Aug. 12, 1969 E. J. HANSEN 3,461,422

PROTECTION SIGNALLING SYSTEM FOR SELF-SERVICE ELEVATORS

Filed Oct. 13, 1965 2 Sheets-Sheet 1

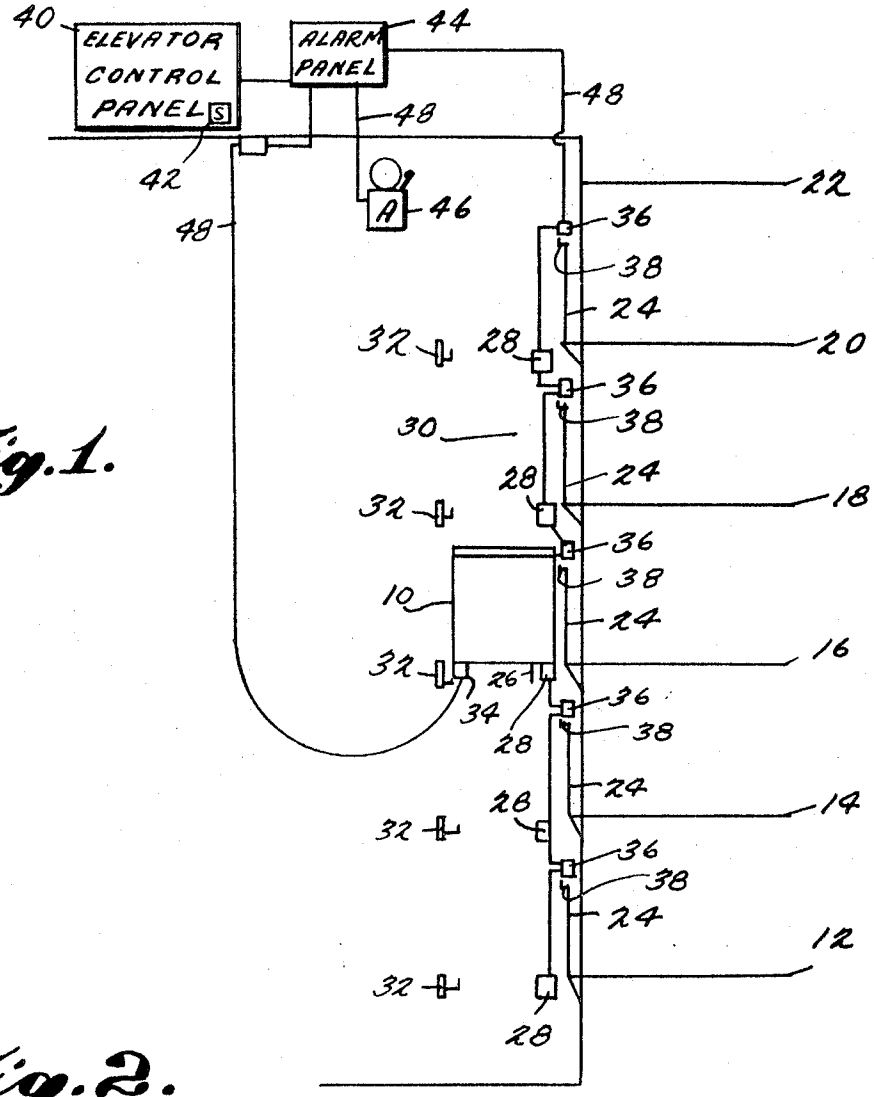
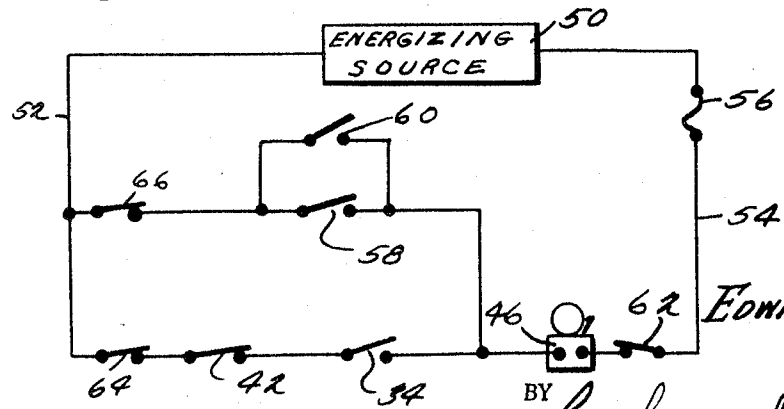


