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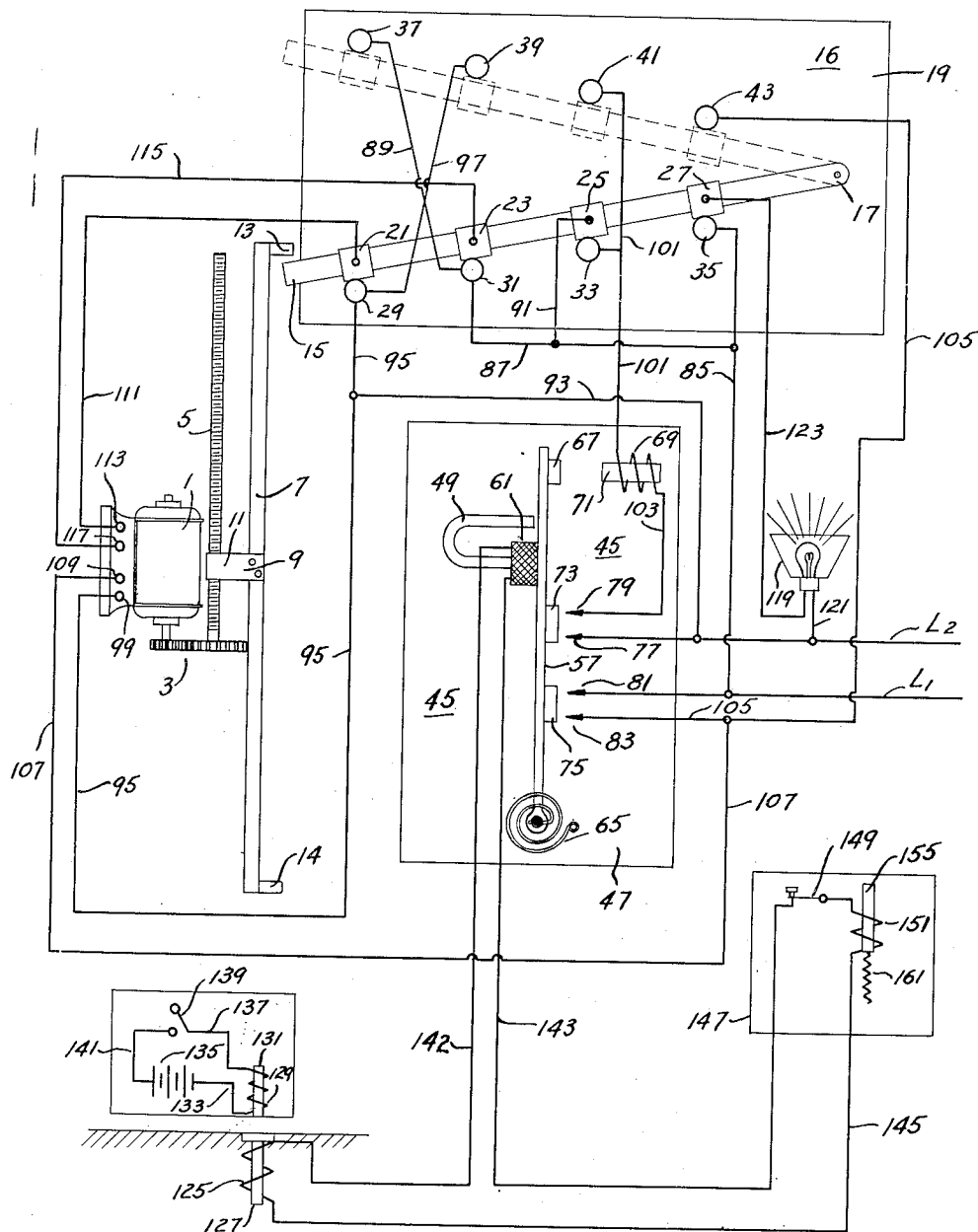
W. F. WEATHERS

2,186,311

DOOR CONTROLLING SYSTEM

Filed Oct. 10, 1936

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Jan. 9, 1940.

W. F. WEATHERS

2,186,311

DOOR-CONTROLLING SYSTEM

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Fig. 2.

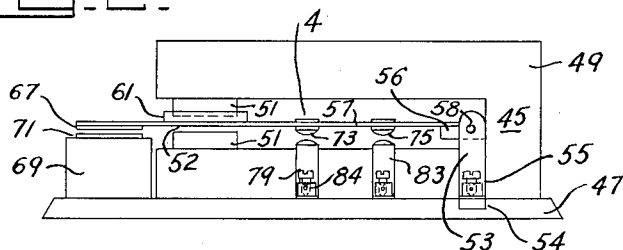
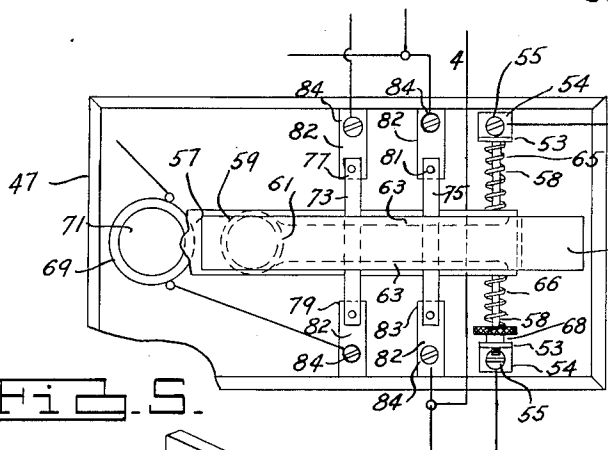


Fig. 3.

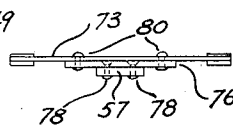


Fig. 4.

Fig. 5.

