing illustrates in a simplified form a control circuit showing floor call registering means cooperating with a stopping circuit for one elevator of a bank of elevators and a program selecting switch arranged to select various methods of operation according to expected traffic demands. The program selection is arranged in certain conditions to operate the by-pass control for the elevator when the elevator is set for travel in a direction counter to the heavy traffic. When the by-pass controls are so conditioned the elevator cars will not stop for calls in the direction of light traffic but will proceed directly to the opposite terminal and then down picking up all down calls as they travel down the shaft. One or more cars, as the occasion demands, are left free of the by-pass control so that these cars may serve traffic moving counter to the heavy traffic. Referring to the figure a series of up hall call buttons 1-1, 1-2, 1-3, and 1-14 corresponding to floors, 1, 2, 3, and 14 of a building are connected in circuit with release coils 2-1, 2-2, 2-3, and 2-14 of up hall call latch relays 3-1 to 3-14 respectively. The latch release circuits are from a power lead L-1, through the release coils 2, the respective hall push buttons 1, to a return lead L-2. Operation of one of the push buttons thus releases or unlatches the corresponding latch relay 3. Release or unlatching of any of the up floor relays 3 by operation of its corresponding hall button allows its armature 4-1, 4-2, 4-3 or 4-14 to drop thereby closing contacts 5 to complete a circuit from the power lead L-1 through the contacts 5-1, 5-2 and etc. to contacts 6-1, 6-2, 6-3, or 6-14 of a lane of contacts of each floor selector machine. The corresponding contacts of the floor selector machines of the elevators are connected in parallel as is indicated by the small arrows leading from the leads between the contacts 5 of the relays 3 and the selector contacts 6.

A second set of hall push buttons arranged to register down calls comprise buttons 7-2, 7-3, 7-14, and 7-15. These buttons, when pushed, connect power leads L-1, L-2 to release coils 8-2, 8-3, 8-14, or 8-15 of down hall call relays 10-2, 10-3, 10-14, or 10-15, so that armatures 11-2, 11-3, 11-14, or 11-15 of the relays may drop and close contacts 12 of each of the relays. The contacts 12 connect the lead L-1 to down stop contacts 13 in a second lane of contacts on the selector machine. Similar selector machine contacts are provided on the other selector machines so that each of the cars will answer the registered calls.

Selector machine brushes and a schematic indication of the stopping control circuit is illustrated in the positions occupied if the elevator is at the fourteenth floor. Assuming that the car had been moving downwardly, down direction contacts D1 and D2 of the elevator con-

trol closed, and that a down call had been registered by tripping the down floor relay 10-14. As the car approached the fourteenth floor and a brush 15 contacted the energized contact 13-14 current was allowed to flow from the lead L-1 through the down floor relay contacts 12-14, through the selector contact 13-14, the brush 15, and thence through the contacts D1, by-pass contacts BP in lead 16, and through now closed brake contacts BK to a coil of a stopping relay S and thence to the return lead L-2. Energization of the stopping relay S caused it to close its contacts S1 and S2. Contacts S2 complete a sealing circuit or holding circuit from the line L-1 through a lead 17 to the contacts S2 and thence through the brake contacts to the operating coil of the stopping relay S. This circuit is thus maintained closed independently of the floor call relays until the elevator stops and the brake releases to open the contacts BK. As the stopping relay S became energized and closed its contacts S1 a circuit was completed from the line L-1, through a reset coil 18-14 of the down floor call relay 10-14, lead 19 to selector machine contacts 20 cooperating with a brush 21, through down direction control contacts D2, a lead 22, by-pass relay contacts 23 assumed to be closed, and the now closed stopping relay contacts S1 to lead L-2. This circuit resets the fourteenth floor stopping relay 10-14 so as to open the contacts 12-14 thereby de-energizing the down call contacts for that floor so that other cars which may be following closely will not stop at the floor until another down call is registered.

If the car had been traveling in the up direction and an up call was registered at the fourteenth floor the call would be answered by current flow from the lead L-1, the now closed contacts 5-14 and selector machine contacts 6-14 to selector machine brush 24 and then through up directional relay contacts U1 to the lead 16 and thence to the stopping relay S. As the stop is made and the stopping relay is sealed in a current path is completed from a lead L-1 through a reset coil 25-14 of the up floor relay 3-14, lead 26-14, a selector machine brush 27, up directional relay contacts U2 to the lead 22 and thence through the contacts 23 and S1 to the return lead L-2. This latter circuit resets the up floor relay to cancel the call.