Fig. 1.

Fig. 2.



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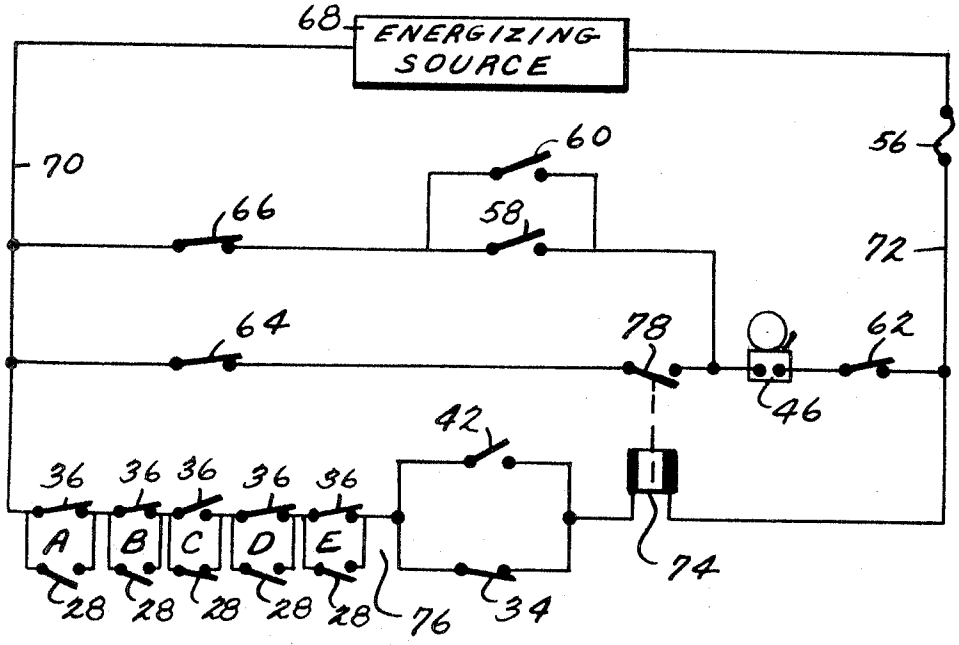


Fig. 3.

