April 12, 1960 S. A. HORNUNG 2,932,365

TESTING APPARATUS FOR SAFETY MECHANISM FOR DOORS

Filed July 19, 1957 2 Sheets-Sheet 1

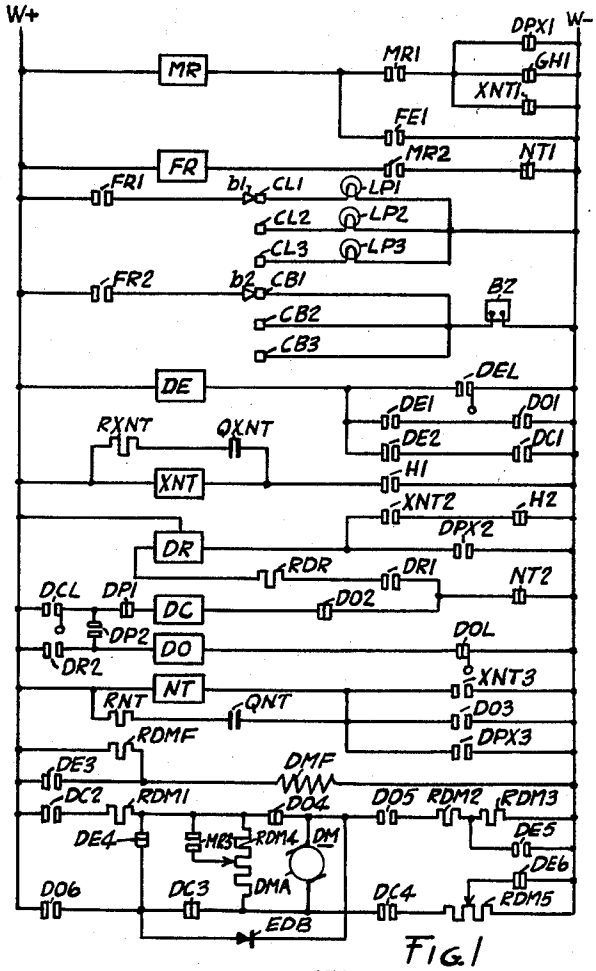

FIG. 1

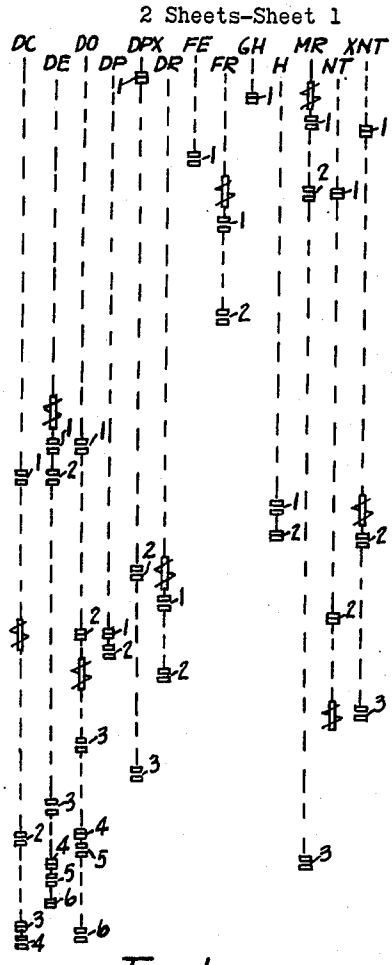

FIG. 1s

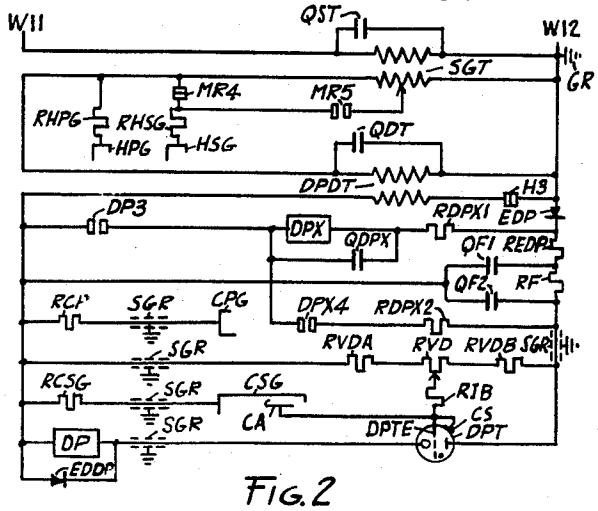

FIG. 2

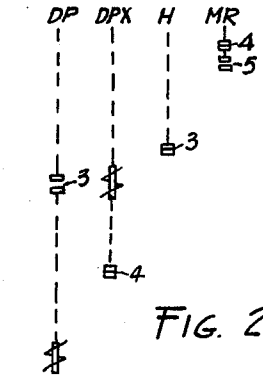

FIG. 2s

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TESTING APPARATUS FOR SAFETY MECHANISM FOR DOORS

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2 Sheets-Sheet 2

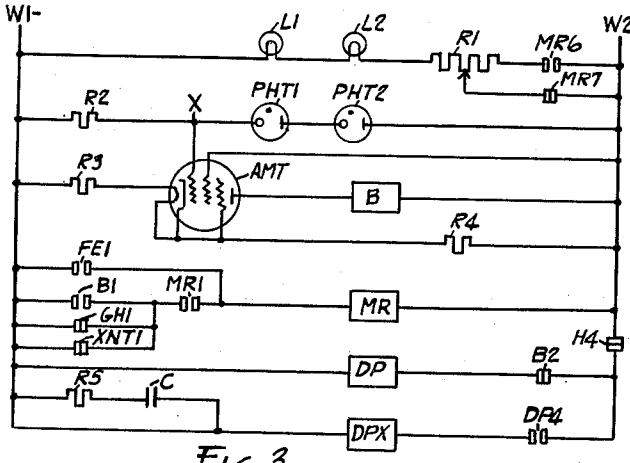

FIG. 3

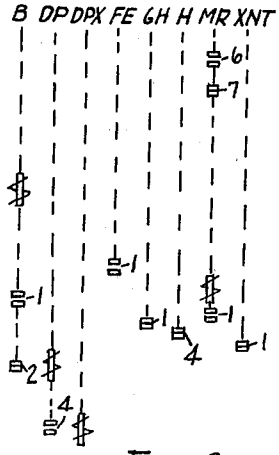

FIG. 3s

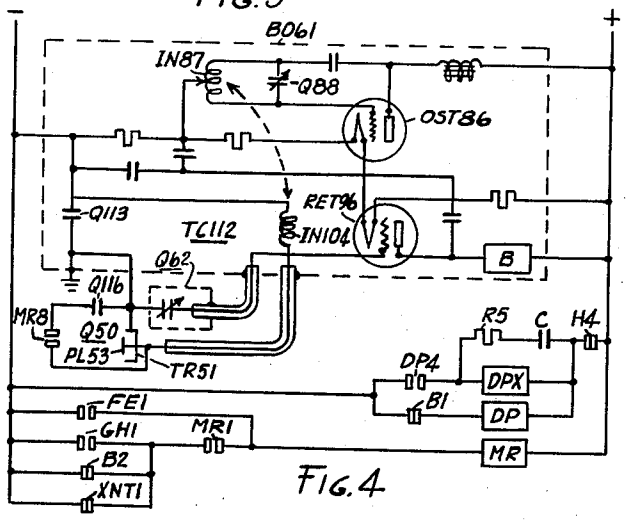

FIG. 4

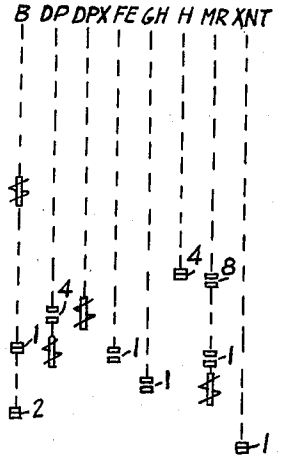

FIG. 4s

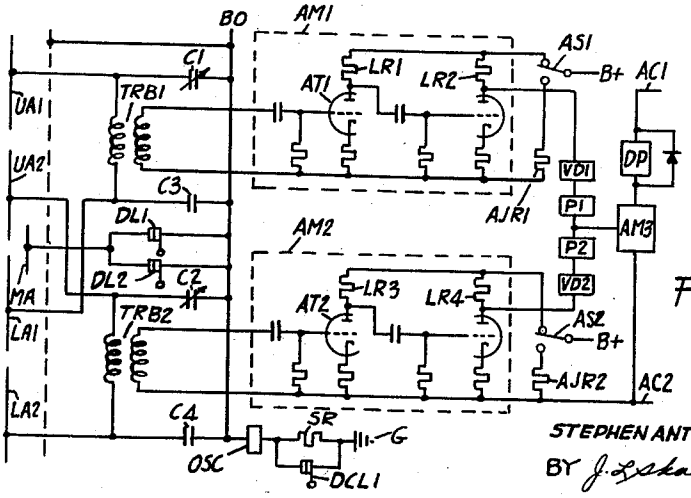

FIG. 5

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United States Patent Office 2,932,365 Patented Apr. 12, 1960

2,932,365

TESTING APPARATUS FOR SAFETY MECHANISM FOR DOORS

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Application July 19, 1957, Serial No. 672,928

9 Claims. (Cl. 187—48)

The invention relates to a device for monitoring safety mechanism, such as safety mechanism for protecting against closing doors of elevator installations.

It is common practice in present day passenger elevator installations, where the closing of the doors is effected automatically, to provide safety mechanism to avoid striking a transferring passenger with a closing door. Automatically controlled doors provided with safety mechanism may be closed at speeds faster than would otherwise be practical, which is desirable from a service viewpoint. However, if this safety mechanism becomes inoperative there is the likelihood that a transferring passenger may be struck with considerable force by a closing door.

If the operation of the safety mechanism is given priority over elevator operation, when a safety mechanism failure occurs, the doors may be retained in open position. This results in the car remaining inoperative at a floor. As an alternative, the doors may be closed at a slower speed after they have remained open an abnormally long time. However, in automatically controlled elevators if the failure is of an intermittent nature it may not be brought to the attention of service personnel for some time. When notice of the poor elevator response is obtained, much time may be spent before the cause is found to be inoperative safety mechanism. This results in reduced elevator efficiency.