The operations just described are the normal operations of registering a call by means of latch relays and answering that call by means of a selector machine having brushes cooperating with a lane of contacts energized according to the tripped or unlatched floor relays. The circuit provides for resetting the floor relay as soon as a car starts to stop in response to the call.

It is also customary to provide, for each elevator car, a by-pass control circuit which includes a by-pass relay BP, the armature of which controls contacts 23 and BP in the stopping and reset circuits. An operating coil 30 of the by-pass relay BP is energized by current flow from the lead L-1 through a branch lead 31, the operating coil 30, normally closed contacts 32 of a control relay 33 and thence through either throw-over contacts 34 or an operator's by-pass control button 35 the latter two being connected in parallel, and thence to the return lead L-2. As long as this circuit is completed either by closure of the throw-over switch 34, closed for completely automatic operation, or by closure of the operator's control button 35 the by-pass relay BP is energized to close its contacts in the stopping circuits and floor relay reset circuits. When an elevator is operated by an attendant with the throw-over switch open the attendant may, by depressing the control button 35, interrupt the circuit to the by-pass relay coil 30 thus opening the contacts in the stopping circuit and permitting the car to by-pass hall calls.

Most elevator systems having two or more cars are provided with program control means for selecting types of operation suited for expected passenger demands. Thus it is desirable in the morning when people are coming into a building to dispatch the elevator cars at regular intervals from the lobby floor and permit each car to

return to the lobby floor as soon as it has served the highest call whether it be registered from the car or from a floor. Then, later in the day, as traffic becomes more nearly balanced, i. e. generally equal number of calls for up and down service, the elevators are dispatched from the terminals at more or less regular intervals of time. At noon and again at quitting time in the evening there is great demand for down service as the tenants of a building are leaving for lunch or at the close of the day. During this down call demand the cars are normally dispatched from the upper terminal at regular intervals of time and are returned to the upper terminal as soon as possible after discharging their loads at the bottom terminal.

In the circuit shown in the figure a selector switch 40 connected to the line L-1 is set either manually or by clock operation to select one of several leads such as leads 41, 42, 43, and 44 connected to control means 45, 46, 47, and 48 that are adapted to establish the proper circuit connections and dispatching machine operations as required for each of the various types of traffic demand.

One problem that often occurs, particularly during down peak operation when large numbers of people are leaving the building in a comparative short period of time, is that cars will become overloaded at the upper floors and will by-pass calls on the way down. Intending passengers at the intermediate and lower floors become impatient when their calls are not promptly answered and many of them will then press an up button to stop an up traveling car so that they can get aboard and be sure of being carried to the bottom terminal on the next down trip of the car. This practice interferes with the efficient operation of the elevators because it causes at least two stops one up and one down for each of the floors where such up calls have been registered. This practice of stopping an up traveling car when the passenger desires to go down may be discouraged and more efficient operation of the elevator bank obtained by causing all but one or two of the elevators to by-pass the up calls during their travel from the lower to the upper terminal. One or two cars are left with full control so that they will stop for the up calls. By limiting the up service to one or two cars the intending passengers soon abandon the practice of calling the up traveling cars because most of the cars would ignore such calls and the remaining cars come by at such infrequent intervals. Even if they persist in registering up calls when they really desire down calls the efficiency of the bank of elevators is not materially affected because most of the cars ignore these up calls and proceed directly to the upper terminal. To accomplish this operational result the control relay 33 is arranged to be energized from the down peak control lead 43 by way of a lead 49, contacts 50 of the up direction relay of the elevator and then lead 51 to the operating coil of the relay 33 and thence through a cutout switch 52 to the return lead L-2. As long as the switch 52 is closed and the program selector switch 40 is set for down peak operation the control relay 33 is energized when the elevator is conditioned for up travel. The control relay 33 by opening its contacts 32 de-energizes the by-pass relay coil 30 so that the car then by-passes all floor call signals. All of the elevators of the bank may be equipped with control relays 33 and cutout switches 52 so that the attendant may select the cars that are to travel express to the upper floor or upper terminal by closing the corresponding switches 52. That car whose switch 52 is not closed will respond to up calls in the normal manner.