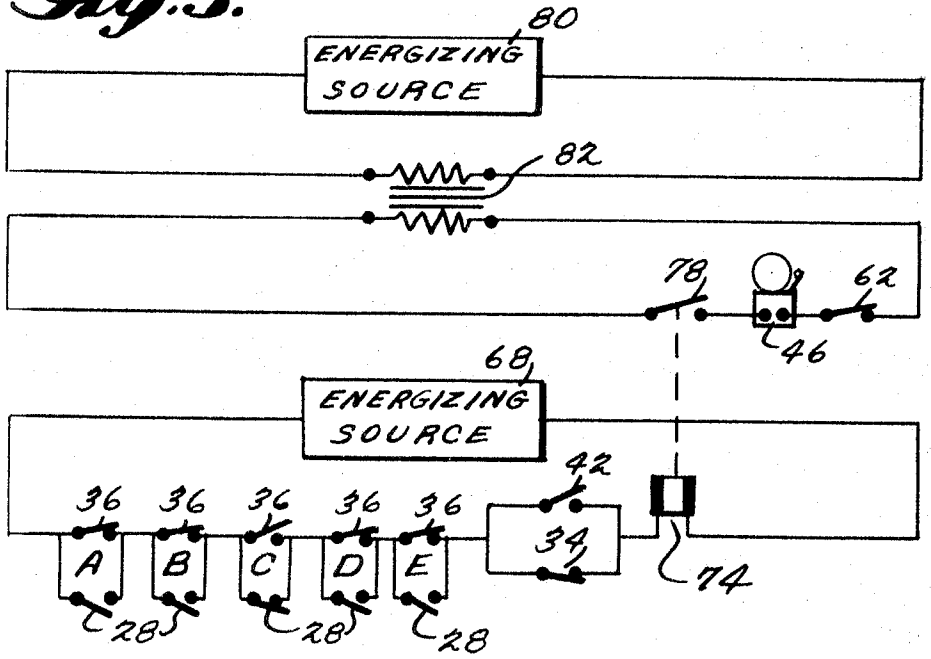


Fig. 4.

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PROTECTION SIGNALLING SYSTEM FOR SELF-SERVICE ELEVATORS

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ABSTRACT OF THE DISCLOSURE

An alarm system for an elevator which operates between a plurality of separated landings and which gives an appropriate alarm whenever the elevator stops except at one of the landings, thereby eliminating the necessity of trying to open the hoistway door to sound an alarm. In the embodiment disclosed, the alarm can also be given whenever emergency or service areas are entered without authorization or the hoistway door is opened between landings.

This invention relates to alarm systems for elevators and more particularly this invention relates to automatic alarm systems for use in conjunction with elevators in situations where manually operable alarm systems are unsatisfactory.

There are many situations when manually actuated alarm means in an elevator cannot be used and therefore the provision of a button or switch inside the elevator to energize the alarm system is of no use. Instances of situations where manually actuated alarm means are unsatisfactory are as follows:

(1) The passengers may be thrown to the floor due to a sudden stop and rendered unable to rise and activate the manual alarm, an automatic alarm system is a necessity;

(2) The passengers may be victims to a crime (elevators can easily be stalled between floors); and

(3) The elevator may stall with a small child therein who is unable to reach the alarm button.

Accordingly, it is an object of this invention to provide means for automatically activating an alarm system if an elevator should stop or be stopped for any reason or by means between predetermined floor stops.

Another object of this invention is to insure passengers of medical assistance in event of an accident resulting from a sharp halt of an elevator between floors rendering the passengers unable to activate a manual alarm button.

Another object of this invention is to protect passengers from criminal attempts upon them in an elevator stalled between floors.

Another object of this invention is to protect small children in an elevator stalled between floors.

A further object of this invention is to prevent children playing around elevator equipment from being injured by restricting the movement of elevators to the restricted passenger area.

A further object of this invention is to protect elevator equipment against vandalism if an elevator door, above or below the elevator, is forced open.

A brief description of an illustrative embodiment of the invention for accomplishing the above-mentioned objects will now be given.

As long as the elevator is operating normally (that is, moving between landings or stopping at landings), there will be no activation of the alarm system. However, the alarm system will be activated whenever unwarranted entrance into the service area or elevator shaft occurs. Unwarranted entry into the elevator shaft occurs when a hoistway door is opened which is located above or below the current position of the elevator.

Assuming that an unwarranted entrance to the service area or elevator shaft occurs, the elevator has associated therewith switching means which will automatically activate an alarm remotely located in at least one supervisory area. An alarm is normally held inoperative by keeping switching means open, the switching means being connected in circuit with the alarm. Switch actuating means may be provided on the elevator and on the elevator control panel to insure that the alarm will not be activated as long as the elevator operation is normal and no abnormal stops occur between landings.

Further switching means automatically activate the alarm upon detection of hoistway doors being improperly opened. Switching means are also provided to detect unauthorized entry into the elevator service area, said switching means operating in conjunction with the alarm system.

