

Oct. 3, 1933.

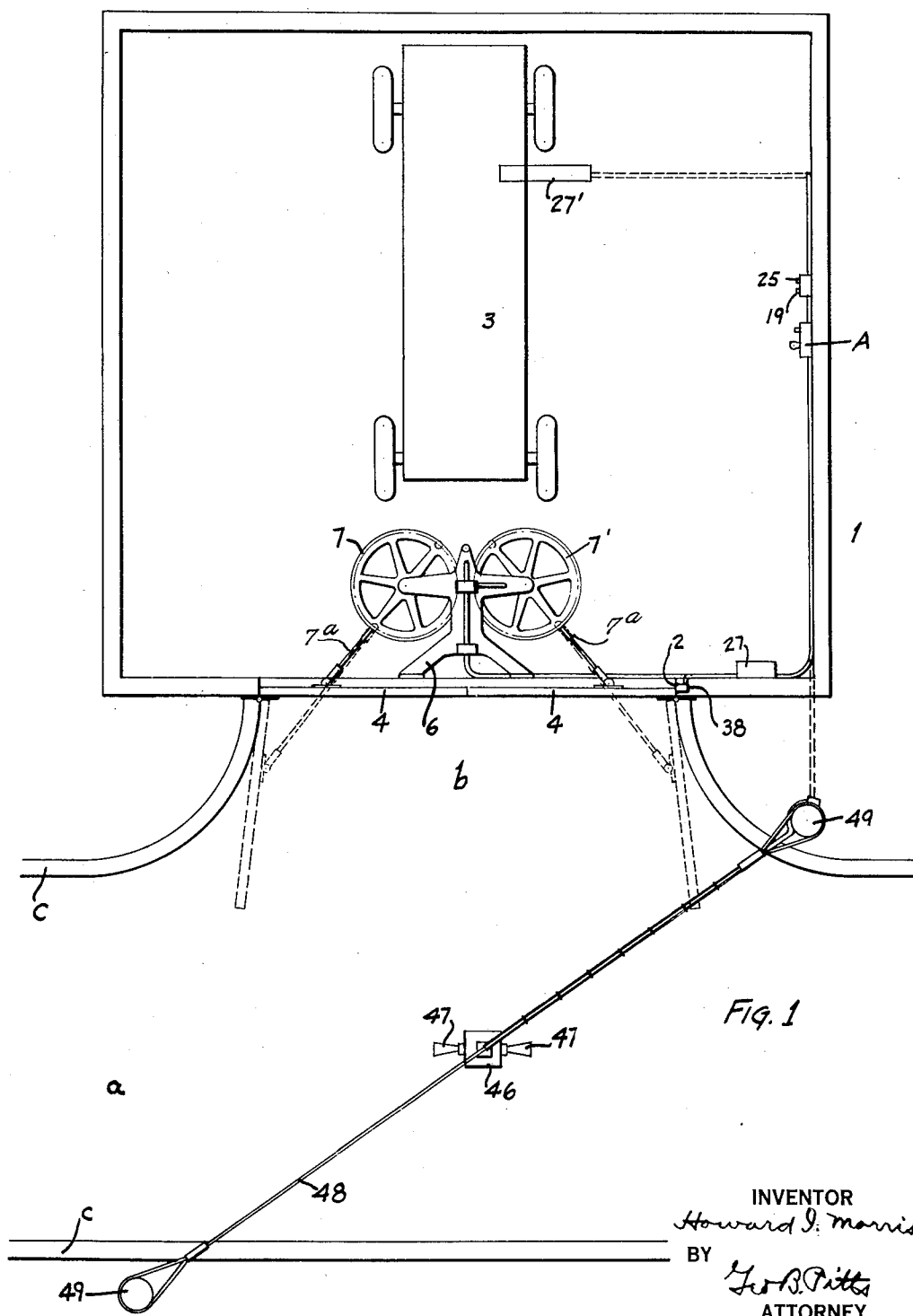
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1,928,698