If a supervisor finds that there are still a large number of false calls registered, that is up calls when the passenger desires to travel down, and the system is set so that most of the cars travel express to the upper terminal, provision may be made so that up floor calls are canceled whenever a down traveling car stops at the floor at which such up call is registered. This is accomplished in the circuit by providing a reset control switch 55 con-

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nected in parallel with the contacts U2 so that the reset brush 27 for the up floor relays is energized every time a car makes a stop at a floor regardless of whether the car is conditioned for up or down travel. The down call signals from the floors are not canceled by the stopping of a car moving in the up direction since the contacts D2 connected in series with the lead to the brush 21 are open during up travel of the car. Cancellation of both up and down calls every time a car stops may be accomplished by by-passing both the U2 and D2 contacts.

The addition of the reset control switch 55 makes it possible to cancel both of the hall calls as the car stops on its way down. If a passenger intended to go up he will invariably re-register his up call as soon as an elevator has stopped at the floor and departed in the down direction. In this manner all of the false calls that may have been registered by impatient passengers are canceled with a minimum number of stops of the elevators and without disrupting the express travel of most of the elevators as is required to get the cars promptly to the upper terminal so that they may serve waiting passengers desiring down transportation.

Various modifications may be made in the control circuits without losing the advantages that may be obtained by automatically expressing most of the cars directly to the upper terminal during periods of heavy down traffic. In a broader sense the control is applicable to any situation in which the traffic is predominantly in a first direction and it is desired to express the cars in the opposite direction. Thus the advantages and high efficiency obtainable by minimizing the number of stops and by providing through travel for certain of the cars may be obtained with a minimum of equipment and with very little modification from standard or conventional circuits. Modifications in the circuit details and arrangements may be made without departing from the scope of the invention.

Having described the invention, I claim:

1. In an elevator system having a plurality of cars serving a plurality of floors of a building and having passenger operated controls effective for registering car and hall calls, in combination, program control means for varying the service of the elevators according to expected passenger demands, conditioning means operable when said program control means is set for heavy traffic in a first direction for conditioning the stop circuits of certain of said elevators serving all floors to by-pass hall calls for service in the opposite direction, means for canceling up and down hall calls when a stop is made in the first direction, and at least one elevator that is independent of said conditioning means and that serves all floors.

2. In an elevator system having a plurality of cars serving a plurality of floors of a building and having passenger operated controls effective for registering car and hall calls and controlling operation of the cars, in

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combination, program control means for varying the service of the elevators according to expected passenger demands, conditioning means operable when said program control means is set for heavy traffic in a first direction for by-passing cars traveling in the opposite direction directly to the terminal floor, means for canceling up and down hall calls when a stop is made in the first direction, and means for separating at least one car from said conditioning means whereby the separated car answers hall calls in either direction of travel while the other cars serve calls in the direction of heavy traffic only.

3. In an elevator system having a plurality of cars serving a plurality of floors of a building and having passenger operated controls effective for registering car and hall calls to which the elevators respond, in combination, program control means for varying the service of the elevators according to expected passenger demands, conditioning means operatively connected to the program means for conditioning certain of said plurality of cars to by-pass hall calls in the direction of little traffic during periods of expected heavy one way traffic, at least one car the control of which is separated from the conditioning means, and means for canceling all hall calls at a floor when any call is answered at that floor.

4. In an elevator system having a plurality of cars, in combination, program control means for varying the operation of the elevators according to expected passenger traffic, a stopping circuit for each elevator car for stopping the car in response to hall calls, means operable when the program control means is set for heavy traffic in a first direction for disabling the stopping circuit for certain cars traveling counter to said first direction, and means for canceling all hall calls at a floor when any call is answered at that floor.

5. In an elevator system having a plurality of cars, in combination, program control means for varying the operation according to expected passenger traffic, hall call registering means common to all cars, a stopping circuit for each car responsive to hall calls, a by-pass relay and control circuit for each elevator car, relay means for each of several but not all said cars operable when said program control means is set for heavy traffic in one direction for operating the by-pass relay means while the car is traveling in the opposite direction, and call canceling means for each hall registering means arranged so that the stopping of any car at a floor cancels all hall calls from that floor.

6. An elevator control means according to claim 5 in which call cancelling means is provided for each hall call registering means and arranged so that the stopping of any car at a floor cancels all hall calls from that floor.

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