An alarm system has thus been described which warns the proper authorities of all abnormal events occurring with respect to the elevator system which require immediate attention.

The invention will now be described in detail with respect to a specific embodiment thereof, this embodiment being illustrative only and in no way restrictive as to how the invention may be practiced. In order to more fully understand the detailed description, reference should be made to the drawings where:

FIGURE 1 is a schematic diagram showing the elevator at a normal stop with hoistway door open, the elevator being located at the third floor landing;

FIGURE 2 is a simplified schematic circuit of an automatic control for an elevator alarm, the automatic control circuit illustrating one aspect of the invention;

FIGURE 3 is a schematic diagram illustrating a preferred embodiment of the invention; and

FIGURE 4 is a simplified schematic diagram illustrating a preferred method for energizing the alarm circuit independently of the energization provided to the elevator.

Referring to FIGURE 1 there is shown a complete elevator system for a single elevator. As shown, a single elevator **10** serves five landings, **12**, **14**, **16**, **18**, and **20**. The roof is indicated at **22**. It will, of course, be understood that the invention may easily be adapted to a multiple elevator system serving any number of landings.

The elevator is shown at a normal stop at the third floor landing with the hoistway door **24** open. A switch actuating means or cam **26** is positioned at the elevator **10** to provide actuation of switches **28** whenever the elevator approaches a landing and stops thereat. That is, the switch **28** located at the third landing **16** will be actuated due to the engagement thereof by switch actuating means **26** as shown in FIGURE 1. Switch **28** may typically be mounted in the hoistway or on the floor selector, the hoistway generally being indicated at **30**. If the switch actuating means **26** employed is a cam, it should not be longer than the retiring cam or master door clutch used to unlock the doors.

Switch actuating means **32** are respectively positioned at each landing and control the actuation of switch **34**, positioned on the elevator. The positioning of switch **34** on the elevator and the location of switch actuating means **32** within the hoistway or on the floor selector is arbitrary. That is, it is not critical as to where the switch actuating means **26** or **32** and the switches **28** or **34** are positioned. The important thing is that these switches be actuated when the elevator **10** approaches and stops at a given landing. Switch actuating means **32** may also be a cam subject to the same restrictions as placed on switch actuating means **26** with respect to the retiring cam or master door clutch.

Switches **36** respectively located at each landing are

respectively actuated by the movement of the hoistway doors 24—that is, when any one of the doors 24 is opened, the switch 36 is actuated by a switch actuating means 38, preferably mounted on the door. Many expedients would be available to one skilled in this art to provide the necessary switch actuating means 38 for actuating switches 36; therefore, there is no need to discuss this in detail.

An elevator control panel 40 is provided. Such panels are normally provided in elevator systems and have means therein to control the starting and stopping of the elevator. Switch means 42 are provided with the elevator control panel to sense the starting and stopping of the elevator. Such an expedient is well within the skill of one practicing this art since there is obviously a first electrical indication available whenever the elevator is moving and a second indication whenever the elevator has stopped. The switch 42 may typically be of the relay type, it being sensitive to the electrical indications at the elevator control panel 40. An alarm control panel 44, separate from the elevator control panel, may be provided to control the operation of alarm 46. Alarm 46 may be of any well-known type—for instance, a buzzer, light or siren, etc. can be employed or a combination of these devices wired in parallel, can be used at various locations. Further, the system, if desired, can be incorporated into the system of a protection agency or a closed TV circuit. The alarm control panel is optional and may or may not be necessary depending on the adaptability of the elevator control panel to absorb the additional functions required of it in providing an automatic alarm system. The wiring or electrical connections from the elevator control panel in the alarm panel to the various electrical components comprising the system is generally indicated at 48, more specific references being made to the wiring arrangement in FIGURES 2 and 3.