OPERATING MECHANISM

Filed Aug. 26, 1927

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

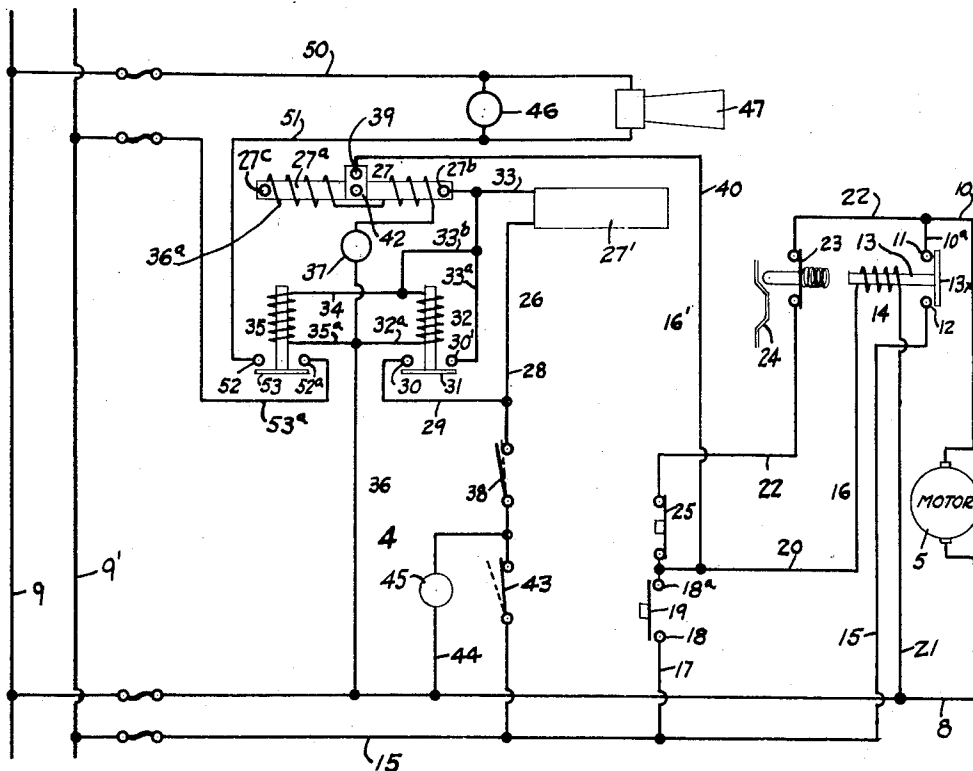


FIG. 2

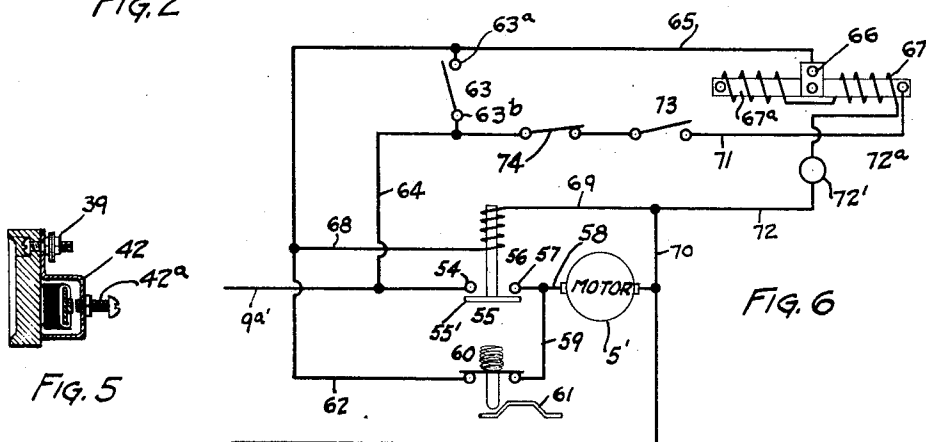


FIG. 5

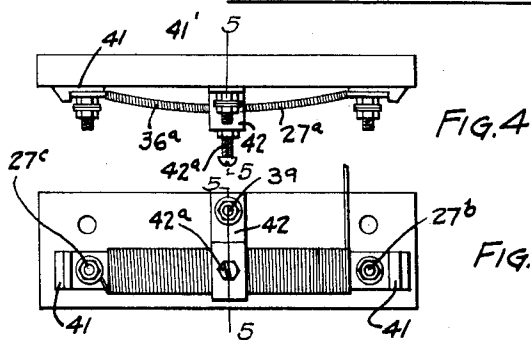


FIG. 4

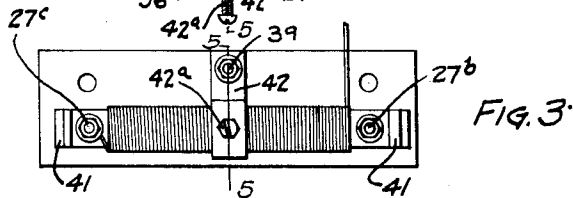


FIG. 3

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OPERATING MECHANISM

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6 Claims. (Cl. 268—67)

This invention relates to a mechanism for operating a movable member, such as a door or the like.

One object of the invention is to provide an improved mechanism for moving a member having a starting device and controlling connections between the device and the power means of the mechanism arranged to actuate the power means in a predetermined period of time following the operation of the starting device.

Another object of the invention is to construct an improved mechanism for operating a door of a vehicle storing structure wherein means are provided for effecting warning signals during the period in which the vehicle is making its exit.

Another object of the invention is to provide an improved operating mechanism wherein the member to be operated is automatically moved in one direction.

Another object of the invention is to provide an improved electrically controlled mechanism in which the circuits and devices therein are so connected and related that after the lapse of a predetermined period the member to be controlled is automatically operated.

Another object of the invention is to provide an improved door operating mechanism for a vehicle storing structure, having a starting means disposed in the path of movement of a portion of the vehicle and capable of closing the door or doors after the vehicle passes therethrough.

Other objects of the invention will be apparent to those skilled in the art to which my invention relates from the following description taken in connection with the accompanying drawings wherein

Fig. 1 is a view showing diagrammatically a structure or building for storing a vehicle and also in plan a vehicle therein and a door operating mechanism and signalling devices embodying my invention.

Fig. 2 is a diagrammatic view showing the electric circuits.

Fig. 3 is an elevation of the time determining device.

Fig. 4 is a plan view of the parts shown in Fig. 3.

