April 10, 1956 H. E. GALANTY 2,741,755

ELEVATOR POSITION OR SIGNAL INDICATING CIRCUIT

Filed April 6, 1951 4 Sheets-Sheet 1

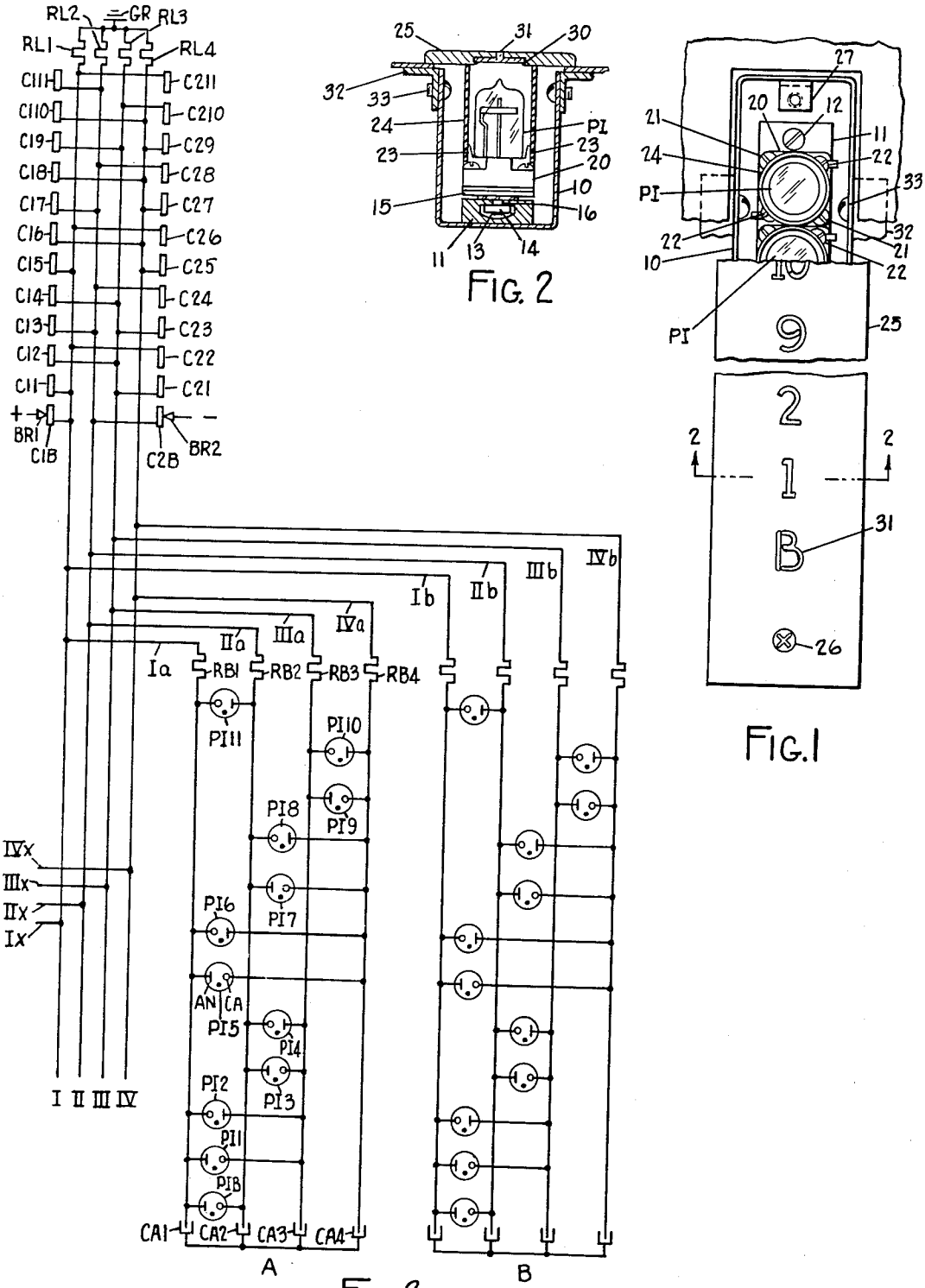


FIG. 3

FIG. 2

FIG. 1

HAROLD EDWARD GALANTY INVENTOR

BY J. L. Sharon ATTORNEY

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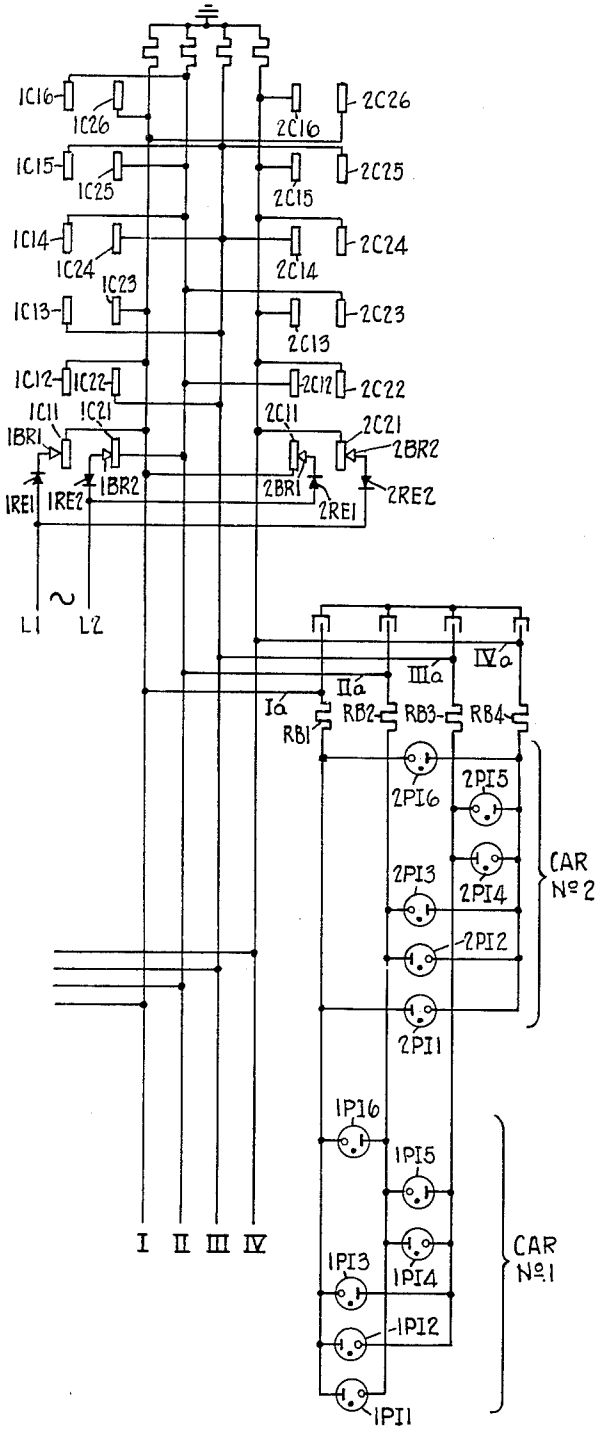