A description of a simplified automatic control circuit for an elevator alarm system, as shown in FIGURE 2, will now be given. The control circuit is energized by a source 50 connected to energizing wires 52 and 54. The source of energy is typically 110 volt or 220 volt power supplied by the local power installation. A fuse 56 is provided to protect the circuitry in case of overloading. Alarm 46 is connected in series circuit with switches 42 and 34, shown in FIGURE 1.

In parallel with the switches 34 and 42 are switches 58 and 60. These switches are representative of switches mounted on doors, windows and other means of egress to elevator equipment service areas. Emergency escape doors on the elevator car would also be provided when such switches as represented by switches 58 and 60 to provide an automatic alarm when these doors or hatches are improperly opened. Although only two switches are shown (that is, switches 58 and 60), it will, of course, be understood that as many switches as are necessary can be connected in parallel to provide the proper protection for the elevator system. Repeating, the system is only protected when all means of egress to the hoistway from either doors or windows located therein or from the elevator car through the escape door thereof, are provided with switch means which are automatically actuated whenever any of these means of egress to the elevator system are improperly opened. It is not intended to use any of the switches represented by switches 58 or 60 on the hoistway landing doors or elevator car doors or gates.

A master disconnect switch 62 is provided in line 54. Partial disconnect switches 64 and 66 are respectively provided in the circuits containing the switches 34, 42 and switches 58, 60. The master and partial disconnect switches are provided to allow authorized personnel to gain entrance to a desired area by disconnecting the appropriate switch. For instance, if access is desired to the service area, partial disconnect switch 66 would be disconnected, thereby preventing alarm activation.

Operation of the alarm control circuit of FIGURE 2 will now be described. Assuming that the elevator car is at a normal floor stop (for instance stopped at floor 3 as shown in FIGURE 1), and assuming that disconnect switch 64 is closed, switch 42 will be closed, it being sensitive to the fact that the elevator car has stopped. Switch 34 will be opened, the switch actuating means 32 shown in FIGURE 4 opening this switch as long as the car is located at the elevator landing. Further assuming that the master disconnect switch is closed, alarm 46 will not be activated from energizing source 50 since switch 34 remains open.

When the elevator starts, this will be sensed at the elevator control panel and thereby causing switch 42 to open. Switch 34 will move away from the switch actuating means 32, thereby returning to its closed position. Therefore, the alarm 46 remains unactivated because switch 42 has now opened, thereby maintaining an open circuit in the path from energizing source 50 to alarm 46.

If the elevator should stop between landings, switch 34 will remain closed since it is not within physical proximity of switch actuating means 32. The stopping of the elevator will be sensed at the electronic control panel and therefore switch 42 will close, resulting in the closure of the path from energizing source 50 to the alarm 46. The alarm will sound and the proper authorities will be promptly notified.

A description will now be given of the automatic alarm system when improper egress is made to the elevator equipment rooms or service areas. As stated before, each of the means of egress to these areas are provided with switch means which are actuated when improper egress is made. Assuming that partial disconnect switch 66 is closed and improper egress is made to one of these areas, either switch 58 or 60 will close, thereby closing the path from energizing source 50 to alarm 46 through the closed switch 58 or 60.

Referring now to FIGURE 3, a description will now be given of a more detailed and complete automatic alarm control circuit for an elevator system.

An energizing source 68 is provided for alarm 46, the main energizing wires being 70 and 72. The connection from wires 70 and 72 through alarm 46 is normally open, thereby preventing actuation of the alarm. An alarm relay 74 is provided in a bypass circuit, generally indicated at 76. The contacts 78 of alarm relay 74 are connected in series with the alarm 46 to control the activation thereof. Switches 58 and 60, corresponding to the switches having the same reference numerals as in FIGURE 2, serve the same purpose as those switches in FIGURE 3. Switches 34 and 42 generally correspond to the switches having the same numerals in FIGURE 2—that is, they are respectively actuated by the electronic control panel and the switch actuating means 32; however, they operate in reverse from the switches shown in FIGURE 2. That is, switch 42 is so arranged in FIGURE 3 that it opens when the car is stopped and closes when the car is moving. The switch actuating means for both switches 34 and 42 basically remain the same as that shown and described with respect to FIGURES 1 and 2. Of course, it would be obvious to one skilled in this art that the only important thing with respect to switches 34 and 42 is that during normal operation, they must act oppositely from one another—that is, when one is closed the other must be open.