The prompt reporting of the inoperativeness or lack of sensitivity of the safety mechanism allows the door to be closed at reduced speed at the expiration of normal door open time and pinpoints the source of the trouble immediately. Also, a test of the sensitivity of the safety mechanism before it is required to function minimizes the danger of injury to passengers and makes practical the use of preventive maintenance. All other factors remaining equal, this results in less costly maintenance and more efficient elevator service.

It is, therefore, an object of the invention to provide a device which detects and reports the inoperativeness or faulty operation of elevator door safety mechanism.

Another object of the invention is to provide a device which will test the operation of the safety mechanism at a predetermined level of sensitivity before the safety mechanism is required to function.

Another object of the invention is to provide a device which will reduce the speed of the doors in closing below the normal closing speed, whenever the safety mechanism is detected as being inoperative or insensitive.

A further object of the invention is to maintain an alarm indication and the reduced door closing speed once they are initiated, until the car departs from that floor at which the inoperativeness of the safety mechanism was detected, even though the safety mechanism again become operative.

The invention involves a device to cause false operation of the safety mechanism in order to test its effectiveness. If the safety mechanism fails to false operate, an alarm is initiated and the speed of the doors in closing is reduced below normal closing speed.

In carrying out the invention, according to the arrangement which will be described, the safety mechanism is stimulated a predetermined minimum amount to approximate the effect on the safety mechanism of a person or object in the path of movement of the doors in closing.

Features and advantages of the invention will be seen from the above and from the following description of operation when considered in conjunction with the drawings in which:

Figure 1 is an "across-the-line" simplified wiring diagram of a portion of elevator power and control circuits;

Figure 2 is an "across-the-line" simplified wiring diagram of one form of door protective mechanism which together with the control circuits of Figure 1 embodies the invention;

Figures 3, 4 and 5 are "across-the-line" simplified wiring diagrams for other forms of door protective mechanism to which the invention is applicable; and,

Figures 1*s*, 2*s*, 3*s* and 4*s* are spindle sheets for use in side-by-side alignment with Figures 1, 2, 3 and 4 respectively, for locating the coils and contacts of these circuits.

In view of the simple circuit involved, no spindle sheet is shown for the wiring diagram of Figure 5.

For convenience, the invention will be described as applied to the safety mechanism of the patent to W. H. Bruns et al., No. 2,634,828, granted April 14, 1953, with particular reference to the circuits of Figure 4.

The electromagnetic switches employed in the circuits shown in Figures 1 through 5 are designated as follows:

B—Safety mechanism switch
DC—Door close switch
DE—Door speed switch
DO—Door open switch
DP—Door protective relay
DPX—Auxiliary door protective relay
DR—Door control switch
FR—Flicker relay
MR—Monitoring relay
NT—Hall time switch
XNT—Auxiliary hall time relay

Throughout the description which follows, these letters will be applied to the coils of the above designated switches and, with reference to numerals appended thereto, to the contacts of these switches. The electromagnetic switches are illustrated in deenergized condition. Door control switch DR is a latching type switch and is illustrated in reset condition.

Referring first to Figure 1, the door power and control circuits are connected to direct current supply lines designated W+ and W—. Car running relay FE (not shown) is energized incident to starting the car and is deenergized incident to stopping the car. Door relay GH1 (not shown) is energized incident to opening the door and remains energized until the door is in fully closed position. Field and brake switch H (not shown) is energized incident to starting the car and is deenergized when the car is stopped.

Car position indicator lamps LP1 and LP3 are provided, one for each floor served by the car and may be located in a panel at the building lobby. The alarm buzzer is designated BZ and may also be located at the lobby. Contacts CL1 to CL3 and CB1 to CB3 are provided, one CL contact and one CB contact for each floor served by the car. Brushes *b*1 and *b*2 engage the CL and CB contacts, respectively, in accordance with car movement to prepare the car position indicator lamp LP and buzzer BZ circuits for the floor at which the car is to stop.

Door open limit switch DOL, door close limit switch DCL and door speed limit switch DEL are actuated by

door movement and are illustrated for the closed position of the door.

Referring to Figure 2, the door protective circuits are connected to a source of single phase alternating current represented by wires W11 and W12. SGT and DPDT are constant voltage transformers for providing the desired value of alternating current voltage. The car door sight guard CSG and the car door strike jamb post guard CPG are connected to the ungrounded side of the secondary winding of transformer DPDT, thus shielding the tubes from unwanted operation due to ground potential. The hoistway door sight guards HSG and the hoistway door strike jamb post guards HPG are connected to the ungrounded side of the secondary winding of transformer SGT, thus shielding the doors against unwanted operation as they near closed positions. For simplicity, the hoistway door post guards HPG and sight guards HSG are shown for only one floor in the building.

Also for simplicity, the circuit for one protective tube DPT and its associated apparatus is shown instead of the three protective tubes DPT1 and DPT3 and their respective associated apparatus shown and described in connection with Figure 4 of the Bruns' Patent No. 2,634,828. An adjustable point on voltage divider resistor RVD for the tube is connected by way of current limiting resistor RIB to the control electrode DPTE and conductive spot CS of the tube. The antenna CA for the tube also is connected to the control electrode DPTE and conductive spot CS. Direct current is provided through rectifier EDP for the anode-cathode circuits of the tube, approximately 150 volts being obtained with 120 R.M.S. volts from the transformer secondary winding which is insufficient in itself to cause a breakdown of the tube. A filter network is provided by condensers QF1 and QF2 and resistor RF. To prevent any undesirable effect on the tube by action of stray fields, shielded conductors are employed with the shields connected to ground as indicated at points SGR. The tube is fired by effecting an increase in antenna to ground capacity by the body capacity to ground of a person in the zone of influence of the antenna. The physical construction of the protective mechanism is more fully illustrated and described in the aforementioned Bruns' Patent No. 2,634,828.