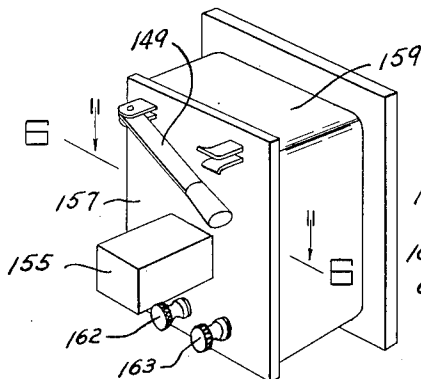
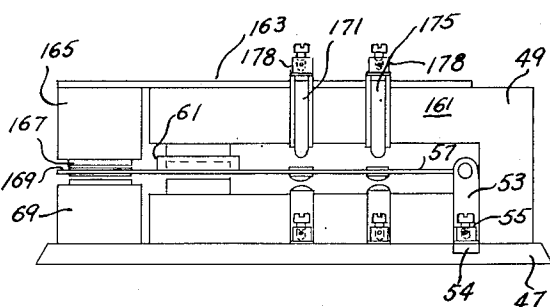


Fig. 6.

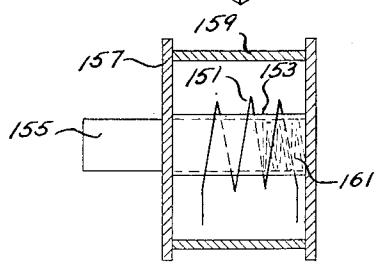


Fig. 7.

BY

INVENTOR.
Warren F. Weathers
Ralph S. Burns
ATTORNEY.

Jan. 9, 1940.

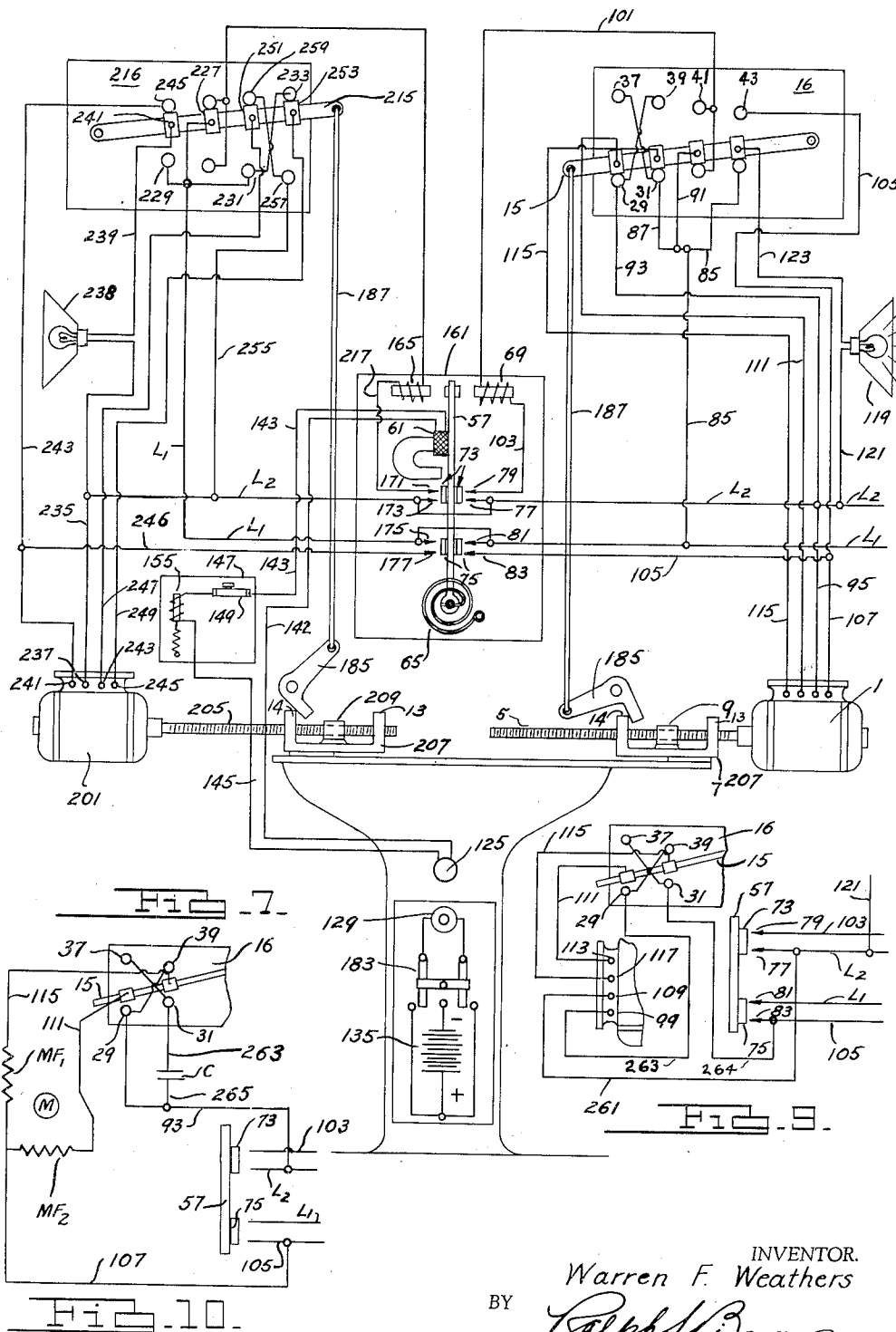
W. F. WEATHERS

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DOOR CONTROLLING SYSTEM

Filed Oct. 10, 1936

3 Sheets-Sheet 3



INVENTOR.
Warren F. Weathers
BY *Ralph B. Bunn*
ATTORNEY.