Switches 28 and 36 are connected respectively in parallel with each other. That is, the switches 28 and 36 associated with the first floor landing are connected in parallel with each other and indicated at A in FIGURE 3. The switches 28 and 36, associated with the second floor landing are again connected in parallel with each other and indicated at B in FIGURE 3. The remaining parallel combinations of switches 28 and 36 are respectively shown at C, D, and E in FIGURE 3. The parallel combinations of switches 28 and 36 are connected in

series with each other and in series with the parallel combination of switches **34** and **42**.

In order to more fully understand the invention, a description of its operation will now be given. The contacts **78** of alarm relay **74** are normally closed. However, when relay **74** is energized, the contacts **78** will be open as shown in FIGURE 3. As long as the contacts **78** are open, alarm **46** cannot be energized from energizing source **68** because of the open circuit between lines **70** and **72**, this, of course, assuming that the switches **58** and **60** are also open. In the following discussion, it will be assumed that switches **58** and **60** are open, their operation being already described with respect to FIGURE 2.

As long as current flows through relay **74**, the contacts **78** remain open. As soon as a break in the current flow from line **70** to line **72** is caused by any of the parallel switch combinations **28** and **36**, or **34** and **42**, the contacts **78** close and the alarm **46** is activated. It is assumed that the elevator is presently parked at the third landing as shown in FIGURE 1 with the hoistway door **24** open. Switch **36** at the third floor landing is open but switch **28** at this landing is closed because switch actuating means **26** on the car **10** is positioned to actuate switch **36** as the elevator approaches the landing, thus maintaining current through alarm relay **74** when switch **36** is opened by the hoistway door at the third landing. Should any other hoistway door be open for instance, the hoistway door at the first landing, switch **36** at this landing will be opened and since switch **28** at this landing must also be open (since it is not being actuated by the switch actuating means **26**), the energizing current for relay **74** will be interrupted. This, as stated above, causes the closure of contacts **78**, thereby resulting in the activation of alarm **36** from source **78**.

Assume, once again, normal operation. As the elevator prepares to leave the third landing, the hoistway door will be closed, closing switch **36** at this landing. Switch **42** will be actuated as the elevator starts, the elevator control panel sensing the movement of the elevator as described hereinbefore. As the elevator leaves the third floor landing, switch **36** at all of the landings will be closed and switch **42** will be closed, maintaining the energization of relay **74**. Switch **28** at the third landing will open because it is no longer actuated by switch actuating means **26** and switch **34** will open because it is no longer actuated by switch actuating means **32**; however, the energizing circuit for relay **74** is maintained as mentioned above.

If the elevator should stop for any reason between landings or if any door is opened while the elevator is in between landings, switch **42** or any of the switches **36** at any of the landings will be opened, thereby interrupting the relay and causing activation of the alarm.

Reference should now be made to FIGURE 4 which shows a preferred energization arrangement for the alarm system. To provide additional protection, an independent energization source **80** should be provided for the alarm circuitry—that is, independent of the energy supplied to the elevator. There is shown an energy source **80** which is independent of the source shown for the elevator system **68**. A transformer **82** may be provided to insure that the alarm is properly matched to the available power supply and equipment. The alarm relay contacts **78** and master disconnect switch **62** are shown in series with alarm **46**, this corresponding to the arrangement shown in FIGURE 3 but, of course, being simplified. The switches and alarm relay shown in FIGURE 4 correspond to the by-pass circuit **76** of FIGURE 3 where once again the components shown in FIGURE 4 perform the same functions as those shown in FIGURE 3.

