March 17, 1942. J. A. LEVESQUE 2,276,989

ELECTRICALLY CONTROLLED DOOR

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Fig. 1.

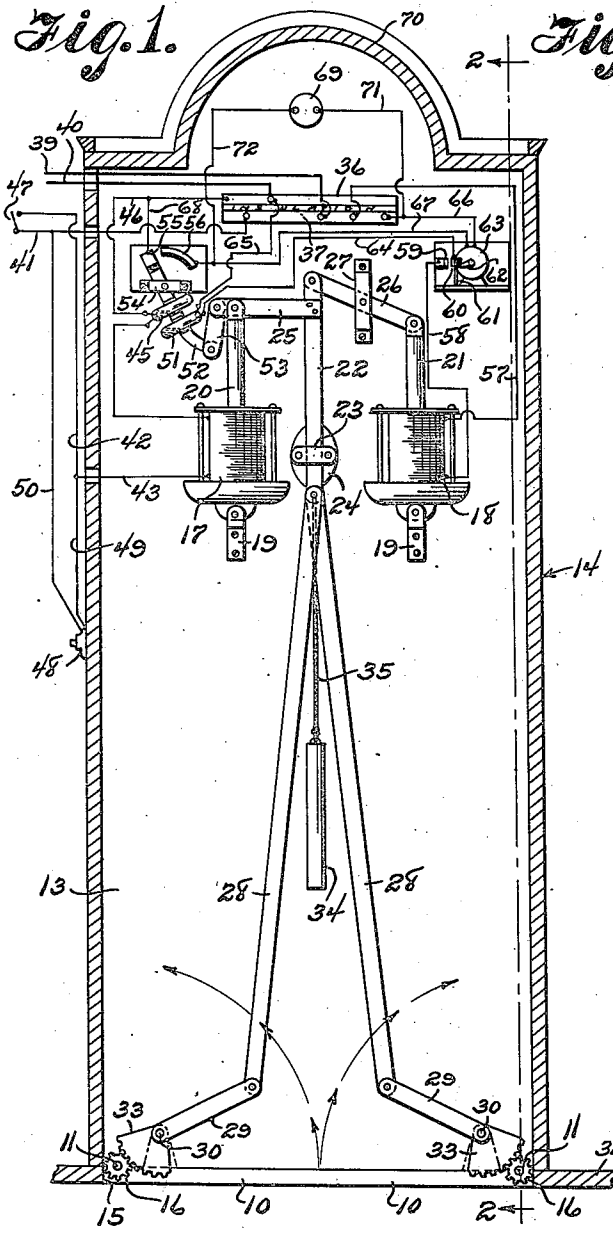
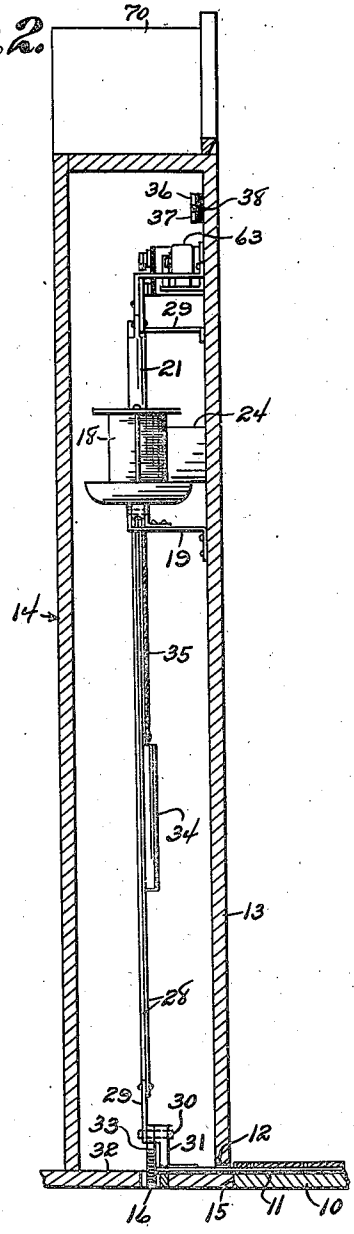


Fig. 2.



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ELECTRICALLY CONTROLLED DOOR

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3 Claims. (Cl. 268—11)

This invention relates to electrically controlled doors and has for an object to provide trap doors for closing pole openings in fire houses and other places, and to further provide simplified means for opening the trap doors to permit firemen to pass down the pole and after a predetermined time period to close the trap doors so that the heat will be retained in the fire house in winter and at the same time children and others will be prevented from falling through the pole opening.

A further object is to provide apparatus of this character which will be formed of a few strong, simple and durable parts, which will be inexpensive to manufacture, and which will not easily get out of order.

With the above and other objects in view, the invention consists of certain novel details of construction and combinations of parts hereinafter fully described and claimed, it being understood that various modifications may be resorted to within the scope of the appended claims without departing from the spirit or sacrificing any of the advantages of the invention.