UNITED STATES PATENT OFFICE

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DOOR CONTROLLING SYSTEM

Warren F. Weathers, Detroit, Mich., assignor to
Horton Manufacturing Company, Detroit,
Mich., a corporation of Michigan

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3 Claims. (Cl. 268—19)

My invention pertains to automatic door opening systems and more particularly to automatic garage door systems for conveniently opening the door of a garage as the automobile approaches and for closing and locking the door thereafter.

In the previously known automatic garage door opening systems with which the applicant is familiar, it was necessary to install and maintain a complicated system comprising a plurality of limit switches actuated by the door in conjunction with electro-magnetically operated reversing switches and other complicated apparatus. Also many such systems have required installation of live wires under-ground, with the necessity of expensive installation to meet the safety code and local ordinances. Accordingly such systems as previously installed were very expensive and required considerable maintenance attention whereby the convenience which the operator hoped to derive from the automatic installation was nullified by the additional inconvenience involved therein.

It is accordingly an object of my invention to provide a simplified garage door opening system which involves a minimum amount of apparatus and moving parts, which is simple to install and maintain, which is positive in its operation and which may be conveniently operated from an approaching automobile.

It is a further object of my invention to provide a simplified automatic garage door opening system which may be operated by momentarily induced electrical impulses either from an approaching automobile or from an adjacent house, whereby the control circuit part of the system is normally dead and it is not at any time connected with the service lines either directly or indirectly, as through transformers or the like.

It also is an object of my invention to provide an automatic garage door operating system comprising a door operating motor, a garage illuminating lamp, a reversing switch actuated by the movement of the door between its extreme positions and a relay responsive to an initial impulse for energizing the circuits prepared by the door operated switch for starting the motor to open the door and to energize the lamp to simultaneously illuminate the garage while the door remains open, the relay also responding to a second impulse for energizing the prepared circuits for closing the door, the lamp being deenergized by the final action of the door operated switch.

Another object of my invention is to provide a two-door garage opening system which operates responsive to the selected polarity of electro-

magnetically induced impulses for selectively opening either one of two garage doors as an automobile approaches.

It is also an object of my invention to provide for use in my automatic door opening system a sensitive impulse responsive relay comprising a permanent magnet of U-shaped conformation, a pair of pole tips disposed between the extremities thereof for defining an air gap therebetween, an annular actuating coil encircling the pole tips adjacent said air gap, a reed for supporting the coil, biasing means for positioning the coil on said reed adjacent the air gap, an armature of magnetizable material disposed on said reed, an adjacently disposed holding solenoid, and contact means associated with the reed for actuation by the movement thereof.

The novel features that I consider characteristic of my invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and its method of operation, together with additional objects and advantages thereof, will best be understood from the following description of specific embodiments, when read in connection with the accompanying drawings, in which:

Fig. 1 is a diagrammatic view illustrating the arrangement of an automatic garage door operating system in accordance with my invention;

Fig. 2 is a side elevational view of the impulse actuated relay for use therein;

Fig. 3 is a plan view thereof;

Fig. 4 is a transverse sectional view through the reed and one of the bridging contacts thereon;

Fig. 5 is a perspective view of the manual impulse for installation in an adjacent house;

Fig. 6 is a cross-sectional view therethrough on line 6—6 of Fig. 5;

Fig. 7 is a diagrammatic view of an embodiment of my automatic garage door operating system arranged for selectively opening either one of two garage doors in response to induced impulses of selected polarity;

Fig. 8 is a side elevational view of a modified embodiment of my impulse responsive relay adapted for use in my two door system;

Fig. 9 is a diagrammatic view showing modified motor connections; and

Fig. 10 is a fragmentary diagrammatic view showing how the control circuits may be modified for controlling a split phase motor.

Referring more particularly to Fig. 1 of the drawings, I have illustrated my automatic system as arranged for automatically controlling a shunt wound garage door operating motor which

operates through a suitable gear train 3, or other power transmitting means, to drive a threaded shaft 5 for opening or closing a garage door 7 which is operated from the threaded shaft 5 by means of an arm 9 comprising a threaded nut 11 which travels along the shaft.

For preparing the circuits in accordance with the position of the door, I provide fingers 13 and 14 which project laterally from opposite edges of the door for engaging a switch arm 15 of a reversing switch 16. The reversing switch 16 comprises the movable arm 15 which is pivotally mounted at one end upon a pivot pin 17 on a base-board 19. The reversing switch is suitably mounted in a position, preferably overhead, where the movable end of the pivot switch arm 15 is alternatively engaged by the door carried fingers 13 or 14 for moving the switch lever between its two alternative circuit closing positions. The pivoted switch arm 15 is made of some non-conducting material, such as fiber board, or hard rubber for example, and carries four electrically conductive contact members 21, 23, 25 and 27 which are mounted in spaced relation thereon, for controlling electrical circuits, to be subsequently traced and described.

Upon the base 19, a set of stationary contacts 29, 31, 33 and 35 is provided and these are positioned for respective engagement by the movable contacts 21, 23, 25 and 27 when the arm is moved to its lower position as shown. Adjacent the opposite side of the movable switch arm 15, I provide four stationary contacts 37, 39, 41 and 43 disposed for respective engagement by the movable contacts 21, 23, 25 and 27 when the switch arm is turned up to its alternative position by a movement of the door which carries the finger 14 thereon into engagement with the movable end of the switch arm. By this simple arrangement all the necessary circuits of my control system are automatically prepared for the next operation by the movement of the door itself.