Fig. 5 is a section on the lines 5—5 of Figs. 3 and 4.

Fig. 6 is a diagrammatic view of an operating means showing a slightly different embodiment of the invention.

While my improved mechanism is capable of many different applications, I have, in practice, used it in buildings utilized for storing fire apparatus. In such buildings, it has been customary

to leave the door or doors open while the apparatus is in active service or to hire a man who remains in the building when the apparatus is called to a fire and closes the door of the building immediately after the apparatus has made its exit therefrom. My invention seeks to avoid both of these objectionable practices since it operates automatically to close the door or doors after the apparatus has been driven out. My invention is equally adapted to buildings commonly known as garages.

In the drawings, 1 indicates as an entirety a structure of suitable size, such as a fire station or garage. This structure is shown diagrammatically. 2 indicates an opening or passage way for a vehicle 3, which is shown in plan view, diagrammatically. 4 indicates the doors for the opening 2. The opening may be closed by one or more doors 4, as desired. The doors may be of the sliding or hinged together type, but by preference they are hinged to the sides of the opening and swing outwardly—see dotted lines in Fig. 1. In the illustrated application of the invention, the opening 2 is related to a street *a*, a drive *b* leading from the street to the door opening, the street being defined by side walks *c*, *c*. Where the doors 4 are hinged as shown, I prefer to use a motor and elements operated thereby to swing the doors open and then closed such as disclosed in my co-pending application Ser. No. 7,087 (see Letters Patent No. 1,874,576, dated August 30, 1932). The motor is shown diagrammatically at 5. The motor 5 is supported on the lower side of a frame 6, which in turn is supported by structural members of the building 1 above and centrally of the door opening 2. The driven elements comprise a shaft having a worm (not shown), two gears 7, 7' in mesh with and simultaneously driven by this worm and a link 7*a* between each gear and the adjacent door, so arranged that the gear serves as a crank to swing the door in one direction when the gear is rotated one half turn.