FIG. 4

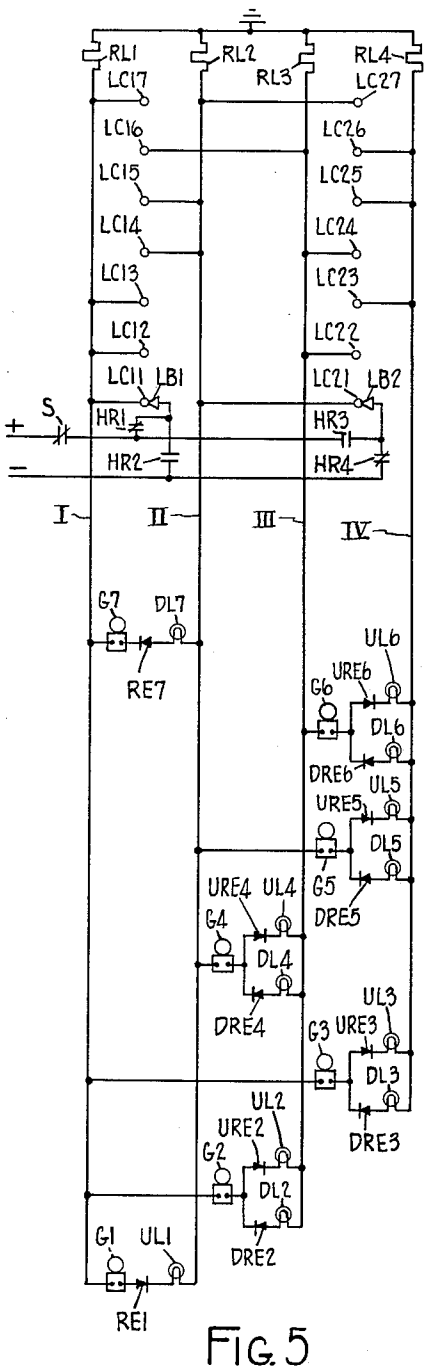


FIG. 5

HAROLD EDWARD GALANTY INVENTOR

BY J. L. Sharon ATTORNEY

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ELEVATOR POSITION OR SIGNAL INDICATING CIRCUIT

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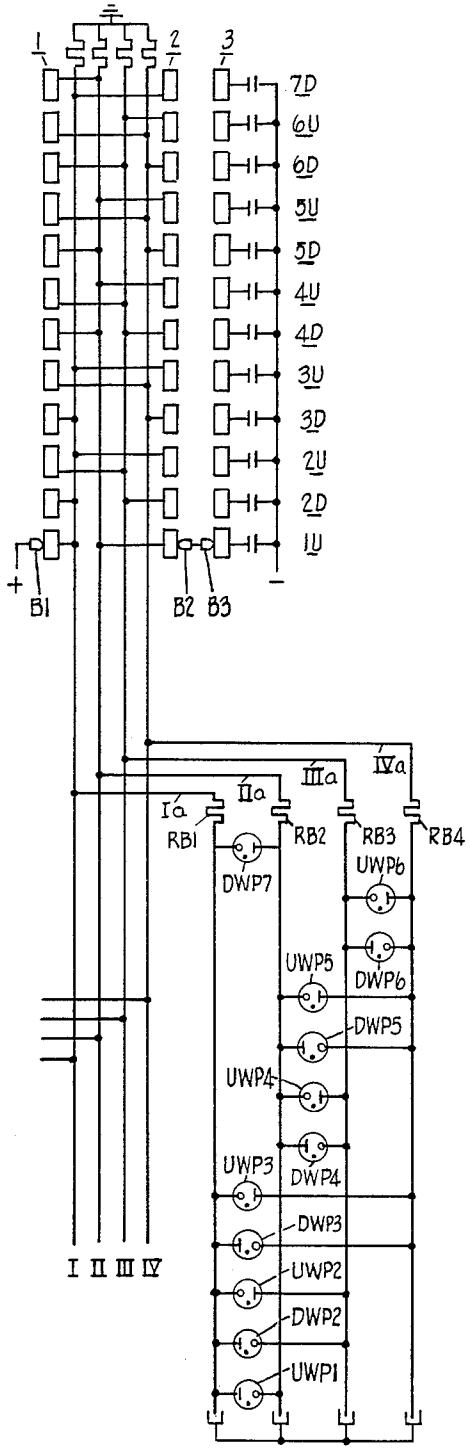