For this purpose of controlling the energization of the electrical circuits which have been prepared by the movement of the switch arm 15 by the door, and which will be subsequently described and traced, I provide a sensitive impulse responsive relay 45, shown in Figs. 2, 3 and 4. The impulse actuated relay 45 which I have provided for controlling my door operating system comprises a base 47, of Bakelite, hard rubber or other insulating material, upon which a powerful permanent magnet 49 of U-shaped conformation is mounted. The permanent magnet 49 is mounted upon the base 47 with one leg adjacent thereto and the other vertically disposed and secured by screws or other fastening means. Between the ends of the legs of the magnet, I provide a pair of pole tips 51 of magnetic material which are preferably of circular cross-section and suitably spaced for defining a small air gap therebetween. The air gap is filled by a disk 52 of copper, brass, or other non-magnetic material whereby the pole tips 51 are smoothly joined. Upon the base 47 a pair of brackets 53 are mounted in spaced relation on opposite sides of the permanent magnet. The brackets 53 are provided with angularly turned foot portions 54 which are clamped on the base 47 by terminal posts 55 secured by screws through the bottom in the usual manner.

The movable member of my impulse controlled relay comprises a reed 57 which consists of a strip of aluminum or other non-magnetic mate-

rial which is pivotally mounted at one end upon a block 56 of Bakelite having insulated pivot pins 58 projecting from opposite sides and to which it is secured in any suitable manner as by rivets. The portion of the reed 57 adjacent the pole tips 51 is provided with a pole receiving aperture 59, indicated by dotted lines in Fig. 3. The aperture is stamped out with a larger diameter than the pole tips 51, and at the same time this operation provides a form for supporting a solenoid 61 in encircling relation around the pole tips 51. For winding the solenoid 61, enameled wire is preferably used and the leads 63 from the annular solenoid are extended along one face of the reed 57, to which they may be secured, as by cementing, and they are soldered to respective ones of the pair of pivot pins 58. The ends of the insulated pivot pins 58 are received by and journaled in apertures in the upper ends of the brackets 53 whereby the terminal posts 55 are conductively connected to the ends of the solenoid 61.

Encircling the pivot pins 58, on opposite sides of the reed 57, are a pair of delicate centering springs 65 and 66. The outer end of the spring 66 engages an adjusting stop 68 which may be rotatably adjusted for resiliently biasing the pivoted reed to a suitable centered position. The stop 68 is apertured to ride freely over the pin 58 which is journaled in the standard 53. The end of the spring 66 presses the stop 68 against the standard 53 where the friction holds it in adjusted position for tensioning the spring 66. On the movable end of the reed 57 an armature 67, of magnetizable metal such as iron, is secured by riveting. Under the armature 67 an electro-magnet 69 is mounted on the base 47 with its upper pole 71 adjacent to and spaced slightly from the armature member 67.

The pivoted reed member 57 carries a pair of bridging contacts 73 and 75 comprising metallic strips which extend transversely across the reed in spaced relation. As shown in Fig. 4, each contact member is secured in insulated relation by means of a piece of Bakelite 76 which is secured to the reed 57 by means of rivets 78 extending through the intermediate portion thereof. By means of rivets 80 the outer ends of the strip of Bakelite are secured to the bridging contact member 73 which is thus insulated from the reed 57.

A pair of stationary contacts 77 and 79 are mounted on opposite sides of the lower leg of the magnet in suitable position for simultaneous engagement by the ends of the contact 73 moving downwardly. Similarly stationary contacts 81 and 83 are mounted on the opposite sides of the magnet for engagement by the opposite ends of the contact member 75. Each of the stationary contact members comprises an upstanding strip having an angular foot 82 abutting the insulating base 47 and secured by terminal posts 84 secured thereon by screws in the usual manner.

The movable reed 57 being non-magnetic is uninfluenced by the magnet 49 and it normally assumes a position determined by the adjustment of the biasing springs. When an electric current is passed through the annular coil 61 adjacent the air gap, the coil and the associated reed are deflected upwardly or downwardly depending upon the direction of current flow through the coil. By the disposition of the actuating solenoid 61 encircling the pole tips and air gap a very sensitive arrangement is provided whereby the reed may be deflected in response

to a feeble electric current impulse of short duration. When a momentary impulse of proper polarity is impressed on the coil 81, in a manner to be subsequently set forth, the reed deflects downwardly carrying its bridging contacts 73 and 75 to bridge their adjacent stationary contacts for completing the energization of circuits which have been prepared by the door operated reversing switch 16.

For this purpose a service conductor L1, of a convenient direct current or alternating current service line, is connected to the stationary contact 81 on the impulse responsive relay 45. From the main line conductor L1, a conductor 85 is connected to the stationary contact 35 of the reversing switch. From the conductor 85 a conductor 87 is connected to the stationary contact 31 from which a conductor 89 provides a permanent connection with the stationary contact 37 adjacent the upper edge of the switchboard 19. Extending from the conductor 87 is a conductor 91 which is connected permanently to the movable contact member 25 of the reversing switch. It will thus be seen that the main line conductor L1 is permanently connected with the stationary contact 81 of the relay and also with the stationary contacts 31, 35 and 37 of the reversing switch and also with the movable contact member 25 of the reversing switch.

The other side of the service line comprising the main line conductor L2, is connected directly with the stationary contact 77 on the relay. From the main line conductor L2, a conductor 93 extends to connect with a conductor 95 in permanent connection, with the stationary contact 29 which through a conductor 97 is also permanently connected with the stationary contact 39 adjacent the upper edge of the switchboard. The conductor 95 is also extended for permanent connection with one of the terminals 99 of the door operating motor 1. By this arrangement the second main line conductor L2 is permanently connected with contact 77 on the relay, stationary contacts 29 and 39 on the reversing switch and one of the motor energizing terminals, 99.

On the receiving switch 16, the stationary contacts 33 and 41, adjacently disposed on opposite sides of the pivoted arm 15, are connected together through a conductor 101 which also extends to one end of the holding electro-magnet 69 on the impulse responsive relay 45. From the other end of the electro-magnet 69 on the relay, a conductor 103 is permanently connected to the contact member 79. From the stationary contact 43 adjacent the upper edge of the reversing switch a conductor 105 is permanently connected to the contact member 83 on the relay 45, and from the conductor 105, a conductor 107 is connected to another one of the motor energizing terminals 109 of the motor. From the movable contact member 21 on the reversing switch a conductor 111 is connected to an energizing terminal 113 on the motor and from the other movable contact 23 on the reversing switch, a conductor 115 is connected to the other energizing terminal 117 on the motor.