One side of the motor is connected by a lead 8 to one electric supply main 9. The other side of the motor is connected by leads 10, 10*a*, to one contact 11 of a magnetically operated switch 14. The other switch contact 12 is arranged to be connected by the armature 13 (or a conductor 13*x* controlled thereby) of the switch 14. The contact 12 is connected by a lead 15 to the main 9'. 16 indicates auxiliary circuits arranged to close the motor circuit and maintain it closed until the door or doors 4 have reached their open or closed position. This circuit comprises the following: a lead 17 connecting the lead 15 to one

contact 18 of a normally open switch 19; a lead 20 connecting the other switch contact 18a to one end of the winding of the switch 14; a lead 21 connecting the other end of the winding with the lead 8; a lead 22 connected to the lead 20 and lead 10; and a normally closed switch 23 interposed in the lead 22 and arranged to be automatically opened when the doors 4 reach their limit of movement in either direction. The opening of the switch 23 is dependent upon the rotation of one of the gears 7, 7'; such gear carrying a pair of devices (one being shown at 24—Fig. 2) diametrically opposite each other and each arranged to engage the switch and open it, thereby breaking the auxiliary circuit and de-energizing the winding of the switch 14, which in turn opens the circuit for the motor. 25 indicates a separate switch in the lead 22 adapted to be operated manually, at will, to stop the motor 5. The switch 25 is preferably spring operated to closed position. The switch 19 is normally open and is preferably of the push button type so that it may be released following the closing of the circuit across the contacts 11—12. The auxiliary circuit and motor circuit control of the motor 5 is as follows (assuming that the doors are closed as shown in Fig. 1): The switch 19 is closed. This closes the circuit consisting of lead 15, lead 17, switch 19, lead 20, magnetic switch winding, lead 21 and lead 8. The energizing of the winding moves its armature 13 and effects engagement of the conductor 13^x with contacts 11, 12, to close the motor circuit and a supplemental circuit, which includes the winding to maintain the motor circuit closed upon the release of the switch 19. The motor circuit is traced as follows; from one side of motor 5 by leads 10, 10a, contact 11, conductor 13^x, contact 12 and lead 15; from the other side of the motor by lead 8. The supplemental circuit is traced as follows: lead 8, lead 21, magnetic switch winding, lead 20, lead 22, lead 10a, contact 11, conductor 13^x, contact 12 and lead 15.

It will be understood from the foregoing description that the switch 19 when closed will effect operation of the motor 5 which will rotate the gears to swing the doors 4 to open position, at which time one of the devices 24 will open the switch 23, whereupon the motor 5 will stop. If the switch 19 be again closed, the doors 4 will swing to their closed position.

In my present invention I associate with the motor and auxiliary circuits electrical control means, indicated as an entirety at 26, constructed and arranged to set the motor 5 in operation to swing the doors 4 closed, as shown in Fig. 1, such control means being constructed to be cut at or prior to the time the doors reach their closed position. The control means includes a time determining device 27 which provides for the lapse of a predetermined period between the operation of a separate switch forming a part of the control means and the starting of the motor 5. The arrangement permits the separate switch to be operated by some portion of the vehicle as it moves toward the door opening 2, but gives sufficient time for the vehicle to pass therethrough before the doors are started in their return direction to closed position.

Of the control means 26, 27' indicates a separate switch disposed in the path of movement of one of the wheels of the vehicle 3. The switch 27' consists of one or more pairs of contacts normally held in spaced relation and adapted to close a circuit when one engages the other. This switch may be similar in construction to the

switch shown in and forming the subject matter of my co-pending application Serial No. 188,163 (see Letters Patent No. 1,725,963, dated August 27, 1929). 28 indicates a lead from one contact of the switch 27' and connected to the lead 15. 29 indicates a lead connected to the lead 28 and to one contact 30 of a switch device or conductor 31 (carried or operated by the armature of a magnetic switch 32). 33 indicates a lead connected to the other contact of the switch 27'. The lead 33 is connected to the time determining device 27 and by branch leads 33a, 33b, to the other contact 30' of the switch device 31 and to a wire 34, respectively, the wire 34 being connected to one end of the winding of the magnetic switch 32 and the corresponding end of the winding of a magnetic switch 35; the latter switch to be referred to later. The opposite ends of the switch windings are connected by wires 32a, 35a, respectively, to a common return lead 36, which is connected to the lead 8. The lead 36 is also connected to the time determining device 27, whereby the same will be operated when the circuit is completed through it. 37 indicates a suitable resistance such as a lamp, in the lead 36. 38 indicates a switch interposed in the lead 28 between the connection of the lead therewith and the lead 15. The movable member of the switch is connected to one of the doors 4 in such manner that it will be open when the doors are closed to prevent the operation of the control means when they are in this position, but closed when the doors are open, so that operation of the switch 27' will control and effect the closing of the doors.