FIG. 6

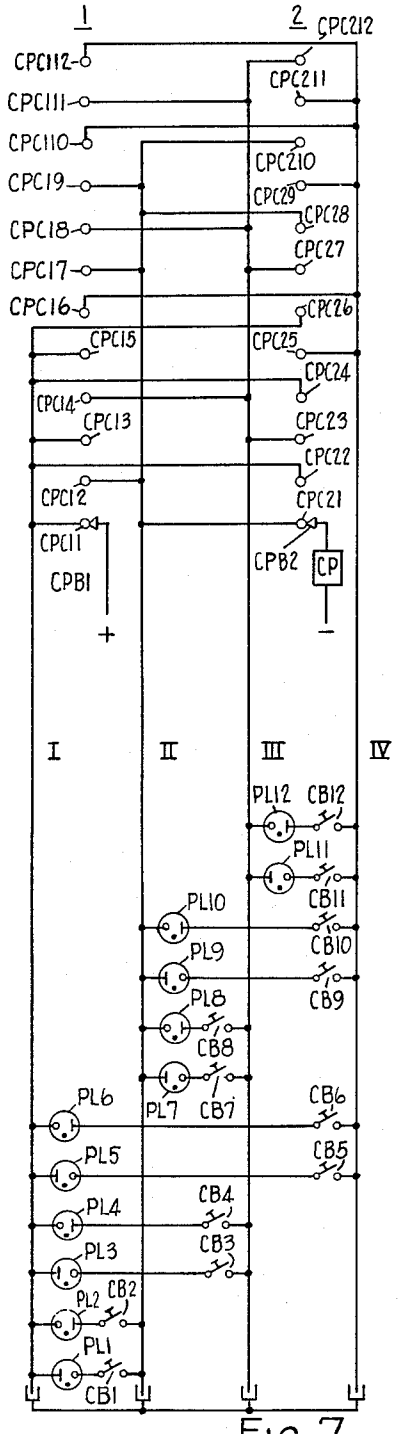


FIG. 7

HAROLD EDWARD GALANTY INVENTOR

BY J. L. Sharon ATTORNEY

April 10, 1956 H. E. GALANTY 2,741,755

ELEVATOR POSITION OR SIGNAL INDICATING CIRCUIT

Filed April 6, 1951 4 Sheets-Sheet 4

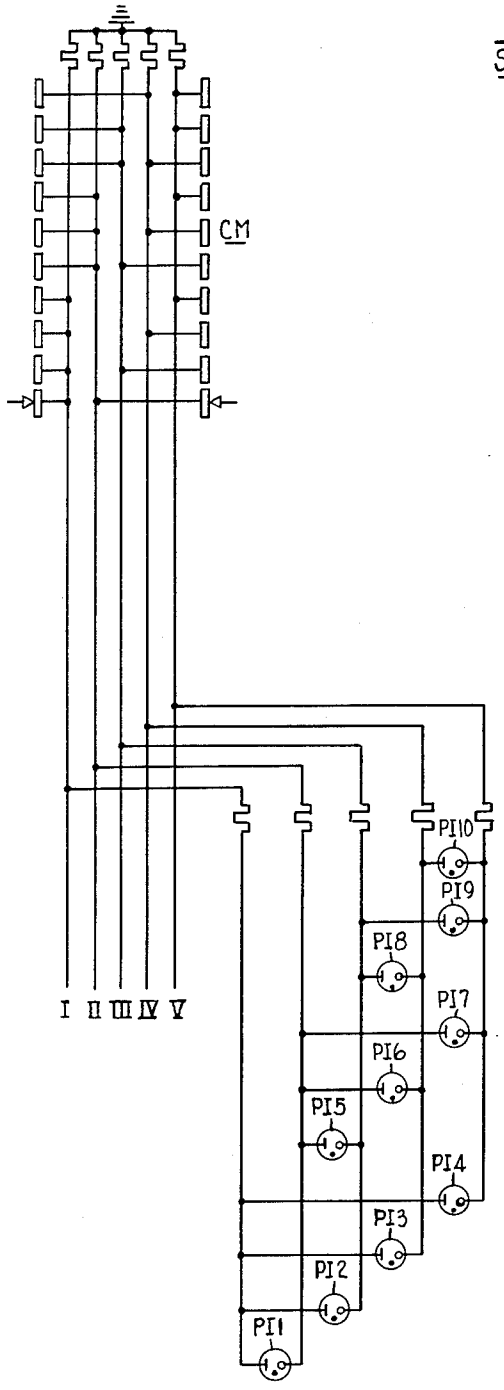


FIG. 8

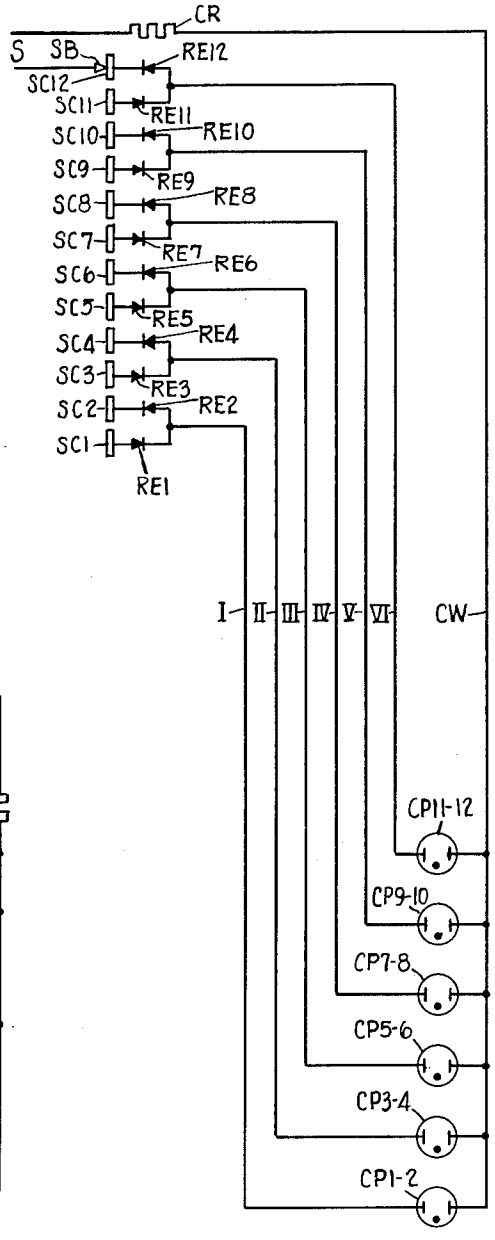


FIG. 9

HAROLD EDWARD GALANTY INVENTOR

BY J. E. Thorson ATTORNEY

United States Patent Office 2,741,755 Patented Apr. 10, 1956

2,741,755

ELEVATOR POSITION OR SIGNAL INDICATING CIRCUIT

Harold Edward Galanty, Hillside, N. J., assignor to Otis Elevator Company, New York, N. Y., a corporation of New Jersey

Application April 6, 1951, Serial No. 219,619

3 Claims. (Cl. 340—21)

The invention relates to signalling circuits and to control circuits especially those employed in elevator installations.

The invention is of particular utility in elevator systems and will be described for that application. There are various signalling circuits and control circuits which extend between points which are a considerable distance apart. For example, the car position indicator circuits extend from commutating mechanism in the penthouse to the elevator car and/or lobby floor (at the car entrance or the starter's panel) and in some instances to each floor served by the car. The hall lantern circuits extend from commutating mechanism in the penthouse to the various floors. Waiting passenger indicator circuits may extend from the various floors or from the control panel in the penthouse to the elevator car or to the starter's panel in the lobby. Car button circuits extend from the elevator car to car actuated control mechanism in the penthouse. In all of these and similar circuits, it is important that they be economically installed.

The object of the invention is to minimize the number of wires utilized in such signalling, control and similar circuits.

The invention is characterized by its simplicity. It involves effecting the connection between points by three or more feed wires utilized in different pairs to provide the desired signalling or control circuits. According to one arrangement, the invention also involves polarization of the connections to the feed wires, thus effecting a further reduction in the number of feed wires for a given number of circuits.