The manner in which the doors are controlled may vary considerably. In the particular circuits illustrated in Figure 1, the doors open automatically as a stop is made at a landing and close automatically upon the expiration of a given time interval. Auxiliary hall time relay XNT and hall time switch NT are both operated during the running of the car. As the car arrives at the landing at which the stop is being made, field and brake switch H deenergizes. Contacts H1 separate to disconnect the coil of auxiliary hall time relay XNT from the supply lines. The deenergization of this relay is delayed by the discharge of condenser QXNT. Contacts H2 close to complete a circuit by way of contacts XNT2 for the set coil of door control switch DR. Switch DR latches itself in operated condition. Contacts DR2 close to complete a circuit by way of door open limit switch DOL for the coil of door open switch DO. Contacts DO5 and DO6 close and contacts DO4 open to establish a circuit for the armature DMA of the door operating motor through resistors RDM2 and RDM3 to open the car door and also the hoistway door. As the doors move a certain distance, door speed limit switch DEL closes to complete a circuit for the coil of door speed switch DE. Contacts DE3 and DE5 engage to short circuit resistance RDMF in circuit with door motor field winding DMF and resistance RDM3 in circuit with armature DMA, respectively. As the doors near open position, door speed limit switch DEL opens and door close limit switch DCL closes without effect. As the doors reach open position, door open limit switch DOL opens to deenergize door open switch DO to break the circuit for armature DMA. Contacts DO1 separate to deenergize door speed switch DE. Contacts DE4 engage to establish a short circuit for armature DMA to bring the door operating motor to a stop.

Upon the expiration of a given time interval, auxiliary hall time relay XNT is deenergized. Contacts XNT3 separate to disconnect the coil of hall time switch NT from the supply lines. Switch NT does not deenergize immediately, being delayed by the discharge of condenser QNT. Contacts NT2 close to establish a circuit by way of contacts DR1 for the reset coil of door control switch DR which is restored to unlatched condition. Contacts NT2 also complete a circuit by way of door close limit switch DCL and contacts DP1 and DO2 for the coil of door close switch DC to initiate the door closing operation. A time interval is thus provided, namely the interval of relay XNT, say three seconds, plus the interval of switch NT, say another three seconds, or a total of six seconds, from the time that the stop is made before the closing of the doors is initiated. This time interval is defined as the "door dwell period." Door close switch DC upon operation engages contacts DC2 and DC4 and separates contacts DC3 to complete a circuit for armature DMA to close the car door and hoistway door. As the doors move from fully open position, limit switch DOL recloses without effect at this time. During the closing operation, limit switch DEL is again closed, causing operation of door speed switch DE. Contacts DE3 close to short circuit motor field resistance RDMF and contacts DE6 open to remove a short circuit for a portion of resistor RDM5. As the doors reach closed position, door close limit switch DCL opens, breaking the circuit for the coil of door close switch DC. Contacts DC2 and DC4 open to break the circuit for the door motor armature DMA. Contacts DC1 and switch DEL open to deenergize switch DE. Contacts DE4 reengage to establish a short circuit for armature DMA to bring the door operating motor to a stop.

The protective circuits of Figure 2 are effective only while the car is stopped due to the provision of contacts H3. Referring to the circuits for tube DPT, there is a capacity network from antenna CA to shield CSG and from antenna CA to ground. Thus a biasing voltage is applied to both the control electrode DPTE and the conductive spot CS adjacent the anode, which bias is due to a direct current potential taken from resistors RVDA, RVD and RVDB, and an alternating current potential which is a function of the ratio of the two capacity networks. This is adjusted so that the biasing voltage is just below tube breakdown value. Resistor RIB is of such value as to effectively isolate the alternating current source from the direct current source. When a person enters or leaves the car his body capacity in effect increases the antenna to ground capacity and thus brings the potential of the conductive spot and control electrode to which it is connected nearer to ground potential. When during the closing of the doors antenna CA comes within a predetermined distance of a person, the alternating current potential reaches a value which causes breakdown of tube DPT. This completes the anode-cathode circuit of the tube which extends through the coil of door protective relay DP, causing this relay to operate. Upon operation, door protective relay DP causes the door to stop and then reopen as more fully described in connection with Figure 4 of the Bruns' Patent No. 2,634,828.

In order to minimize the chances of a person being hit by a closing door and to obtain an indication of the failure of the protective mechanism, the protective mechanism may be tested by causing tube DPT to conduct as if a person was detected in the path of the door. False operation of the protective mechanism to test it may be caused by removing the shield voltage applied

to any of the following: hoistway door sight guard HSG, post guard HPG, car door sight guard CSG, and post guard CPG, or by increasing the biasing voltage applied to conductive spot CS and electrode DPTE.

In the preferred embodiment of the invention, the shield voltage applied to the hoistway door sight guard HSG is reduced slightly below the minimum value necessary to keep the tube from firing. The operation of the protective mechanism at a predetermined level of sensitivity is thus tested.