A flood lamp 119, which is provided for illuminating the garage, is connected on one side directly to the main line conductor L2 through a conductor 121. The other side of the flood lamp 119 is connected through a conductor 123 to the movable contact 27 on the reversing switch.

In accordance with my invention, I control my automatic garage door operating system by

inducing a momentary electric current impulse in a coil 125 which is wound upon a large iron core 127 and embedded in the concrete or ground of the driveway over which the automobile passes to the garage. For this purpose the automobile carries a strong electromagnet 129 having a large iron core 131 which is so mounted on the vehicle that it passes over in the vicinity of the coil 125 buried in the driveway. The winding of the inducing electromagnet 129 is connected by a conductor 133 to one terminal of the storage battery 135 of the automobile. The other end of the automobile electromagnet 129 is connected by a conductor 137 to one terminal of a manual switch 139, and from the other terminal thereof a conductor 141 is connected to the other terminal of the car carried storage battery 135. The connections thus established, must provide current of suitable polarity to the electromagnet 129 whereby a current impulse of proper polarity will be induced in the buried coil 125. This is readily ascertained by trial and reversing the connections on the electromagnet 129 if necessary.

As the driver of the automobile approaches the garage, he closes the manual switch 139 thereby energizing the car carried electromagnet 129. When the car passes over the buried coil 125 a current impulse of proper polarity is induced therein which passes by way of a conductor 142 to the actuating solenoid 61 on the relay 45 returning by way of conductors 143 and 145 to the other end of the buried coil. The conductors 143 and 145 being normally dead and not at any time connected with the service lines either directly or indirectly are extended conveniently through an auxiliary controller 147 in the house without any danger or hazard.

In the auxiliary controller 147, I also provide a manual impulser comprising a solenoid winding 151 disposed on a tube 153 of non-magnetic material which receives a permanent magnet 155 disposed therein, as more clearly shown in Figs. 5 and 6. The permanent magnet 155, which is preferably of a strongly magnetizable magnet steel alloy, is disposed to slide axially through the solenoid winding 151 and to project through the front panel 157 of a box 159 in which the solenoid is mounted. To normally hold the permanent magnet in its projected position, a compression spring 161 is provided reacting between its innermost end and the bottom of the enclosing box.

The auxiliary controller 147 comprises a manually operable switch 149 whereby the impulsing circuit may be opened at night, or any other time, to prevent unauthorized opening of the garage door. The manually actuable switch 149 is mounted upon the front panel 157 of the enclosing box. A pair of terminal ports 162 and 163 are also mounted upon the front panel 157 of the auxiliary controller for conveniently connecting it to the conductors 143 and 145 of the impulsing circuit. The circuit elements of the controller are connected in series relation in the controller box, as diagrammatically represented in Fig. 1.

The auxiliary controller is mounted in the house from which the garage door may be controlled, and at night or at other times the system is locked by opening the manual switch 149. The conductors 142 and 143 are conveniently extended to the house as they are normally dead, do not at any time carry high voltages and are not at

any time connected with the service lines either directly or indirectly.

The manual impulser of the auxiliary controller 147 is actuated by quickly depressing the permanent magnet 155 into the solenoid winding 151. This generates a short current impulse in the coil for energizing the coil 61 on the relay. If, when the system is first installed, the impulse thus generated is not of the correct polarity for moving the reed 57 of the relay in the proper direction to bridge the stationary contacts, this can be conveniently corrected by changing the connections of the circuit wires on the terminal posts 162 and 163 of the auxiliary controller.

The operation of my automatic garage door controlling system is accomplished as follows: The position of the parts, as shown in Fig. 1, is with the garage door in the open position, the reversing switch 16 has been moved to a position which corresponds to the open position of the door by the engagement of the finger 13 with the pivoted switch arm 15. In this position the door is open, and the garage flood lamp 119 is energized for illuminating the garage. The circuit for the lamp may be traced from main service line L1, conductor 85, contacts 35 and 27, conductor 123 to one side of the lamp 119 continuing from the other side of the lamp through conductor 121 to the main service conductor L2.

With the elements of the system in the positions described above, with the garage door open and the lamp lighted, the operator is prepared to take his car out of the garage. The driver of the car closes the switch 139 on the car to energize the car electromagnet 129, and as the car passes out of the driveway this induces a momentary impulse in the coil 125 buried in the driveway which, as previously explained, is of proper polarity for energizing the movable coil 61 on the impulse responsive relay 45 to move its pivoted reed 57 to its circuit closing position.

When the relay coil 61 is energized by the momentary impulse, the movable bridging contact 73 bridges the stationary contacts 77 and 79 of the relay thereby energizing the holding coil 69 which attracts the armature 67 and holds the pivoted reed 57 of the relay in its circuit closing position.

The stick circuit for the holding solenoid 69 may be traced from main line L1 through conductors 85, 87, and 91, thence through movable contact 25 to stationary contact 33 on the reversing switch 16, thence by way of conductor 101 to the holding solenoid 69. From the other side of the holding coil, its energizing circuit continues through a conductor 103 thence through contact members 79, 73 and 77 on the impulse responsive relay to the other main line L2.

By this arrangement, the impulse responsive relay holds itself in closing position until the energizing circuit of the holding solenoid 69 is broken by the movement of the movable contact member 25 of the reversing switch which does not take place until the door 7 has been moved to its extreme alternate position which in this example is the closed position.