In the accompanying drawing forming a part of this specification:

Figure 1 is a longitudinal sectional view showing trap doors for closing a pole opening, and electrically operated controlling apparatus for opening and closing the doors.

Figure 2 is a longitudinal sectional view taken on the line 2—2 of Figure 1.

Referring now to the drawing in which like characters of reference designate similar parts in the various views, 10 designates a pair of trap doors, which are fixed at their outer ends to respective pivot shafts 11 which enter openings 12 in the back wall 13 of a casing 14 disposed adjacent a fire house pole opening 15 which is normally closed by the trap doors 10. Within the casing the pivot shafts 11 are equipped with respective pinions 16 which when rotated in one direction turn the pivot shafts 11 to open the doors, and when rotated in the opposite direction turn the pivot shafts to close the doors.

A pair of solenoids 17 and 18 are mounted on respective angle brackets 19 which are secured to the inner face of the back wall 13 of the casing above the horizontal center of the casing and on opposite sides of the vertical median line of the casing. The solenoids are provided with respective cores 20 and 21. A link 22 is slidably mounted in a strap guide 23, carried by a block 24 which is secured to the inner face of the back wall 13 of the casing between the solenoids. A horizontally disposed link 25 is fixed at one end to the link 22, and near the opposite end is connected to the core 20 of the solenoid 17. A lever 26 is pivoted intermediate its ends on a U-shaped bracket 27, the legs of which are fixed to the inner face of the back wall of the casing. One end of the lever is pivotally connected to the upper end of the link 22 and the other end of the lever is pivotally connected to the core 21 of the solenoid 18. When the solenoid 17 is energized, its core 20 will slide the link 22 downward, and when the solenoid 18 is energized, its core 21 will slide the link 22 upward.

Sliding movement of the link 22 causes the trap doors to be opened or closed according to the direction of such movement, and for this purpose a pair of links 28 are pivotally connected at the upper ends to the lower end of the sliding link 22, and diverge downwardly and outwardly from each other. The lower ends of the links are pivotally connected to the upper ends of the crank arms 29 which are fixed to shafts 30 journalled in bearing brackets 31 secured to the floor 32 upon which the casing 14 stands upright. The shafts have fixed to them segment gears 33 which mesh with the pinions 16. For clearness, the floor 32 is shown removed in Figure 1 so that it can be seen that the trap doors 10 are rocked open, as indicated by the arrows, when the levers and gearing are moved by downward movement of the link 22 due to energizing of the solenoid 17, and conversely, the doors are closed when the link 22 is moved upwardly by energizing of the solenoid 18.

A counter-balancing weight 34 is suspended by a cord 35 from the lower end of the link 22 to counter-balance the weight of the trap doors and reduce the amount of mechanical work the solenoids must perform.

The solenoid 17 is electrically controlled each time the fire alarm circuit is energized, or manually controlled by a manually operated switch, to open the doors, and subsequently, after a time period sufficient to allow the firemen to man the apparatus and leave the fire house, the solenoid 18 is electrically controlled automatically to close the doors, as will now be described.

A pair of bus bars 36 and 37 are secured to an insulating base 38 which is secured to the back wall 13 of the casing. Main line current supply wires 39 and 40 are secured to the respective bush bars 36 and 37. A fire alarm circuit wire 41 is connected to the bus bar 37. The other wire 42 of the fire alarm circuit is connected by a wire 43 to one end of the solenoid 17. The other end of the solenoid is connected by a wire 44 through

a mercury switch 45 to a wire 46 which is connected to the other bus bar 36. Assuming the fire alarm circuit to be normally closed at the switch 45, when the fire alarm circuit is closed at the fire alarm switch 47, the solenoid 17 will be energized through the circuit which may be traced from the bus bar 36 to the wire 46, mercury switch 45, wire 44, solenoid 17, wire 43, wire 42, to the closed switch 47, and from thence to the wire 41 and to the other bus bar 37. Thus, the solenoid is energized to move the levers and linkage and open the doors when a fire alarm is sounded.

The solenoid may be operated from a push button switch 48 disposed on the side of the casing 14, one side of the switch being connected by a wire 49 to the fire alarm wire 42, and the other side of the switch being connected by a wire 50 to the other fire alarm circuit wire 41 adjacent to the casing, when the push button is manually actuated a circuit will be closed from the bus bar 37 through the wire 41, wire 50, push button switch 48, wire 49, wire 43, solenoid 17, wire 44, closed mercury switch 45, to the other bus bar 36, to energize the solenoid.