An understanding of the invention may best be obtained from a description of the sequences of operations considered in conjunction with Figures 1 and 2. While the car is running, monitoring relay MR is energized through car running contacts FE1 which are closed. Shield potential at a value which will cause tube DPT to fire is applied to the hoistway door sight guard HSG by closed contacts MR5 which connect the sight guard to a top on transformer SGT. This reduced shield potential on the hoistway door sight guard HSG has no effect on the protective mechanism at this time since brake contacts H3 are open while the car is running, as previously mentioned.

Incident to the car stopping at a floor, car running contacts FE1 open but are not effective at this time, being bypassed by the self-holding circuits MR1 through DPX1 and GH1. As the car stops at the floor, contacts H3 close to render the protective mechanism effective. As the doors begin to open, door relay contacts GH1 open without affecting monitoring relay MR. The aforementioned reduced shield potential applied to HSG via the transformer SGT tap brings the antenna closer to ground and causes the tube to conduct energizing door protective relay DP. Contacts DP3 close to energize auxiliary door protective relay DPX which is delayed in dropping out through contacts DPX4.

Contacts DPX1 open to break the self-holding circuit of monitoring relay MR thereby rendering any subsequent actuation of contacts DPX1, GH1 or XNT1 ineffective. Contacts MR4 close and contacts MR5 open to apply full shield potential to sight guard HSG, thereby removing the stimulant to false operation of the protective mechanism.

As the doors begin to open, if the protective mechanism fails to operate under the stimulation of reduced shield potential which approximates the effect on the mechanism of the presence of a person in the path of the closing door, monitoring relay MR remains energized through self-holding circuit MR1, DPX1. Closed contacts MR3 short circuit part of resistor RDM4 in a parallel with door motor armature DMA to reduce the speed of the door closing. At the expiration of the time interval of auxiliary hall time relay XNT, contacts XNT1 close to maintain relay MR energized, even though during the door closing operation, tube DPT may conduct and cause contacts DPX1 to separate. At the end of the "door dwell period" contacts NT1 close to complete the circuit to energize flicker relay FR through closed contacts MR2. Flicker relay contacts FR1 and FR2 close and open to flicker the lamp LP, corresponding to the floor at which the car is stopped and to ring buzzer BZ as an indication of the faulty operation of the protective mechanism. The alarm condition and reduced door closing speed, once initiated, is maintained until contacts NT1 separate to break the circuit to flicker relay FR as the car leaves the floor.

Arrangements for monitoring the operation of other forms of door protective mechanism may be employed. To illustrate this, examples of other forms of door protective mechanism are illustrated in Figures 3 and 4. These circuits are arranged to be used with the door operating circuits shown in Figure 1 below relay MR.

Referring to Figure 3, the circuits there illustrated are for the light ray type of protective mechanism suitable for both side opening and center opening doors. PHT1 and PHT2 are indicative of a plurality of photo tubes, such as the 918 type, positioned on one side of the car door entrance to scan an area of average person height. L1 and L2 are pinpoint sources of light for the photo tubes arranged on the opposite side of the entrance in line respectively with the photo tubes for which they are provided. The photo tubes are arranged to act through an amplifying tube AMT having its control grid connected to the point X. This tube may be a pentode such as 6SJ7 to provide a high gain. The coil of safety mechanism switch B is in the anode-cathode circuit of tube AMT. So long as the light ray for each tube PHT is not obstructed, a positive potential exists at point X to cause sufficient current flow through tube AMT to operate safety mechanism switch B. Thus contacts B2 are separated. Contacts H4 close when the car stops at a floor and remain closed until the car departs from that floor. Upon obstruction of one or more of the light rays by passenger transfer, the potential at point X is reduced sufficiently to cause the deenergization of safety mechanism switch B. Contacts B2 engage to cause operation of door protective relay DP which in turn engages contacts DP4 to cause operation of auxiliary door protective relay DPX. Relays DP and DPX control the door operating circuits of Figure 1 to prevent the then closing of the door or if closing, to return it to open position as described in Bruns' Patent No. 2,634,828. Also, if any of the light sources or photo cells are inoperative or tube AMT fails to conduct properly, contacts B2 engage to open the doors. In this case the doors will remain open after the "door dwell period" has expired.

Referring now to Figures 1 and 3, while the car is running, monitoring relay MR is energized through car running contacts FE1. Closed contacts MR6 insert the full value of resistor R1 in series with light sources L1 and L2. The excitation for the light sources L1 and L2 is reduced to a value which will bias tube AMT to conduct less current than the minimum current required to maintain switch B energized. The sensitivity of the photo tubes PHT1 and PHT2 is tested in this manner. Therefore, switch B is in deenergized condition while the car is running. Contacts B2 are not effective at this time since the circuits of relays DP and DPX are inoperative due to open contacts H4. Contacts XNT1 are open and remain open until the expiration of the time interval of auxiliary hall time relay XNT, as previously mentioned. When the car slows down, contacts FE1 open without affecting relay MR due to self-holding circuit MR1, GH1. As the doors begin to open prior to the car coming to a stop, contacts GH1 separate breaking the circuit of relay MR through self-holding contacts MR1. Contacts MR6 open and contacts MR7 close to short circuit part of resistor R1 to apply full voltage to light sources L1 and L2. The bias of tube AMT is reduced causing it to conduct and energize switch B. As the car stops, contacts H4 close putting the door protective mechanism into operation. Contacts B1 close without effect since contacts MR1 are already open.