The time determining device 27 preferably consists of a thermostat arranged to complete a circuit 16' which includes the auxiliary circuit 16, so that the latter will effect operation of the motor 5. The thermostat comprises a section of metal 27a capable of expansion under the influence of heat and conducting electric current, so that it may make contact with a terminal 39 to which the lead 40 (forming part of the circuit 16') is connected, the other end of the lead 40 being connected to the lead 20. I prefer to make the thermostat element 27a from aluminum. The ends of the thermostat element 27a are stationarily mounted against and secured to abutments 41 of a suitable support 41', so that its intermediate portion may flex laterally.

As shown, the lead 33 is electrically connected to one end of the element 27a by a terminal 27b and a portion of the lead 36 (such portion being indicated at 36a) is wrapped around but insulated from the element 27a and electrically connected to the opposite end thereof by means of terminal 27c, but the portion 36a being formed of suitable resistance material so as to heat the thermostat element. The terminal 39 is electrically connected to a contact member 42 which carries an adjustable screw 42a adapted to be engaged by the thermostat element 27a when it has expanded a predetermined distance due to the heat of the resistance 36a, to close the circuit 16'. By adjusting the screw end toward and from the element 27a, the period required to heat and expand the latter into engagement therewith may be varied, so that the time interval between the closing of the switch 27' and starting of the motor 5 may be predetermined, at will.

Operation.—The doors 4 being open the switch 38 is closed, as shown in dotted lines in Fig. 2. When the vehicle 3 starts to move toward the door opening 2, its rear wheel passes over the switch

27' which closes a circuit (in which the winding of the switch 32 is connected in series) which is traced as follows: from one side of switch 27' by leads 28 and 15; from the other side of the

5 switch 27' by lead 33, branch lead 33b, wire 34, winding of switch 32, wire 32a, lead 36 and lead 8. In closing this circuit, the switch winding is energized which effects a closing of the switch device 31. This completes a secondary circuit traced as
10 follows: lead 15, lead 28, lead 29, contact 30, armature 31, contact 30', lead 33a, lead 33, thermostat element 27a, resistance 36a, lead 36 and lead 8, and also a shunt circuit from lead 33a, through lead 33b, wire 34, winding of switch 32, wire 32a
15 to wire 36, the purpose of the shunt circuit being to maintain the winding of switch energized and thus keep the circuit across the contacts 30, 30' closed. As the contacting means for the thermostat element 27a are connected in series in the secondary circuit, the expansion of the element
20 27a will result in making contact with the contact 42a, whereupon the operating circuit 16' will be completed, as follows: lead 15, lead 28, lead 29, contact 30, conductor 31, contact
25 30', lead 33a, lead 33, thermostat element 27a, contact 42a, terminal 39, lead 40, lead 20, winding of switch 14, lead 21 and lead 8; the winding of the switch 14 being energized, the contacts 11, 12, will be connected by the conductor 13', so that the motor circuit will be completed and the motor 5 will operate to swing the
30 doors 4 to closed position. Upon the closing of the doors, the switch 38 will be automatically opened. This will break the circuit 16' and de-energize the winding of switch 32, thus opening the circuit for the time determining device 27 across the contacts 30, 30', and permitting the thermostat element to contract to its normal position. As the circuit through the winding of
40 the magnetic switch 14 is closed as already set forth, the opening of the circuit 16' will not stop the motor, but the latter will continue to operate until one of the devices 24 opens the auxiliary circuit.

45 43 indicates a switch interposed in the lead 28 and serving, when open, to cut out the control means 26. I preferably provide a lead 44 from the lead 28, beyond the switch 43 to the lead 8 and connect therein a pilot lamp 45 to indicate
50 whether the switch is open or closed.