For example, in applying the invention to a position indicator for an elevator car, the position indicator lamps are connected across different pairs of feed wires and the voltage applied to the various pairs of wires is commutated in such way as to effect the illumination of the position indicator lamps in accordance with the position of the car. With polarized connections of the lamps, a twelve floor indicator, for example, can be operated from four feed wires, a twenty floor indicator from five wires, and so on.

Features and advantages of the invention will be seen from the description which follows and from the appended claims.

In the drawings:

Figure 1 is a plan view, with parts broken away, of a position indicator fixture suitable for use in connection with the invention;

Figure 2 is a view along the line 2—2 of Figure 1;

Figure 3 is a schematic wiring diagram of position indicator circuits embodying the invention;

Figure 4 is a schematic wiring diagram of interconnected position indicator circuits embodying the invention as applied to two elevators;

Figure 5 is a schematic wiring diagram of hall lantern circuits embodying the invention;

Figure 6 is a schematic wiring diagram of waiting passenger indicator circuits embodying the invention;

Figure 7 is a schematic wiring diagram of car button control circuits embodying the invention;

Figure 8 is a schematic wiring diagram of circuits in which reverse polarities are not employed, illustrated as applied to a position indicator; and

Figure 9 is a schematic wiring diagram of still another arrangement of circuits, illustrated as applied to a position indicator.

Referring first to Figures 1 and 2, the position indicator fixture there illustrated is especially suitable for use within the elevator car, in a starter's panel or at the lobby. It comprises a casing 10 having an elongated extrusion 11 secured to the bottom of the casing as by screws 12. This extrusion is formed with a longitudinal channel 13 into which are slid a plurality of nuts 14, one for each floor for which the indicator is provided. A small plate 15 is secured as by a screw 16 to each of these nuts with the plates positioned in accordance with the desired positions of the indicator lamps. These indicator lamps are designated PI and are preferably miniature neon lamps of the cathode glow type. Lamp sockets 20, one for each lamp, are secured as by screws 21 to the corresponding plates. 22 are terminal screws for connecting the lamps in the system. Lugs 23 are formed on each socket for receiving and locating a light shield 24. These shields extend from the sockets to the face plate 25. This face plate is secured to the casing as by screws 26 cooperating with threaded brackets 27 welded to the casing. The face plate is illustrated as formed with apertures 30 in the shape of the designating numbers or characters for the floors served. Jewels 31 are provided with these numbers or characters moulded thereon to fit into apertures 30. The fixture is mounted as by securing to angles 32 by screws 33 before the face plate is put in place.

Referring now to Figure 3, circuits are illustrated for a single car installation in which the car serves twelve floors, say a basement and floors 1 to 11 inclusive. These circuits are for two position indicators connected in parallel. These indicators may be positioned, say one in the elevator car and one at the lobby. To differentiate between these indicators they will be designated generally as A and B. The lamps of each indicator are differentiated in accordance with the floors served by appending a numeral or character corresponding to the floor for which the lamp is provided. For example, PIB designates a position indicator lamp for the basement while PI6 designates a position indicator lamp for the sixth floor. Each lamp is a cold cathode gas diode, preferably a neon lamp of the cathode glow type as above indicated. Referring for example to the fifth floor lamp for indicator A, the anode is designated AN and the cathode CA.

The circuits for the indicator lamps are commutated by car actuated mechanism. This mechanism has been illustrated as two columns of stationary contacts, one contact in each column for each floor, and a pair of brushes, one for each column, movable in accordance with car movement. These may be provided on a selector or floor controller as is well understood in the art. The columns are differentiated as 1 and 2, the brushes being designated BR1 and BR2 and the stationary contacts as C1 and C2. The stationary contacts are further differentiated as to floors by appending reference characters indicative of these floors, as for example, C1B indicating the contact for the basement in column 1 and C26 indicating the contact for the sixth floor in column 2. Brushes BR1 and BR2 are supplied with direct current from supply lines which are designated + and —.

In accordance with the invention, the connection of the position indicators to the commutating mechanism is effected with only four feed wires. These feed wires are designated I, II, III and IV. Position indicator A is con-

nected to these feed wires by four wires correspondingly designated Ia, IIa, IIIa and IVa while position indicator B is connected to the feed wires in parallel with indicator A by correspondingly designated wires Ib, IIb, IIIb and IVb. Connecting wires Ix, IIx, IIIx and IVx are included to indicate that any number of additional indicators may be connected in parallel with indicators A and B, as for example, one at each floor served.

The neon lamps are connected across different pairs of wires, two lamps to each pair of wires. The neon lamps are inherently unidirectionally conductive so that by merely connecting two lamps across each pair of wires, only one lamp is lighted at a time depending upon the polarity of the applied voltage. By controlling the polarity of excitation applied to the lamps a total of twelve lamps can be individually lighted off four feed wires. In the arrangement shown for indicator A for example: lamp PIB is connected across wires Ia and IIa; lamp PI1 across wires Ia and IIIa; lamp PI2 reversely across wires Ia and IIIa; lamp PI3 across wires IIa and IIIa; lamp PI4 reversely across wires IIa and IIIa; lamp PI5 across wires Ia and IVa; lamp PI6 reversely across wires Ia and IVa; lamp PI7 across wires IIa and IVa; lamp PI8 reversely across wires IIa and IVa; lamp PI9 across wires IIIa and IVa; lamp PI10 reversely across wires IIIa and IVa; and lamp PI11 across wires Ia and IIa but reversely with respect to lamp PIB. It is preferred to connect the lamps for the top and bottom floors across the same pair of wires as this facilitates standardization of connection for different numbers of floors.

The circuits are commutated to light individually these lamps by connecting the pairs of stationary contacts for the corresponding floors across corresponding pairs of feed wires, with the two pairs of contacts connected across each pair of feed wires reversely connected to provide the proper polarity of excitation for the lamps. Thus contacts C1B and C2B are connected across wires I and II; contacts C11 and C21 across wires I and III; contacts C12 and C22 across wires I and III but reversed; contacts C13 and C23 across wires II and III; contacts C14 and C24 across wires II and III but reversed; contacts C15 and C25 across wires I and IV; contacts C16 and C26 across wires I and IV but reversed; contacts C17 and C27 across wires II and IV; contacts C18 and C28 across wires II and IV but reversed; contacts C19 and C29 across wires III and IV; contacts C110 and C210 across wires III and IV but reversed; and contacts C111 and C211 across wires I and II but reversed with respect to the connection of contacts C1B and C2B across these wires.