As the doors begin to open, although the excitation of the light sources L1 and L2 is reduced, as previously described, the protective mechanism may fail to false operate. This failure may be due to tube AMT continuing to conduct, relay B failing to deenergize or contacts B2 being stuck together. Whatever the reason for the failure may be, if contacts B1 are closed, as contacts FE1 open and contatcs GH1 separate incident to the car slowdown and the door opening, relay MR remains energized. At the expiration of the time interval of auxiliary hall time relay XNT, contacts XNT1 close to maintain relay MR energized. At the expiration of the "door dwell period," the door closes at reduced speed and an audible and visual alarm is initiated, as previously described. Without this described "pre-test" of the protective mechanism, if during closing movement of the door the light beam is interrupted, with contacts B2 stuck

together, the door will continue to close at full normal door closing speed with the protective mechanism inoperative.

Referring to Figure 4, the door protective circuits therein lustrated are based on the circuits of Figure 5 of the patent to Lubkin No. 1,982,442 granted November 27, 1934. A capacitor Q50 made up of trough TR51 and plate PL53 extends vertically over a scanning area along the front edge of the car door. Q62 is a shielded compensating condenser variable in accordance with the position of the doors for preventing unwanted operations. Connections to one side of capacitor Q50 and condenser Q62 are led through shielded cables to box BO61. This box, the shield for condenser Q62, the cable sheaths, the other side of condenser Q62 and capacitor Q50 are connected to ground. Within box BO61 is a triode vacuum tube OST86 with its grid and anode connected to a tuned circuit made up of condenser Q88 and inductance IN87, this being utilized to generate high frequency oscillations. RET96 is a triode vacuum tube with its input circuit conducted across inductance IN104. The coil of switch B is connected in the anode-cathode circuit of tube RET96. Inductances IN87 and IN104 are inductively coupled so that the generated high frequency oscillations are induced in inductance IN104. In parallel with inductance IN104 are capacitors Q50 and Q62 to form in conjunction with condenser Q113 a tuned circuit TC112. Condenser Q116 in parallel with condenser Q50 is prevented from affecting tuned circuit TC112 during normal operation of the door protective mechanism by open contacts MR8, whose operation will be explained later. With no person in the entranceway the tuned circuit is in resonance with the generated high frequency oscillations causing sufficient current flow in the coil of switch B to maintain this switch in operated condition. When a person or object in the entranceway alters the electrostatic field due to capacitor Q50 and thus detunes the tuned circuit TC112 from resonance with the generated oscillations, the current flow is reduced sufficiently to cause switch B to deenergize and complete the circuit for the coil of relay DP. As previously explained, this relay controls the door operating circuits to prevent the then closing of the door or if closing, to return it to open position.

Referring to Figures 1 and 4, while the car is running, monitoring relay MR is energized through car running contacts FE1 and is maintained energized through self-holding circuit MR1, GH1. Closed contacts MR8 connect condenser Q116 in parallel with condenser Q50 of tuned circuit TC112. Condenser Q116 has a value of capacity selected to approximate the effect of the body capacity of a person in the path of a closing door at a predetermined distance from the front edge of that car door on capacitor Q50. This selected value of capacity is sufficient to detune the tuned circuit TC112 from resonance with the generated oscillations. Thus, current flow is reduced sufficiently to cause switch B to deenergize. The operation of the protective mechanism is tested at a predetermined level of sensitivity in this manner. Contacts B1 are not effective at this time since the circuits of relays DP and DPX are inoperative due to open contacts H4. When the car slows down, contacts FE1 open without affecting relay MR. As the doors begin to open prior to the car coming to a stop, contacts GH1 separate breaking the circuit relay MR through self-holding contacts MR1. Contacts MR8 open removing condenser Q116 from the circuit of TC112, returning that circuit to resonance with the generated oscillations to cause sufficient current to flow in the plate circuit of tube RET96 to energize switch B. As the car stops, contacts H4 close putting the door protective mechanism into operation. Contacts B2 close without effect since contacts MR1 are already open.

With condenser Q116 disconnected, as previously described, if contacts B2 remain closed to indicate a failure of the protective mechanism, as contacts FE1 open and contacts GH1 separate incident to car slowdown and door opening, relay MR remains energized. Contacts XNT1 close at the expiration of the auxiliary hall time relay time interval. Relay MR controls the door operating circuits to reduce the closing speed of the door and initiate an alarm indication, which once initiated is maintained by closed contacts XNT1, as previously explained.

An arrangement for monitoring the operation of still another form of door protective mechanism is illustrated in Figure 5. This circuit is arranged to be used with the door operating circuits shown in Figure 1, wherein all contacts designated DPX are to be considered contacts designated DP. The circuits of Figure 5, with the exception of monitoring antenna MA are the subject matter of the co-pending application of Lew H. Diamond, et al., Serial No. 697,370, filed November 19, 1957. TRB1 and TRB2 designate transformers. AM1 to AM3 designate amplifiers. VD1 and VD2 designate voltage doublers. P1 and P2 designate potentiometers. An alternating voltage source is connected from line BO to ground G, this source being indicated by block OSC. The anodes of amplifier tubes AT1, AT2 are connected to supply line B+. Current for the coil of relay DP is provided from alternating current supply lines AC1, AC2. The four antennae UA1, UA2, LA1 and LA2 form capacitances to ground. They are arranged in pairs and are positioned one above the other along the leading edge of the car door.