The door operating motor 1 is also energized by this holding operation of the impulse responsive relay 45 through the engagement of its bridging contact 75 with the stationary contacts 31 and 83. This motor energizing circuit may be traced from main service line L1, contacts 81, 75 and 83 of the relay, thence by way of conductors 105 and 107 to the motor terminal 109,

which may be connected with one side of the armature winding of the motor. From the other terminal 89 of the motor armature, the energizing circuit is completed through conductors 95 and 93 to the other main line L2 whereby the door operating motor is started. The direction of operation of the door operating motor 1 is determined by the connection of its field terminals 113 and 117 through conductors 111 and 115 respectively to the movable reversing contacts 21 and 23 of the reversing switch. In the position shown, this circuit may be traced from main line L1 by way of conductors 85 and 87, through contact members 31 and 23 of the reversing switch, thence by way of conductor 115 to motor terminal 117. From the other motor terminal 113, this energizing circuit continues through conductor 111, thence through contact members 21 and 29 on the reversing switch, thence by way of conductors 95 and 93 to the other main line L2. From the terminals 113 and 117 of the motor, the field may thus be energized reversely to operate the motor in reverse directions in accordance with the position of the reversing switch.

As the motor operates to move the door 7 to closing position, the finger 14 thereon is carried into engagement with the pivoted switch arm 15 of the reversing switch as the door approaches its extreme closed position. The reversing switch arm 15 is thus moved upwardly to engage the alternate set of stationary contacts 37, 39, 41 and 43. As this occurs the movement of the contact 25 away from the stationary contact 33 interrupts the energizing circuit of the holding coil 69 on the relay which drops out thereby opening the motor energizing circuit which was completed through contacts 75, 81 and 83.

This operation deenergizes and stops the motor when the door has reached its extreme closed position. The movement of the contact 27 of the reversing switch away from stationary contact 35 also breaks the lamp circuit and extinguishes the flood lamp 119 in the garage when the door is closed.

When the car returns to the garage, the driver again closes the switch 139 on the car and thus energizes the inducing magnet 129 from the car storage battery 135 to provide proper polarity for inducing impulses in the buried coil 125 in the driveway. As the car approaches up the driveway, the current impulse thus induced is impressed upon the movable coil 61 of the relay through impulse transmitting circuit, previously traced. This moves the pivoted reed 57 of the relay to its circuit closing position whence the bridging contacts 73 and 75 thereon bridge the adjacent stationary contacts to complete the energization of the circuits which were prepared by the final movement of the switch arm 15 of the reversing switch by the door.

By its initial movement, the bridging contact 73 on the relay closes a stick circuit for the holding electromagnet 69 for the purpose and in the manner previously described, except that it is now the upper stationary contact 41 on the door actuated switch which is now utilized for completing the stick circuit from conductor 101 through the movable contact 25 of the reversing switch. The engagement of the bridging contact 75 of the impulse responsive relay with its associated contacts 81 and 83 again completes the motor starting circuit for operating the motor in the manner previously traced. The motor now

operates in the opposite direction for opening the door because the energization of its terminals 113 and 117 has been reversed by the movement of the connected contacts 21 and 23 of the reversing switch into engagement with the stationary contacts 37 and 39 which are reversely connected from the contacts 29 and 31 through conductors 97 and 99.

The motor now operating in the reverse direction moves the garage door 7 toward its opened position and when this position is finally reached the finger 13 on the door engages the end of the switch arm 15 thus drawing it down to its original full line position as previously described.

Also the engagement of the bridging contact 75 with the stationary contact members 81 and 83 on the relay immediately energizes the flood lamp 119 in the garage. This circuit may be traced from main line L1, contact members 81, 75 and 83, thence by conductor 105 to the stationary contact 43 on the door actuated reversing switch, thence by the movable contact 27 and through the conductor 123 to one side of the flood lamp 119 the other side of which is permanently connected to conductor 121 to the other main line L2.

The flood lamp is thus immediately energized as soon as the door operating system starts, and the lamp continues illuminated during the opening of the door. As the door approached its opened position and the switch arm 15 of the reversing switch moved downwardly, the movable lamp energizing contact 27 was thereby disengaged from its contact 43, but this only caused a momentary flickering of the flood lamp because the lamp was promptly reenergized when the contact 27 engaged the stationary contact 25 thereby completing the circuit from main line L1 through conductor 85 and stationary contact 35. The flood lamp thus remains energized after the garage door has opened and while the door remains opened as previously described the flood lamp remains completely energized during the operation of closing the door and until the door is completely closed which enables the operator to observe that the door is completely closed.

When the operator enters the house, he may then, or at a later time, conveniently close the garage door by operating the auxiliary controller 147. For this purpose he merely depresses the permanent magnet 155 of the manual impulser quickly into the coil 151. As previously explained, this provides an impulse of the proper polarity for energizing the movable coil 61 of the polarized relay to move the pivoted member 57 to circuit closing position for operating the motor.

After the door operating system has operated to move the door 7 to closed position, the finger 14 on the door engages the reversing switch 15 thus moving it up to its dotted line position and preparing the circuits for the next operation. This operation of the reversing switch 15 also deenergizes the flood lamp in the garage.

By opening the manual switch 149 on the auxiliary controller, the operator can now render the impulsing circuit ineffective whereby it can not be opened by the approach of any other car, even if it is equipped with an impulsing electro-magnet, and by this operation the garage door is effectively locked for the night.

In the morning it is only necessary for the operator to first close the switch 149, and by thereafter punching the permanent magnet 155 in the impulsing solenoid 151, he may conven-

iently open the garage door preparatory to driving out.

In providing for the control of the doors of a two door garage, it is of course only necessary to provide an independent one of my door operating systems for each door, if there are two separate driveways approaching the doors. However, in accordance with another embodiment of my invention, I have provided a two-door garage door operating system whereby it is unnecessary to duplicate all the parts, and a single impulse responsive relay and a single impulsing coil and circuit may be utilized for selectively operating either one of the garage doors as a car approaches. Such a system is shown in Fig. 7, and the impulse responsive relay 161, which is utilized for selectively operating either door, is also shown in Fig. 8.