Resistors RL1, RL2, RL3 and RL4 are loading resistors. The resistors are respectively connected to the feed wires and are connected together at their other ends and where the direct current power supply is ungrounded, the junction point is connected to ground GR. These loading resistors are provided to prevent unwanted lighting of the neon lamps by leakage currents. The grounding of the junction point is to obviate any unwanted glowing of the lamps due to capacity effects as a result of any potential which might exist between the direct current source and ground. Resistors RB1, RB2, RB3 and RB4 are ballast or current limiting resistors for each indicator. It is to be noted that only the same number of ballast resistors are employed for each indicator as there are feed wires, whereas the loading resistors are common to the network and only a total of four are employed. Capacitors CA1, CA2, CA3 and CA4 are provided for each indicator, connected from a common junction point to the respective feed wires. These are to obviate any unwanted reverse polarity breakdown of the lamps due to current surges.

In operation, with the car standing at the basement, the condition illustrated in the circuit diagram, a circuit is completed from the positive supply line + through brush BR1 and contact C1B in the penthouse to feed wire I, down the hoistway by way of feed wire I to say position indicator A, thence by way of wire Ia, resistor RB1, lamp PIB, wire IIa, resistor RB2 to feed wire II, up the hoistway by way of feed wire II and thence through contact C2B and brush BR1 to the negative supply line —. This causes lamp PIB to glow, being unidirectionally conductive and having its anode connected to the positive supply line. As the car moves up the hoistway, brushes BR leave contacts CB, breaking the circuit for lamp PIB and engage contacts C1 to complete a circuit for lamp PI1. Tracing this circuit more briefly, it is from line +, brush BR1, contact C11, wires I and Ia, resistor RB1, lamp PI1, wire IIIa, resistor RB3, wire III, contact C21, brush BR2 to line —. This causes lamp PI1 to be illuminated. As the brushes move from contacts C1 to contacts C2, lamp PI1 is extinguished and lamp PI2 is illuminated, the circuit being from line +, brush BR1, contact C12, wires III and IIIa, resistor RB3, lamp PI2, wire Ia, resistor RB1, wire I, contact C22, brush BR2 to line —. It is to be noted that with this connection wire IIIa becomes positive and wire Ia becomes negative, reversing the excitation. As lamp PI3 is connected across these wires oppositely to lamp PI2, lamp PI3 is illuminated whereas lamp PI2 is not. It is believed that it will be seen without further detailed description that: as the car moves to the third floor, voltage is applied to wires II and III of a polarity to cause illumination of lamp PI3; as the car moves to the fourth floor, voltage is again applied to wires II and III but of opposite polarity to cause illumination of lamp PI4; as the car moves to the fifth and sixth floors, voltage is applied to wires I and IV but of opposite polarities to cause illumination respectively of lamps PI5 and PI6; as the car moves to the seventh and eigth floors, voltage is applied to wires II and IV but of opposite polarities to cause illumination respectively of lamps PI7 and PI8; as the car moves to the ninth and tenth floors, voltage is applied to wire III and IV but of opposite polarities to cause illumination respectively of lamps PI9 and PI10; and as the car moves to the eleventh floor, voltage is applied to wires I and II of a polarity opposite to that of the voltage applied to these wires with the car at the basement, causing the illumination of lamp PI11.

It will be seen that the lamps of position indicator B are lighted the same as those of indicator A, being connected in parallel therewith. Also, it will be seen that during downward car travel the position indicator lamps are illuminated in reverse sequence, the circuits for the respective lamps being the same as for up car travel. It is to be noted that when voltage is applied to a lamp, it is also applied to other combinations of lamps in series relation and with the proper polarity for lighting these lamps. For example, when the brushes engage the basement contacts as illustrated, not only is voltage of proper breakdown polarity applied to lamp PIB, but also to lamps PI1 and PI4 in series, to lamps PI1, PI9 and PI8 in series, to lamps PI5 and PI8 in series, and to lamps PI5, PI9 and PI4 in series. However, these other lamps are not illuminated because the voltage employed, while of a value to break down one lamp across the feed wires, is insufficient to cause breakdown of two or three lamps in series relationship.

Thus, it is seen that a twelve floor position indicator can be operated off only four feed wires. Inasmuch as these feed wires may run the full length of the hoistway, this involves a substantial saving in labor and material and thus in time and cost of installation. Also, where the indicator is located in the car, the weight of the travelling cable is materially reduced.

Reference may now be had to Figure 4 which illustrates interconnected position indicator circuits for two elevators embodying the invention. The commutating mechanism for car No. 1 is illustrated to the left of the feed wires while that for car No. 2 is illustrated to the right. To differentiate the corresponding parts of these mechanisms, their designating characters are appended to the numeral 1 in the case of elevator No. 1 and to the numeral 2 in the case of elevator No. 2. Thus, for example, 1BR2 desig-

nates the brush of the cummutating mechanism for elevator No. 1 which engages the contacts of column 2 of that mechanism and 2C16 designates the stationary contact of the commutating mechanism for elevator No. 2 in column 1 for the sixth floor. To prevent undesired operations, the circuits are arranged so that voltage is applied to only one pair of brushes at a time. This is effected in the arrangement illustrated by connecting the pairs of brushes to a source of alternating current through rectifiers, those designated 2RE1 and 2RE2 for brushes 2BR1 and 2BR2 being connected oppositely to those designated 1RE1 and 1RE2 for brushes 1BR1 and 1BR2. With the rectifiers connected as indicated, when voltage is applied to brushes 1BR1 and 1BR2, brush 1BR1 is positive and brush 1BR2 is negative. Similarly, when voltage is applied to brushes 2BR1 and 2BR2, brush 2BR1 is positive and brush 2BR2 is negative. The alternating current supply lines are designated L1 and L2.

The position indicator lamps for both cars are connected across the same feed wires. Because of space limitations, circuits for only six floors are illustrated or for a total of twelve lamps. The position indicators are distinguished generally by relating them in brackets respectively to the legends car No. 1 and car No. 2. As a further distinction, the designation PI for the lamp is appended to the numeral 1 in the case of the position indicator for car No. 1 and to the numeral 2 in the case of the position indicator for car No. 2. Thus, for example, 1PI4 designates car No. 1 position indicator lamp for the fourth floor. With both cars positioned at the first floor as indicated by the circuits, voltage is applied during one half cycle to brushes 1BR1 and 1BR2 and during the other half cycle to brushes 2BR1 and 2BR2, rectifiers 2RE1 and 2RE2 blocking the flow of current to brushes 2BR1 and 2BR2 during each of the first mentioned half cycles and rectifiers 1RE1 and 1RE2 blocking the flow of current to brushes 1BR1 and 1BR2. Thus during each of the first mentioned half cycles, current flows from line L1 by way of rectifier 1RE1, brush 1BR1, contact 1C11, wires I and I*a*, resistor RB1, lamp 1PI1, wire II*a*, resistor RB2, wire II, contact 1C21, brush 1BR2 and rectifier 1RE2 to line L2. This causes the illumination of lamp 1PI1. During each of the other half cycles, current flows from line L2 by way of rectifier 2RE1, brush 2BR1, contact 2C11, wires I and I*a*, resistor RB1, lamp 2PI1, resistor RB4, wire IV*a*, wire IV, contact 2C21, brush 2BR2 and rectifier 2RE2 to line L1. This causes illumination of lamp 2PI1. Thus the first floor position indicator lamps for both cars are illuminated.