The antennae of each pair are connected directly to the opposite side of the diagonal of a bridge, with each antenna connected in a different bridge circuit from the one in which is connected the next succeeding antenna. Each bridge is adjusted to provide substantially zero voltage across its diagonal when no object, such as a person, sought to be protected, is in the field of influence of the antennae connected in that bridge. When such person comes into the field of influence of one or more antennae, there is sufficient change in capacity in one leg with respect to the other of one or more bridges to cause a sufficient signal voltage to appear across the diagonal of the bridge, which when amplified energizes relay DP. Relay DP in turn is caused to operate mechanism to bring the door to a stop if closing or to prevent its closing if it is in open position.

Monitoring antenna MA is provided to span the two centrally located antennae UA2 and LA1, and is rendered effective during each initial door opening operation to cause sufficient decrease in impedance of one antenna of each bridge to ground to cause operation of relay DP. By means of door limit switches DL1 and DL2, the monitoring antenna is connected to line BO while the doors are in closed position and in open position and during door closing, thereby rendering the monitoring antenna ineffective to cause operation of relay DP during this time. Monitoring antenna MA is connected to line BO by shielded cable, with the shield, not shown, connected to ground. During the initial door opening operation, when the car stops at a floor, these limit switches disconnect the monitoring antenna from line BO, enabling the antenna by means of the capacitance coupling to ground of its wire in the grounded cable to bring ground potential sufficiently near the center antennae UA2 and LA1 to cause operation of relay DP.

Limit switch DL1 is a toggle switch which opens when the door reaches approximately one-quarter inch of closed position and remains open until the door reaches approximately one-quarter inch of open position, at which point it closes and remains closed until the door again reaches, roughly, one-quarter inch of closed position. Limit switch DL2 is set to open at approximately one-half inch of door opening movement and close as the door arrives approximately within one-half inch of fully open position.

When the door starts to open at a floor at which a stop is being made, limit switch DL2 opens, disconnecting monitoring antenna MA from line BO. Assume that the

detecting mechanism is functioning properly, this causes operation of relay DP to open contacts DPX1 (Figure 1) which deenergizes relay MR. Contacts MR1 open, thus the subsequent reclosing of limit switches DL1 and DL2 to reconnect antenna MA to line BO and thus cause the deenergization of relay DP to close contacts DPX1 is without effect. Switch DL1 now maintains antenna MA connected to line BO until the doors reach closed position. Thus, antennae UA1, UA2, LA1 and LA2 are effective during this period.

Should the door protective relay DP fail to operate upon the opening of limit switch DL2 in the initial door opening operation, relay MR remains energized to close the door at slow speed and initiate an alarm as previously explained, advising that the detecting mechanism is not functioning properly.

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 drawing shall be interpreted as illustrated and not in a limiting sense.

What is claimed is:

1. In a control for opening and closing an elevator door, door actuating means for moving said door in an opening direction at a given speed and for closing said door at either of two predetermined speeds, protective mechanism responsive to the presence of an object in the path of the door during its closing movement and effective to control further movement of said door, testing means normally adapted to actuate said protective mechanism momentarily to its operated condition during the opening of said door, and control means operatively responsive to the operation of said protective mechanism in response to said testing means for causing said door actuating means to close said door at the slower of said two predetermined speeds under conditions where said protective mechanism fails to operate in response to said testing means and to close said door at the other of said speeds under conditions where said protective mechanism operates in response to said testing means.

2. In a control for an elevator door in which power actuated mechanism moves said door in its opening and closing movement, said closing movement being in accordance with either of two predetermined modes of operation, protective mechanism mounted on said door responsive to the presence of an object in the closing path of the door and effective to control subsequent movement of said door, testing means operative during the opening movement of said door for subjecting said protective mechanism to controlled conditions designed to cause its actuation, and control means operatively responsive to the reaction of said protective mechanism to said controlled test conditions and effective to cause said power actuated mechanism to close said door in accordance with one of said two predetermined modes of operation and effective to the lack of reaction of said protective mechanism to said controlled test conditions to cause said power actuated mechanism to close said door in accordance with the other of said two predetermined modes of operation.

3. In combination, an elevator door control, said door control having protective mechanism effective when actuated to cause stopping of the elevator door during its closing movement, testing means effective to test the operation of said protective mechanism incident to the car stopping at a floor landing, and circuit controlling means operable from a first condition to a second condition, said circuit controlling means when in said first condition being to reduce the speed of closing said door below normal closing speed, said circuit controlling means being actuated to said second condition by said operation of said protective mechanism in response to said testing means.

4. In combination, an elevator door control, said door control having protective mechanism for stopping the elevator door during its closing movement, alarm initiating means, means for reducing the speed of the door during its closing movement, testing means to test the operation of said protective mechanism incident to the car stopping at a floor, and circuit controlling means responsive to initial door opening and actuable by operation of said protective mechanism in response to said test by said testing means to render said alarm initiating means, said speed reducing means and said testing means inoperative.