When it is desirable to give warnings of the exit of the vehicle 3, I provide suitable signaling devices, such as a lamp 46 (red colored to indicate danger) or a sound emitting device 47, such
55 as an electrically operated horn. I have shown both types of devices as being carried by a suitable cable 48, which is suspended from poles 49 on opposite sides of the street a. The circuit for these devices comprises a lead 50 connected to the main 9 and to one side of each device, and a
60 lead 51 connected to the other side of each device, and to one contact 52 of a switch 53, which consists of the conductor carried by the armature for the magnetic switch 35 and arranged to bridge the circuit from the contact 52 to the
65 other contact 52a and a lead 53a connected to the latter contact and the main 9'. As the winding for the magnetic switch 35 is connected to the circuit between the lead 33 and lead 36, it will
70 be seen that when switch 27' is operated and the circuits of the control means 26 are closed, as already set forth, the signaling devices will be actuated upon the closing of the switch 27' and continue to be actuated until the doors 4 close—that is, until the switch 38 is opened. As the

closing of the circuit for the signaling devices is dependent on the circuits for the control means, such devices will also be inoperative if the switch 43 is opened.

In Fig. 6 I have shown a slightly different embodiment of the invention wherein the time determining device is interconnected with or interposed between the motor and the switch which controls the opening of the doors so that following the movement of the doors to open position and
80 at the end of a predetermined period of time the doors will automatically swing to closed position.

In this view, 9a, 9a' indicate the electric supply mains, the former being connected to one side of the motor 5', which operates the gears 7, 7', as
85 shown in Fig. 1, and the latter being connected to one contact 54 of a magnetic switch 55. The movable member 55' of the switch 55 constitutes the armature thereof. The other contact 57 of the switch 55 is connected by a lead 58 to the other
90 side of the motor 5'. 59 indicates a lead between the lead 58 and one contact of a normally closed switch 60, which is actuated to open position to break the motor circuit, by a suitable device, such as cams 61, (only one being shown), on one of the
95 gear wheels 7, 7', when the doors reach their open or closed position. The other contact of the switch 60 is connected by a lead 62 to a contact 63a of a normally open switch 63. The other contact of the switch 63 is connected by a lead 64 to the
100 main 9a'. 65 indicates a wire connected to the lead 62 and the terminal 66 of a time determining device 67, which is preferably similar in construction to that shown in Figs. 3, 4, and 5. The terminal 66 is arranged to be engaged by the thermostat element 67a, as will later appear. 68 indicates a lead connected to the lead 62 and one end of the winding for the magnetic switch 55; the other end of the winding being connected by leads
105 69, 70, with the main 9a. The switch 63 may be manually operated or it may be arranged in the path of movement of one of the wheels of the vehicle 3. In this latter event a separate switch may be provided to permit of manual closing of the circuit. When the switch 63 is closed a circuit, in which the magnetic switch winding is included, is completed, thereby closing the circuit across the contacts 54—57. The first circuit is traced as follows: contact 63b of switch 63, lead
110 64 and main 9a'; contact 63a, lead 62, lead 68, switch winding, lead 69, lead 70 and main 9a. The motor circuit may be traced as follows: main 9a', contact 54, armature 55, contact 57 and lead 58 to one side of the motor 5'; and main 9a' from its other side. Also, upon the closing of the magnetic switch a separate circuit will be established as follows: main 9a', contact 54, armature 55, contact 57, lead 58, lead 59, switch 60, lead 62, lead
115 63, winding of magnetic switch 56, lead 69, lead 70 and main 9a, which circuit will maintain the switch winding energized and the magnetic switch closed, until the cam 61 opens the switch 60, whereupon the switch winding becomes de-energized and the magnetic switch opens to break the motor circuit. By this arrangement, the switch 63 need not be maintained closed after the magnetic switch circuit is once completed.