By providing the additional energization source **80**, the alarm system is now capable of functioning when the power supply to the elevator system fails. As soon as the power fails, current in alarm relay **46** will cease, thereby permitting contacts **78** to return to their normally closed position, which results in the energization of alarm **46** from independent energization source **80**.

Thus, there has been described a control circuit (FIGURE 2 or 3) for automatically actuating an alarm **46** by coupling the alarm to an energization source **50** where the actuation occurs when an elevator stops or halts between landings or only when a hoistway door to an elevator shaft or hoistway is opened without the elevator being parked at the opened hoistway door. This control circuit is extremely simple to implement and provides foolproof protection of the entire elevator system. Further switch means (switches **58** and **60**) have been incorporated into the system with great ease, these switches thwarting unauthorized entrance to the elevator equipment service areas.

The control circuit in particular for actuating the alarm when the elevator stops between landings comprises switching means (switch **42**) for normally coupling the energization source to the alarm **46** whenever the elevator stops—that is, switch **42** will normally cause the alarm to be actuated if no other precaution were taken to prevent this actuation. However, means (switch **34**) is provided for preventing the coupling of the alarm to the energization source by switch **42**, this preventing action taking place only when the elevator is normally parked at a landing.

As shown in FIGURE 2, the switches **34** and **42** are connected in series circuit with each other and with the alarm **46**. Another variation in the switching arrangement is shown in FIGURE 3 where the switches **34** and **42** are in parallel circuit with each other and in series circuit with a relay means (relay **74**), where the above-mentioned parallel and series circuits comprise a by-pass circuit **76**. The contacts **78** of relay **74** are in series circuit with the alarm **46**, this series circuit being connected to the energization source together with and parallel to the above-mentioned by-pass circuit. Of course, other variations of arranging the switches **34** and **42** in conjunction with the alarm **46** will occur to those skilled in the art.

A switch actuating means (switch actuators **32**) is also provided at each of the landings and is responsive to the elevator being normally parked at one of the landings for actuating the preventing switching means (switch **34**). Also provided is a further energization means (source **68**) independent of source **80** for energizing the above-mentioned by-pass circuit where the further energization source provides operating power for the elevator.

A control circuit is also described in FIGURE 3 for actuating the alarm when at least one hoistway door to an elevator shaft or a hoistway is opened without the elevator being parked at the opened door. This circuit comprises means (switch **36**) for normally coupling the energization source to the alarm whenever any of the hoistway doors open; however, the means (switch **28**) are provided to prevent coupling of the energization source to the alarm by switch **36** only when the elevator is normally parked at the opened or hoistway door. Switch actuating means (switches **38**) are responsive to the hoistway doors being opened and a further switch actuating means (switch actuator **26**) is responsive to the elevator being normally parked, thereby actuating the preventing switching means **28**, the switch actuators **38** actuating the coupling switching means **36**.

Further, there has been described a control circuit (see FIGURE 3) which combines all of the protective features necessary for a truly complete and effective automatic alarm for an elevator system. Together with the control circuitry for activating the alarm whenever an elevator stops between landings or whenever a hoistway door is opened to the elevator shaft without the elevator being parked at that door, means (switches **58** and **60**) have been provided whenever any of the means of egress to the elevator shaft or elevator service area are entered

without authorization where switching means (switches 58 and 60) are associated with each of the means of egress. These switches are in parallel with each other and in parallel with the contacts 78 of the alarm relay means 74.

Having now described circuitry for accomplishing the objects of this invention, other objects and advantageaus and, even further modification of the invention, will become apparent to one skilled in this art upon reading this disclosure.

What is claimed is:

1. A control circuit for automatically activating an alarm by coupling said alarm to an energization source, said alarm being activated only when at least one elevator stops between landings, said circuit comprising:

means for normally coupling said energization source to said alarm whenever said elevator stops; and

means for preventing the coupling of said alarm to said energization source by said first-mentioned means only when said elevator is normally parked at one of said landings.