5. In a control for a door of an elevator car in which mechanism is provided wihich is responsive to an object being in the path of said door to detect the presence of said object before striking said object, testing means actuated incident to the car stopping at a floor landing momentarily to stimulate false operation of said detecting mechanism to test the operation thereof, door-open means, door-close means, timing means to cause said door-close and said door-open means to establish a period during which the door remains open at a floor landing to effect passenger transfer, alarm initiating means operably controlled by said testing means and said timing means for initiating an alarm at the end of said period under conditions where no such false operation of said detecting mechanism occurs, and means to reduce the speed of the door in closing operably controlled by said testing means, said testing means being responsive to said false operation to render said alarm initiating means and said speed reducing means inoperative.

6. A monitoring and alarm initiating device for use with a control of the door of an elevator car, said car serving several floors of a building, said control including protective mechanism to limit the force with which the door strikes an object in its path while said door is closing, said device comprising, protective-mechanism-actuating means operable incident to the car stopping at any of said floors in response to a call to cause operation of said protective mechanism, detecting means responsive to such operation of said protective mechanism by said actuating means, such door-close speed reducing means, audible and visual alarm initiating means for initiating an alarm as said door begins closing, said audible and visual alarm initiating means and said door-close speed reducing means being rendered inoperative by operation of said detecting means, and means to maintain the alarm and reduced door closing speed, once initiated, until the door reaches its fully closed position.

7. An elevator installation in which an entrance-way is provided for the elevator car, in which a door is provided for said entrance-way, in which power mechanism including a reversible direct current motor is provided for operating said door, in which switching means is provided for variably connecting the armature of said motor to a source of direct current to cause operation of said mechanism to open and close said door, and in which safety mechanism responsive to the presence of a person in said entrance-way is provided for causing operation of said switching means to disconnect said armature from said source thereby discontinuing the closing operation of said door by said power mechanism; characterized in that second switch means is provided to cause said safety mechanism to be actuated momentarily during the opening cycle of said door, that alarm initiating means is provided to initiate an alarm, that circuit controlling means is provided to reduce the amount of direct current to said armature to cause the door to close at a speed slower than normal closing speed, and that disabling means responsive to actuation of said safety mechanism by said second switching means is provided for rendering said circuit controlling means and said alarm initiating means inoperative upon such actuation of said safety mechanism.

8. In an elevator installation in which the elevator car is provided with a door, in which a hoistway door is

provided at each floor served by the car, in which power operating mechanism is provided for operating said doors, in which a sight guard is provided for said car door electrically insulated therefrom, in which a plurality of cold cathode gas tubes are provided mounted in said sight guard, said tubes having their anode-cathode circuits connected in parallel, in which a plurality of antennae, one for each tube, are provided positioned in vertical alignment along the front edge of said sight guard to provide a zone of influence extending horizontally across the path of said car door and said hoistway door and vertically substantially from the floor of the car to scan a person of average height, each tube having a control connected to its antenna, in which means for applying direct current voltage to the anode-cathode circuits of said tubes of a value above the sustaining voltage of the tubes but insufficient to break down the tubes is provided, in which means for applying alternating current potential with respect to ground to a point in the anode-cathode circuit of each tube and to said sight guard is provided, said alternating current potential applied to said sight guard causing said sight guard to shield said tubes and antenna against unwanted firing of said tubes by ground potential on said car door and in addition causing each antenna to have an alternating current potential of a value determined by the ratio of the antenna to ground capacity to the sight guard to antenna capacity, said potential of each antenna being insufficient to fire the tube for which the antenna is provided but upon a person moving into the zone of influence of such antenna to increase the antenna to ground capacity being brought sufficiently near ground potential to fire such tube, in which switching means is provided responsive to the firing of any tube to prevent operation of said power operating mechanism to close said doors, in which a sight guard is provided for each hoistway door electrically insulated therefrom, and in which means for applying to said hoistway door sight guards alternating current potential with respect to ground in phase with the potential applied to said car door sight guard is provided to prevent unwanted firing of said tubes by ground potential of said hoistway doors, characterized in that circuit controlling means to reduce said alternating current potential applied to said hoistway door sight guard to a value slightly below the value necessary to prevent unwanted firing of any of said tubes by ground potential on said hoistway doors is provided to cause any of said tubes to fire and said switching means to be actuated incident to the opening of said car and hoisting doors at a floor, means to cause said door to close at a slower than normal closing speed is provided, and means to initiate an alarm is provided, said means to cause said door to close at a slower than normal closing speed and said means to initiate an alarm being rendered inactive if said tube is caused to fire by said reduction of said potential applied to said hoistway door sight guard.

9. In combination with a control for the door of an elevator car serving several floors of a building, said car having an entrance-way, said control having light ray type protective mechanism, in which a light source emits a light beam, in which said light beam is directed across said entrance-way upon a photo cell to cause conduction in said photo cell, in which interruption of said light beam by an object in the path of the elevator door causes said door control to stop said door during its closing movement to avoid striking said object, means to reduce the intensity of said light beam incident to the car stopping at a floor in response to a call to cause said protective mechanism to be actuated, means to reduce the speed of closing said door under conditions where said protective mechanism is unactuated by said intensity reducing means, and means to initiate an alarm under conditions where said protective mechanism is so unactuated, said means to reduce the intensity, said means to reduce the speed of closing and said means to initiate an alarm being disabled as said protective mechanism is so actuated.

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