When the solenoid 17 is energized to open the doors, a time responsive mechanism is actuated to control the solenoid 18 to close the doors after a predetermined time period. For this purpose, a second mercury switch 51 is employed. Both the mercury switch 45 and the mercury switch 51 are secured to a lever 52, the lower end of which is connected by a link 53 to the outer free end of the link 25, which is connected to the core 20 of the solenoid 17. The lever is pivoted near its upper end to a strap guide 54 and the free end of the lever is equipped with a switch contact 55 which coacts with an arcuate stationary switch contact 56. It will be observed that the terminals in the mercury switch 45 are at one end of the mercury switch, while the terminals in the mercury switch 51 are at the opposite end of the switch. Thus, when the lever 52 is in normal position, the circuit of the solenoid 17 is closed by the mercury connecting the terminals in the switch 45, while the mercury in the switch 51 is at the opposite end of the switch from the terminals so that this switch is open. However, when the core 20 is attracted into the solenoid 17, the link 53 rocks the lever 52 on its pivot and rocks both switches through a sufficient angle to reverse the mercury in both switches and open the switch 45 which opens the circuit of the solenoid 17 and simultaneously closes the switch 51 which controls the circuit to the time responsive mechanism, as will now be described.

One end of the solenoid 18 is connected by a wire 57 to the bus bar 37. The other end of the solenoid is connected by a wire 58 to the stationary contact 59 of a time responsive switch including a movable switch contact 60 carried by a resilient arm 61 which is in the path of an arm 62 rotated by a motor 63 of the time switch type adapted at the end of a predetermined time period after the motor is started to engage the arm 62 against the resilient arm 61 and close the time switch by engaging the contact 60 with the contact 59. The contact 60 is connected by a wire 64 to one terminal of the switch 51 and the other terminal of the switch is connected by a wire 65 to the other bus bar 36.

It can be seen that when the lever 52 is swung to close the mercury switch 51, at the moment the doors are opened by the solenoid 17, the circuit of the solenoid 18 closed at the switch 51, while it remains open at the time controlled switch contacts 59—60. This circuit may be traced from the bus bar 36, through the wire 57 to one end of the solenoid 18, and from the other end of the solenoid through the wire 58, through the contact 59, then from the contact 60 through the wire 64 to the mercury switch 51 and from the mercury switch 51 through the wire 55 to the other bus bar 37. After the lapse of the predetermined time period, the circuit will be closed at the time switch contacts 60 and 59 to energize the solenoid 18 which then attracts its core 21 and swings the lever 26 to move the link 22 upward and close the doors 10.

The motor circuit is controlled at the contact 55, carried by the lever 52 and arcuate stationary contact 56 being moved to circuit closing position by energizing of the door opening solenoid 17. The motor circuit comprises a wire 66 connected to one side of the motor and to the bus bar 37. A wire 67 leads from one side of the motor to the fixed switch contact 56. A wire 68 leads from the movable switch contact 55 to the wire 46 which is connected to the other bus bar 36. When the circuit just traced is closed at the switch contacts 55 and 56, the motor circuit is closed to energize the motor.

Simultaneously with energizing of the motor, a lamp bulb 69 is energized. The lamp bulb is shown diagrammatically as being disposed in an arched housing 70 projecting above the top of the casing 14 and open at the rear side so that the lamp is both a signal and an illuminating medium for the trap doors 10. One side of the lamp is connected by a wire 71 to the motor circuit wire 66 which is connected to the bus bar 37. The other side of the lamp is connected by a wire 72 to the motor circuit wire 67 which is connected to the fixed switch contact 56 so that when current is supplied to the motor, the lamp circuit will be also energized. The lamp circuit may be traced from the bus bar 37, wire 71, lamp 69, wire 72, wire 67, fixed switch contact 56, movable switch contact 55, wire 68, to the other bus bar 36.

Since the operation of the parts has been described as the description of the parts progressed, it is thought that the invention will be fully understood without further explanation.

What is claimed is:

1. In electrically controlled fire house doors, a hinged trap door, a pair of solenoids having cores, means connected to the cores and to the door for opening the door when one solenoid is energized and closing the door when the other solenoid is energized, a pair of mercury switches, means connecting both switches to the core of the door opening solenoid to be actuated as a unit by the core, one of said switches being normally closed and the other being normally open, a fire alarm circuit including a manual switch, the door opening solenoid and the normally closed mercury switch, a current supply circuit connected to the fire alarm circuit, a circuit connected to the supply circuit and including the normally open mercury switch, a motor in the last named circuit, a time switch actuated by the motor, and a circuit connected to the supply circuit and including the time switch and the door closing solenoid, energizing of the door opening solenoid by closing of the fire alarm circuit reversing the inclination of both mercury switches to open the normally closed mercury switch and simultaneously close the normally open mercury switch for energizing the motor to actuate the time switch for ener-

gizing the door closing solenoid to close the door and simultaneously reset the core of the door opening solenoid and both mercury switches for the next operation.

2. The structure as of claim 1 and in which the first named means comprises a counter-balanced slidably mounted link disposed between and parallel with both solenoids, levers pivoted intermediate their ends and connected at the inner ends to the link and connected at the outer ends to the cores of the solenoids, a shaft for the door, and gear means connected to the shaft and to the sliding link.

3. The structure as of claim 1 and in which the second named means comprises a lever pivoted intermediate its ends laterally of the core of the door opening solenoid, a connection between the core of the door opening solenoid and one end of the lever for swinging the lever on its pivot, both mercury switches being mounted on the lever in inclined position between the pivot of the lever and said connection.

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