My impulse responsive relay 161, for selectively operating either one of a pair of garage doors is quite similar to that previously described in the single door system, and to the corresponding elements similar reference characters have been applied. To this construction however it is necessary to add several elements to provide a selective control and for this purpose, I provide a strip 163 of insulating material, such as hard rubber, fiber, or a phenolic condensation product, which is mounted on top of the upper leg of the U-shaped permanent magnet 49. The strip of insulating material 163 may be secured to the permanent magnet in any suitable manner as by cement, or a clamp, and is of suitable length to project beyond the end of the magnet a distance substantially equal to the extended portion of the baseboard 47. On the extended end of the insulation strip 163, I secure a second holding electro-magnet 165 comprising a magnetizable core 167 which extends downwardly adjacent the movable end of the reed 57. For holding the pivoted reed 57, the portion of iron 67 provides a sufficient armature.

Also I provide the selecting relay 161 with additional pairs of stationary contact members 171 and 173, 175 and 177 which depend downwardly from the insulation strip 163 in insulated relation on opposite sides of the magnet 49. A terminal post 178 is provided for convenient connection on each contact member. The movable bridging contacts 73 and 75 which project transversely from the movable reed 57, as previously described, are utilized in the uppermost position for bridging these additional stationary contacts.

The other elements of the two-door selective relay 161 are similar to that previously described in the single door controlling system, and it is operated selectively for operating either one of the garage doors by energizing the movable coil 61 thereon by current impulses, the polarity of which is suitably selected to predetermine which door is to be operated.

In my two door control system, the movable coil 61 of the relay is energized from the impulse inducing coil 125 buried in the single driveway approaching the garage. From the buried coil 125 an impulse transmitting circuit is extended to the relay coil 161 by way of the conductors 142, 143 and 145 through a solenoid controller 147 which is mounted in the house adjacent to the garage, in the same manner as previously described with reference to the single operating system.

In order to selectively operate my two door system, I energize the inducing electro-magnet 129, carried by the car, from the car storage 75

battery 135 through a manually actuatable reversing switch 183, of any well-known construction, whereby the polarity of the inducing electro-magnet may be conveniently reversed. By manually operating the reversing switch to one position, a current of a predetermined polarity is provided for energizing the electro-magnet 129, and by moving it to an alternate position, current of reverse polarity is supplied for energizing the electro-magnet 129. In its normal position the movable blades of the manual reversing switch are disengaged from its stationary contacts, and the car carried electro-magnet 129 is deenergized.

The garage door shown at the right hand side of Fig. 7 corresponds to the door 7 and its actuating motor 1, the associated reversing switch 16 and the conductors thereof correspond to the similar elements of Fig. 1, and they have been designated by similar reference characters. The operation of the door 7 by the motor 1 is controlled by the successive operations of the reed 57, of the relay to the right-hand position, in the same manner as in the previous embodiment, and which will not be repeated. In the two door system, a door actuating arrangement has been shown for operating the reversing switch 16 comprising a bell crank 185 having one arm connected with a link 187 which at its upper end connects with the end of the switch arm 15 with the reversing switch. The other arm of the bell crank 185 projects for operative engagement by the fingers 14 and 13 associated with the garage door 7 whereby the reversing switch 16 is thrown alternatively to its extreme positions in accordance with the movements of the door.

In the two door system, when the impulse responsive relay 161 is successively energized by impulses of suitable polarity for throwing the reed 57 toward the righthand side, as predetermined by moving the manual reversing switch 183 to a proper position before driving the car over the buried coil 125, the relay operates to complete the circuits which have been prepared by the reversing switch 16 for operating the motor 1 and the flood lamp 119, in the same manner as previously described with reference to the two door embodiment.

For operating the second door 207, I provide a door operating motor 201 which drives a threaded shaft 205 for reversely operating the second garage door to which it is threadably connected by a member 209. For reversibly controlling the door operating motor 201 in accordance with the position of the door 200, I provide a reversing switch 216 which is similar in construction and operation to that previously described. The switch 216 is similarly actuated by a link 187 interconnected from the movable end of the switch arm to one arm of a bell crank 185. The second door 207 also carries projecting members 13 and 14 for engaging the bell crank 185 to correspondingly operate the reversing switch 216. To selectively control the second door operating system, circuits are provided as follows: The additional contact 171 provided on my two door selective relay 161 is connected through a conductor 217 to one end of the holding electro-magnet 165 which operates to hold the movable reed 57 of the relay in its left-hand position, when it is selectively operated. The energizing circuit of the holding electro-magnet is completed through the reversing switch 216 in a manner substantially identical with that previously described.

When the relay 161 is deflected and locked in its left-hand position, the bridging contact 75 en-

gages the stationary contacts 175 and 177 of the relay for completing the circuit of the door operating motor 201 in a manner substantially similar to the operation of the door operating motor 1 for the right hand deflections of the relay.

For this purpose, the main line conductor L1 is extended to contacts 227, 229, 231 and 233 on reversing switch 216, from the added stationary contact 175 of the relay. The second main line conductor L2 is extended from the added contact member 173, and is connected by conductor 235 with one of the motor terminals 237. The conductor 235 also extends to one side of a flood lamp 238 which is positioned for illuminating the other side of the garage. From the other side of the flood lamp, the conductor 239 is extended to connect with the movable contact 241 carried by the pivoted switch arm 215.

From the motor energizing terminal 241, a conductor 243 is connected to the stationary terminal 245 on the reversing switch. From conductor 243, a conductor 246 is connected to the added stationary terminal 177 on the relay. From extended main line L2, the conductor 255 is connected to stationary contacts 257 and 259 on the reversing switch. The other pair of motor energizing terminals 243 and 245 are connected through conductors 247 and 249 respectively to movable terminals 251 and 253 on the pivoted switch arm 215 for reverse energization to reversely operate the motor for opening and closing the door.