It is believed that it will be seen from previous description that: when car No. 1 is opposite the second floor, voltage is applied to wires I and III of a polarity to cause illumination of its second floor position indicator lamp 1PI2; when the car is opposite the third floor, voltage is again applied to wires I and III but of opposite polarity to cause illumination of lamp 1PI3; when the car is opposite the fourth and fifth floors, voltage is applied to wires II and III of the proper polarity to cause illumination of lamps 1PI4 and 1PI5 respectively; and when the car is opposite the sixth floor, voltage is applied to wires I and II of a polarity to cause illumination of lamp 1PI6. Similarly, when car No. 2 is opposite the second and third floors, voltage is applied to wires II and IV of the proper polarity to cause illumination of lamps 2PI2 and 2PI3 respectively; when the car is opposite the fourth and fifth floors, voltage is applied to wires III and IV of the proper polarity to cause illumination of lamps 2PI4 and 2PI5 respectively; and when the car is opposite the sixth floor, voltage is applied to wires I and IV of a polarity to cause illumination of lamp 2PI6. This arrangement has the advantages set forth in discussing Figure 3 and also effects considerable saving in wires over arrangements such as shown in Figure 3 applied to the elevators individually. It is to be understood that the invention is applicable to interconnected position indicator circuits for more than two elevators, as by applying voltage to the pairs of brushes of the respective communicating mechanisms, one pair at a time. In interconnected position indicator circuits where the position indicators are located in the cars, the number of wires in the respective travelling cables is minimized by confining the reverse connections across each pair of feed wires to the same elevator in so far as possible. This has been indicated in Figure 4 where the lamps for car No. 1 are supplied by feed wires I, II and III and those for car No. 2 by feed wires I, II, III and IV.

Reference may now be had to Figure 5 which illustrates an application of the invention to hall lantern circuits for an elevator car. The hall lanterns are usually located over the doors at the landings for which they are provided and are illuminated to indicate that a stop is about to be made and the direction in which the car is to leave the floor. Inasmuch as the invention contemplates the use of various forms of signals in the various signalling circuits to which the invention is applicable, including the position indicator circuits previously described and the hall lantern circuits about to be described, the hall lantern circuits have been illustrated by way of example as utilizing incandescent lamps instead of neon lamps. In order to polarize these lamps, rectifiers are provided in series with the lamps. Also, gongs are connected in circuit with the hall lanterns, one gong for each floor. Hall lantern circuits for a seven floor installation have been illustrated. With an up lantern and a down lantern at each intermediate floor, this makes a total of twelve lamps. The lanterns are designated generally as L, differentiation between up lanterns and down lanterns being by the letters U and D to which the letter L is appended. The gongs are designated G. The rectifiers are designated RE and are differentiated between up circuits and down circuits by appending this characterization to the letter U or D. Whereas the stationary contacts of the position indicator commutating mechanism have been illustrated as long contacts and the brushes moved in synchronism with car movement, the commutating mechanism for the hall lantern circuits is illustrated as of the type used in a system in which the brushes are advanced with respect to the car in starting and when a call is picked up are locked onto the contacts for the floor for which the call is registered with the advance taken up by the continual movement of the car. This gives advance hall lantern indication, such an arrangement being illustrated for example in the patent to Dunn and Larson No. 2,074,578, granted March 23, 1937. The stationary contacts may be short in such a system. These contacts are designated LC and are differentiated as to column by appending thereto the numerals 1 and 2. The brush for engaging the contacts of column 1 is designated LB1 and that for engaging the contacts of column 2 is designated LB2. Contacts HR1, HR2, HR3 and HR4 are contacts of an electromagnet controlled in accordance with the next direction of car travel. S designates contacts which engage when a call is picked up and separate incident to the next starting operation as is well understood in the art.

In operation, assume that the car is standing at the first floor in accordance with the illustrated position of the brushes LB. Under such conditions, contacts HR1 and HR4 are engaged and contacts HR2 and HR3 are separated as the next direction of car travel will be up. This completes a circuit from line + through contacts S and HR1, brush LB1, contact LC11, wire I, gong G1, rectifier RE1, lantern UL1, wire II, contact LC21, brush LB2 and contact HR4 to line —. This causes the lighting of the first floor hall lantern. Incident to the starting of the car from the first floor, contacts S separate, causing discontinuance of the lantern illumination, and brushes LB1 and LB2 advance with respect to the car. If an up call is in registration for the second floor, the brushes upon engaging the second floor contacts are locked in

that position and contacts S are engaged, causing the application of voltage to wires I and III. Wire I is positive and wire III is negative with this connection. Rectifier URE2 permits the flow of current through lamp UL2, causing the lighting of this lamp and the sounding of gong G2. Rectifier DRE2 blocks the flow of current through lamp DL2 so that the down second floor hall lantern is not illuminated. For convenience, assume an up call at each of floors three, four, five and six. As the up third floor call is picked up, voltage is applied to wires I and IV of a polarity to cause illumination of up third floor hall lantern UL3; as the up fourth floor call is picked up, voltage is applied to wires II and III of a polarity to cause illumination of lantern UL4; as the up fifth floor call is picked up, voltage is applied to wires II and IV of a polarity to cause illumination of up fifth floor hall lantern UL5; and as the up sixth floor call is picked up, voltage is applied to wires III and IV of a polarity to cause illumination of up sixth floor hall lantern UL6. Assume also a call at the seventh floor. This is the highest call which can be answered and under such conditions, incident to the picking up of the call, switch HR drops out separating contacts HR1 and HR4 and engaging contacts HR2 and HR3. This reverses the polarity of the brushes so that voltage is applied to wires I and II of a polarity to cause the illumination of the seventh floor hall lantern DL7. Similarly, should a down call at an intermediate floor be the highest call registered, it is picked up by the car on its up trip and switch HR is dropped out incident to the picking up of the call. Thus the polarity applied to the feed wires for the particular floor is reversed from what it would be for an up call above described, causing the down lantern at that floor to be illuminated.