71 indicates a lead connected to the lead 64 and one end of the thermostat element 67a. The other end of the element has connected to it a
120 lead 72. A portion 72a of this lead is wrapped around the element 67a, such portion being formed of resistance material to effect heating of the element as already set forth in connection with the embodiment shown in Fig. 2. The lead
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72 is connected to the lead 70. 73 indicates a switch connected to and operated by one of the doors, 4, its connection therewith being so arranged that when the doors are closed the switch will be open, but when the doors are in open position the switch will be closed and complete a circuit as follows: from one contact of switch 73, through lead 71, element 67a, resistance 72a, lead 72 (and suitable resistance element—lamp 72'), lead 70 and main 9a; and from the other contact of switch 73 through lead 71, lead 64 and main 9a' and from terminal 66 through lead 65, lead 62, lead 68, magnetic switch winding, leads 69, 70 and main 9a. The closing of this circuit will energize the switch winding and thus close the motor circuit, which has already been described. The motor 5' will then swing the doors 4 closed in which position the switch 73 will be opened and effect the opening of the circuit in which the switch winding is connected to de-energize the latter and thus break the motor circuit.

74 indicates a switch which may be manually operated to prevent the closing of the circuit through time element when the doors are opened. In the construction shown in Fig. 6, a separate switch 63 may be provided outside the building or garage so as to effect opening of the doors and their closing after the lapse of a predetermined period, during which the vehicle may be driven into the building.

In the construction shown in Fig. 2, it will be understood that upon the return of the vehicle 3 to the position shown in Fig. 1, the wheel of the vehicle in passing over the switch 27' causes the closing of the doors automatically in the same manner as when the vehicle is driven out, but the doors may be manually closed at will by the switch 19; also by the provision of the separate switch 43, which cuts out the timing device 27, the doors may be kept open while the vehicle is being driven in or until it has passed over the switch 27'.

To those skilled in the art to which my invention relates many changes in construction and widely differing embodiments and applications of my invention will suggest themselves without departing from the spirit and scope thereof. My description and the disclosures herein are not intended to be in any sense limiting.

What I claim is:

1. In apparatus of the class described, the combination with a building having an opening and a door for closing said opening, of an electric motor operatively connected with said door to move it to open position or to closed position, main and secondary circuits for said motor and a switch for said circuits, whereby the latter when closed operate said motor to move said door in one direction, a separate circuit, a time controlled switch element in said separate circuit and controlled thereby, and a supplemental circuit arranged to be closed by said switch element for controlling said main and secondary circuits, whereby the latter operate said motor to move said door in the opposite direction.

2. In apparatus of the class described, the combination with a building having an opening and a door for closing said opening, of an electric motor operatively connected with said door to move it to open position or closed position, main and secondary circuits for said motor and a switch for said circuits, whereby the latter, when closed, operate the motor to move said door in one direction, a separate circuit having a thermostat element therein, a contact arranged to be engaged by said thermostat element, and a lead between said contact and said main and secondary circuits and arranged to complete a circuit including said separate circuit and said main and secondary circuits, whereby said motor is operated to move said door in the opposite direction.

3. An apparatus as claimed in claim 2 in which the separate circuit includes a switch that is actuated into closed and open positions by said door, whereby said separate circuit can only be closed when the door is in a predetermined position.

4. In apparatus of the class described, the combination with a building having an opening and a door for closing said opening, of an electric motor operatively connected with said door to move it to open position or to closed position, main and secondary circuits for said motor and a switch for said circuits, whereby the latter when closed operate said motor to move said door in one direction, a separate circuit including a switch disposed in the path of movement of a manually controlled device, a time controlled switch element in said separate circuit and controlled thereby, and a supplemental circuit arranged to be closed by said switch element for controlling said main and secondary circuits, whereby the latter operate said motor to move said door in the opposite direction.

5. In apparatus of the class described, the combination with a building having an opening and a door for closing said opening, of an electric motor operatively connected with said door to move it to open position or to closed position, main and secondary circuits for said motor and a switch for said circuits, whereby the latter, when closed, operate the motor to move said door in one direction, a separate circuit including a switch disposed in the path of movement of a manually controlled device and having a thermostat element therein, a contact arranged to be engaged by said thermostat element, and a lead between said contact and said main and secondary circuits and arranged to complete a circuit including said separate circuit and said main and secondary circuits, whereby said motor is operated to move said door in the opposite direction.

6. An apparatus as claimed in claim 5 in which the separate circuit includes a switch that is actuated into closed and open positions by said door, whereby said separate circuit can only be closed when the door is in a predetermined position.

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