In operation the driver of an automobile approaching up the single driveway to the garage throws the manual reversing switch 183 in such a direction as to properly energize the car carried electro-magnet 129 so that as it is carried over the buried coil 125, a momentary current impulse is induced therein of suitable polarity for drawing the reed 57 of the impulse responsive relay 161 to engage either set of stationary contacts for selectively opening either door as desired. The relay reed 57 is then held in its actuated position by the adjacent holding coil 69 or 165 depending upon the direction of its deflection. As soon as it is ascertained which position of the reversing switch 183 on the automobile controls which door, the switch may be calibrated accordingly for convenience of the operator. Operating the movable reed 57 of the impulse responsive relay 161 successively in a given direction, either to the right or to the left, operates to energize the circuits which were previously prepared by the corresponding reversing switch 16 or 216 to open and close the door, in the manner which was previously described with reference to the single door embodiment and will therefore not be repeated.

In accordance with my simplified arrangement, it is not necessary to duplicate all the apparatus of the system, and the two doors are controlled selectively from the single relay 161. Also by this arrangement a single impulse energizing circuit and buried coil in the driveway is sufficient for selective control of both doors. Furthermore, when a two door garage is approached by a single driveway it is possible, in accordance with my two door control system, to plant the impulsing coil in the single driveway an appreciable distance from the garage.

The manual impulser in the house may be operated to generate impulses of either polarity for operating either door. By pressing the magnet 155 in quickly, an impulse of a predetermined polarity is generated. When it is allowed to snap out, an impulse of the opposite polarity is gen-

erated. Hence, if the switch 149 is closed after the magnet is depressed, the impulse generated by depressing the magnet is not applied to the relay. Also it is possible to depress the magnet so slowly that the impulse generated is too feeble to operate the relay, which is then ready to operate in the opposite direction when the magnet 155 is projected rapidly from its coil.

As shown in Figs. 1 and 7, my door control system is adapted for operating a shunt type motor, but the connections are conveniently rearranged for energizing a series type motor, as shown in Fig. 9. For this the motor armature terminal 109 is connected through a conductor 261 to the main line conductor L2. The motor armature terminal 99 is connected by a conductor 263 to the stationary contact 29 on the reversing switch 16, and from its stationary contact 31 a conductor 264 is extended for permanent connection on conductor 105 and relay contact 83. By this arrangement the operation of the reversing switch 16 reversably connects the field of the motor in series with its armature and the series circuit from line L1 is completed by the engagement of the impulse relay bridging contact 75 with the stationary contacts 81 and 83.

As shown in Fig. 10, my control system of Fig. 1 is readily adapted for controlling the operation of a split phase induction motor M comprising field windings MF1 and MF2. This control is readily accomplished by connecting the conductor 107 leading from the conductor 105 to the permanently joined ends of the motor field windings. The reverse field energizing conductors 111 and 115 of the system are then connected to the other ends of the field windings MF1 and MF2 of the motor. From the permanent contact 31 on the reversing switch 16 a conductor 263 is connected to one side of a large condenser C, or other phase shifting impedance device, which is connected from its other side through a conductor 265 to the conductor 93 of the system. By the movement of the reversing switch arm 15 the impedance device C is thus alternatively connected in series between the main line L2 and either one or the other of the motor field windings MF1 or MF2, the other one being connected directly to the service line L2. When the relay moves its contact 75 to engage the adjacent stationary contacts the motor circuit is thus completed for operation in either direction corresponding to the position of the reversing switch 16.

Aside from the specific embodiments of the invention herein shown and described, it will be readily understood the contacts and connections of the switch and the relay may be rearranged to control various types of electrical apparatus and numerous details of the construction may be altered or omitted without departing from the spirit and scope of the invention as disclosed and claimed, and that I do not desire to limit the

invention to the exact constructions herein set forth.

I claim:

1. A garage door operating system having in combination, a pair of doors, a pair of motors, driving mechanism associated with each motor whereby a corresponding one of the doors is moved to opened or closed positions accordingly as the associated motor is operated in one direction or another, a source of electrical energy, switch means operated in accordance with the movement of each door for preparing reverse energizing circuits for the associated motor, a polarized relay for completing the motor energizing circuit last prepared for either motor by the associated switch means, a remote control circuit for actuating said relay, and means associated with said control circuit for providing current of selective polarity for actuating the relay to operate a selected one of the motors to open a corresponding one of the doors.

2. A garage door operating system having in combination, two doors, two motors, a driving mechanism associated with each of said motors for opening and closing a corresponding one of said doors as the motor is actuated in one direction or another, a source of electrical energy, switch means associated with each of said doors for preparing reversely energizing circuits from the source to the respective associated motor, a polarized relay, front contacts on said relay for energizing the circuits prepared for one of said motors, back contacts on said relay for energizing the circuits prepared for the other one of said motors, a remote control circuit for actuating said relay, and means for selectively inducing impulses of suitable polarity for actuating said polarized relay to selectively operate either motor to open or close its associated door.

3. A garage door operating system having in combination, two doors, two motors, a driving mechanism associated with each of said motors for opening and closing a corresponding one of said doors as the motor is actuated in one direction or another, a source of electrical energy, switch means associated with each of said doors for preparing reversely energizing circuits from the source to the respective associated motor, a polarized relay, front contacts on said relay for energizing the circuits prepared for one of said motors, back contacts on said relay for energizing the circuits prepared for the other one of said motors, a remote control circuit for actuating said relay, a solenoid in said control circuit, a reversely magnetizable inducing member adapted to be carried adjacent said solenoid for inducing current impulses of suitable polarity for actuating said polarized relay to selectively operate either motor to open or close its associated door.

WARREN F. WEATHERS.