During the downward trip of the car, contacts HR2 and HR3 are engaged, rendering when contacts S engage, brush LB2 positive and brush LB1 negative. Thus assuming a down call at the fifth floor for example, upon the call being picked up, voltage is applied to feed wires II and IV of a polarity to cause illumination of the fifth floor down hall lantern DL5. It is believed that, in view of the above description, it will be understood that where down calls are picked up at other intermediate floors the corresponding down hall lanterns are illuminated. As the car approaches the first floor, switch HR is reoperated, causing the engagement of contacts HR1 and HR4 and the separation of contacts HR2 and HR3. Thus with the completion of the circuit to the brushes, voltage is applied to wires I and II of a polarity to cause the lighting of the first floor hall lantern. The load resistors RL for arrangements in which incandescent lamps are used, are of low enough ohmic value to insure that the voltage across lamps in series relationship in circuits paralleling the one for the illuminated lamp is insufficient to cause these lamps to glow, thus obviating unwanted operations.

Reference may now be had to Figure 6 which illustrates an application of the invention to waiting passenger indicator or annunciator circuits. Waiting passenger indicators are provided to indicate the various calls that are registered and are usually positioned in the elevator cars and at the starter's stations. For convenience, the waiting passenger indicator lamps are indicated as neon lamps. Circuits for a total of twelve lamps have been illustrated, sufficient for a seven floor installation in which both an up call and a down call may be registered from each intermediate floor. The waiting passenger indicator lamps are designated generally as WP and differentiated as to up and down by the letters U and D. Inasmuch as there may be more than one call in registration at a time, to avoid undesirable operations, the application of voltage to the feed wires is commutated in such way that voltage can be applied to only one lamp at a time. This may be effected in various ways. One effective method would be to utilize a rotating beam electronic tube. For convenience a commutating device of the rotating gang switch type has been illustrated which has three stages of stationary contacts. These contacts are illustrated as arranged in vertical columns, the contacts of the different columns being designated generally as 1, 2 and 3. The connection of the contacts of the third column are controlled by call registering contacts, such as provided on floor relays. These contacts are differentiated as to floors by the floor numbers and as to direction by the letters U and D. For convenience, these designations will be utilized to designate the horizontal rows of commutator contacts and call registering contacts. The commutating mechanism contacts of each column are engaged in succession by brushes designated B and differentiated as to columns by the numerals 1, 2 and 3. The positive side of the supply lines is connected to brush B1 while the negative side is connected to one side of the call registering contacts. The mechanism for rotating the brushes is not illustrated but it is to be understood that it may be of the high speed type, say thirty revolutions per second, to satisfy persistence of vision requirements.

Assume that a down call is in registration for the third floor and that an up call is in registration for the fifth floor. Each time the brushes engage the contacts in row 3D, a circuit is completed from line + by way of brush B1, left-hand contact, wires I and I*a*, resistor RB1, waiting passenger indicator lamp DWP3, wire IV*a*, resistor RB4, wire IV, intermediate contact, brushes B2 and B3, right-hand contact, contacts 3D to line —. Also, each time the brushes engage the contacts in row 5U, voltage is applied by way of wires IV and II of a polarity to cause the lighting of lamp UWP5. Due to the rapidity with which the voltage pulses are applied to these lamps, they give the appearance of steady illumination.

It is believed that it will be understood that when any call is registered, voltage of the proper polarity is applied to the corresponding waiting passenger indicating lamp to cause the lamp to be illuminated. Also this operation is effected without unwanted operations, due to the fact that only one circuit is completed at a time. As pointed out above, commutation of the applied voltage for the waiting passenger indicator circuits may be effected in various ways and the same principles may be employed in commutating the voltage applied to the pair of selector brushes for interconnected position indicator circuits for a plurality of elevators, previously referred to.

Reference may now be had to Figure 7 which illustrates the invention applied to a control circuit. The control circuit illustrated is one in which buttons within the car, one for each floor served, control the stopping of the car at the floors for which the buttons are provided. The buttons are arranged to be held in operated condition and released either, as each call registered thereby is cancelled, or at the end of the trip. The wires from the car buttons run from the car to commutating mechanism in the control room. This mechanism comprises two columns of stationary contacts and a brush for each column for picking up the calls registered by the car buttons. The picking up of a call is illustrated as effected by causing the operation of a call pick-up switch CP. In order to polarize the buttons, neon lamps are illustrated in series with the buttons. A twelve floor installation has been illustrated. The car buttons are designated generally as CB, the polarizing lamps as PL, the commutating mechanism brushes as CPB and the stationary contacts as CPC. The two columns of contacts and their brushes are differentiated as 1 and 2.

In operation, assume for example that the third floor car button CB3 is pressed. This button is maintained operated, permitting the finger to be removed. Upon the engagement of brushes CPB1 and CPB2 with contacts CPC13 and CPC23, a circuit is completed from line + through brush CPB1, contact CPC13, wire I, lamp PL3, button CP3, wire III, contact CPC23, brush CPB2, and coil of switch CP to line —. This picks up

the car call at the third floor which causes the car to be brought to a stop at the third floor. Had the fourth floor button been pressed, the call is picked up upon the engagement of the brushes with contacts CPC14 and CPC24. This engagement again applies voltage to wires I and III but with the polarity reversed and as the fourth floor car button circuit is polarized oppositely to the third floor car button circuit, the fourth floor button is effective to complete the circuit for the coil of switch CP. It is believed that it will seen without further detailed description that as the brushes engage pairs of contacts for different floors, voltage is applied to different pairs of wires I, II, III and IV and of a proper polarity to render the corresponding car button, if in operated condition, effective to cause operation of switch CP.

Thus it is seen from the above examples that the invention has various applications in elevator circuits and similar circuits and that a considerable saving in wiring is effected thereby. In accordance with the invention, with the polarizing arrangement, the number of circuits which may be fed from a given number of wires is in accordance with the equation: $L=w^2-w$, where L is the number of possible circuits and w is the number of feed wires. As the number of circuits desired for any particular installation is a known quantity, the number of feed wires which will supply these circuits is obtained from the above equation as follows: $w^2-w-L=0$, this being a quadratic equation the solution for which is

$$w=\frac{1+\sqrt{1+4L}}{2}$$

If upon solution w is not an integer, the number of wires used is the next above integer.