2. A control circuit as in claim 1 where said coupling means includes a switch and said preventing means includes a switch.

3. A control circuit as in claim 2 where both said switching means are connected in series circuit with each other and with said alarm.

4. A control circuit as in claim 2 including relay means in circuit with both said switching means, the contacts of said relay means being in circuit with said alarm.

5. A control circuit as in claim 4 where both said switching means are in parallel circuit with each other and in series circuit with said relay means, said parallel and series circuits comprising a by-pass circuit for said alarm, said by-pass circuit being coupled to said energization source; and

where the contacts of said relay means are in series circuit with said alarm means, said series circuit also being connected to said energization source and in parallel to said by-pass circuit.

6. A control circuit as in claim 5 including further energization means independent of said first-mentioned energization means for energizing said by-pass circuit, said further energization means providing operating power for said elevator.

7. Apparatus having a control circuit as in claim 2 including switch actuating means responsive to said elevator being normally parked at one of said landings for actuating said preventing switching means.

8. A control circuit for automatically activating an alarm by coupling said alarm to an energization source, said alarm being activated whenever at least one elevator stops between landings or at least one hoistway door to an elevator shaft is opened without the elevator being parked at said opened hoistway door, said circuit comprising:

means for normally coupling said energization source to said alarm whenever said elevator stops;

means for preventing the coupling of said alarm to said energization source by said first-mentioned means only when said elevator is normally parked at one of said landings;

means for normally coupling said energization source to said alarm whenever any of the hoistway doors to said elevator shaft are opened; and

means for preventing the coupling of said energization source to said alarm by said second-mentioned coupling means only when said elevator is normally parked at said opened hoistway door.

9. A control circuit as in claim 8 for further automatically activating said alarm whenever any of the means of egress to said elevator shaft or to the elevator service area are opened without authorization, said control circuit further including switching means associated with each of said means of egress for activating said alarm whenever said unauthorized opening of said means of egress occurs.

10. A control circuit as in claim 8 where said first-mentioned and second-mentioned coupling means and said first-mentioned and second-mentioned preventing means respectively include a switch.

11. A control circuit as in claim 10 including relay means in circuit with the said first and second-mentioned coupling switching means and the said first and second preventing switching means, the contacts of said relay means being in series circuit with said alarm and where said first-mentioned coupling switching means and preventing switching means are in parallel circuit with each other and in series circuit with said relay means, and where said second-mentioned coupling switching means and preventing means are in parallel circuit with each other and in series circuit with said relay means, said series circuit of said relay means and said switching means comprising a by-pass circuit for said alarm, said by-pass circuit being coupled to said energization source, said series circuit of said alarm and said relay contacts also being connected to said energization source and in parallel circuit to said by-pass circuit.

12. A control circuit as in claim 11 for further automatically activating said alarm whenever any of the means of egress to said elevator shaft or to the elevator service area are opened without authorization, said control circuit further including a switching means respectively associated with each of said means of egrees in parallel circuit with each other and said contacts of said relay means for activating said alarm whenever said unauthorized opening of said means of said egrees occurs.

13. An elevator alarm system for an elevator operating between a plurality of separated landings and having entrance means operable between a first position permitting entrance to and exit from said elevator and a second position preventing entrance to and exit from said elevator comprising:

alarm means for giving a signal indicating an abnormal condition in said elevator, and

first means for causing said alarm means to give said signal whenever said elevator stops except at one of said landings regardless of the position of said entrance means.

14. A system as in claim 13 including a second means for causing said alarm means to give said signal whenever said entrance means operates from said second to said first position except at one of said landings.

15. A system as in claim 14 including a third means for causing said alarm to give said signal whenever any of the means of egress to the elevator shaft or to the elevator service area are opened without authorization.

16. A system as in claim 15 wherein said first, second and third means each include a switch which is closed to cause said alarms means to give said signal.

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ALVIN H. WARING, Primary Examiner

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