There may be advantage in certain instances in omitting the polarizing arrangement. A non-polarized arrangement is illustrated in Figure 8 applied by way of example to position indicator circuits. An arrangement for ten floors utilizing neon position indicator lamps is illustrated. The commutating mechanism is designated generally as CM. These circuits are supplied by five wires in the hoistway. With this arrangement, current is supplied to lamp PI1 by way of wires I and II, to lamp PI2 by way of wires I and III, to lamp PI3 by way of wires I and IV, to lamp PI4 by way of wires I and V, to lamp PI5 by way of wires II and III, and so on. The source of current for the system may be direct current or alternating current. With the non-polarized arrangement, the number of circuits which may be fed from a given number of feed wires is in accordance with the equation

$$L=\frac{w^2-w}{2}$$

where again L is the number of possible circuits and w is the number of feed wires. Again as the number of desired circuits for any particular installation is known, the number of feed wires which will supply these circuits with a non-polarized arrangement is obtained from the above equation as follows: $w^2-w-2L=0$, the solution for this quadratic equation being

$$w=\frac{1+\sqrt{1+8L}}{2}$$

If w is not an integer, the number of wires becomes the integer next above.

Thus it is seen that while the non-polarized arrangement utilizes more wires than the polarized one, there is a considerable saving in wiring over the individual circuit arrangement. Comparative advantages of the

polarized and non-polarized schemes may be seen from the following tabulation:

No. of Circuits	No. of Feed Wires		
	Individual	Polarized	Non-Polarized
6	7	3	4
10	11	4	5
12	13	4	6
15	16	5	6
20	21	5	7
21	22	6	7
28	29	6	8
30	31	6	9
36	37	7	9
42	43	7	10

This may be extended in a similar manner for greater numbers of circuits. Thus it is seen that both the polarized and the non-polarized systems effect considerable wiring saving as compared with the corresponding individual circuit arrangement. Also, it is seen that, while the non-polarized systems use more wires than the polarized ones, for certain numbers of circuits, the increase in the number of hoistway wires is not great.

Another arrangement for effecting a saving in wiring is illustrated as applied to position indicator circuits in Figure 9. In this arrangement are utilized but a single row of selector contacts designated generally as SC and differentiated by numerals indicative of the floors, and a single brush SB. The circuits are supplied from a source of alternating current, and the circuits are polarized by means of rectifiers at the commutating mechanism and utilizing neon lamps for the indicator. The rectifiers are designed generally as RE and differentiated by numerals indicative of the floors. The neon lamps are illustrated as of the bidirectional glow discharge type. Such a tube can serve for two floors as where regional glow is utilized to indicate car position. These tubes are designated CP and differentiated by numerals indicative of the floors served. For example, lamp CP1—2 serves for the first and second floors. A twelve floor system has been illustrated by way of example. With this arrangement, the twelve circuits can be supplied by means of seven wires, namely one wire for each lamp designated I, II, III, IV, V and VI and a return wire CW. A ballast resistor CR common to the lamps is connected in series relationship in the return wire circuit. Thus with the car at floor twelve for example, a circuit is completed through rectifier RE12 for lamp CP11—12, causing glow at its upper electrode. With the car at floor eleven, a circuit is completed through rectifier RE11 for lamp CP11—12, causing glow at its lower electrode, and so on.

It is to be noted that capacitors CA are not utilized where incandescent lamps are employed in the circuits. Also, these capacitors may be omitted in circuits employing neon lamps in certain instances, as for example in the arrangement illustrated in Figure 8 and also when the lamp characteristics are such that erroneous breakdown in the reverse direction due to sudden voltage pulses does not occur. The grounded connection may be omitted in certain instances. For example, the ground connection to the point of common connection of the load resistors RL would not be made where the power supply is grounded. While the ballast resistors have been illustrated in the feed wires, thus effecting a saving in these resistors as well as in wiring, it is to be understood that they may be individual to the lamps, especially when the ballast resistance is inherent in the lamp. While the invention has been described as applied to circuits involving lamps, gongs and push buttons, it is also applicable to circuits in which other forms of translating devices or circuit controlling devices are employed.

Therefore, as many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without

departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. In combination in an elevator system in which the elevator car operating in the hoistway serves a plurality of floors; a position of the car indicator having a plurality of polarized glow discharge lamps, one for each of said floors; a plurality of feed wires in said hoistway extending to said position indicator, the number of said feed wires being the minimum from which a number of different pairs of feed wires may be had corresponding to one-half the number of lamps; means for connecting said lamps in groups of two in parallel respectively across different pairs of feed wires with the polarity of connection of one lamp of each pair opposite to that of the other; a source of direct current; a plurality of pairs of stationary contacts, each pair corresponding to one of said floors; a pair of brushes movable in accordance with car movement for engaging said contacts one pair at a time to connect said source of current to said stationary contacts; means connecting said stationary contacts to said feed wires to cause current to each pair of feed wires to be of opposite polarity as the two pairs of stationary contacts connected thereto are engaged by said brushes; and a plurality of resistors, one for each feed wire connected from a common point respectively to the feed wires for which they are provided.

2. In combination in a plural elevator system in which the elevator cars operating in their hoistways serve a plurality of floors; a position of the car indicator for each of said cars, each having a plurality of polarized glow discharge lamps, one for each of said floors; a plurality of feed wires common to said position indicators, the number of said feed wires being the minimum from which a number of pairs of feed wires may be had corresponding to half the total number of lamps of all of said indicators, said lamps being respectively connected in pairs of opposite polarity across different pairs of feed wires; a source of current; and means to cause said source of current to be applied to one indicator at a time, said means including mechanism for each indicator for commutating the application of voltage from said source to said feed wires to cause, as the car reaches said floors, voltage of the proper polarity to be applied to the lamps of that indicator for such floors to effect the lighting of the lamps.

3. In combination in a plural elevator system in which the elevator cars operating in their hoistways serve a plurality of floors; a position of the car indicator in each of said cars, each having a plurality of polarized glow discharge lamps, one for each of said floors; a plurality of feed wires common to said position indicators, the number of said feed wires being the minimum from which a number of pairs of feed wires may be had in accordance with the equation

$$w=\frac{1+\sqrt{1+4L}}{2}$$

where L is the total number of lamps of all of said indicators and w is the number of feed wires, said lamps of each indicator being respectively connected in pairs of opposite polarity across different pairs of feed wires, the combinations of feed wires utilized for each indicator being different from those used for the others; a source of current; and means to cause said source of current to be applied to one indicator at a time, said means including mechanism for each elevator for commutating the application of voltage from said source to the feed wires utilized for the indicator for that elevator to cause, as the car reaches the floors, voltage of the proper polarity to be applied to the lamps of that indicator for such floors to effect the lighting of the lamps.

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