Oct. 22, 1940. R. CHAMBERS 2,218,505

DOOR OPERATING MECHANISM

Filed Aug. 24, 1937 3 Sheets-Sheet 1

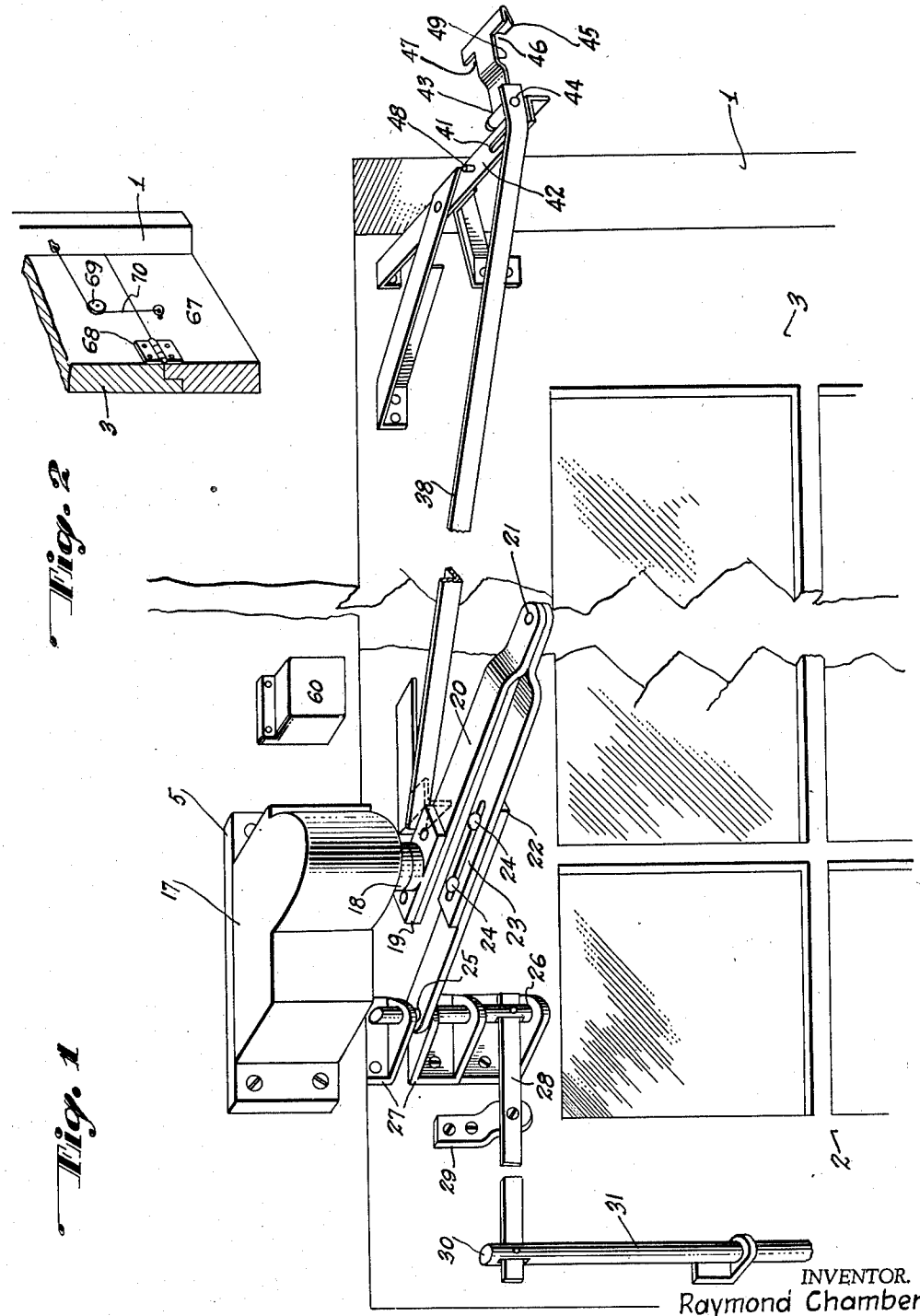


Fig. 2

Fig. 1

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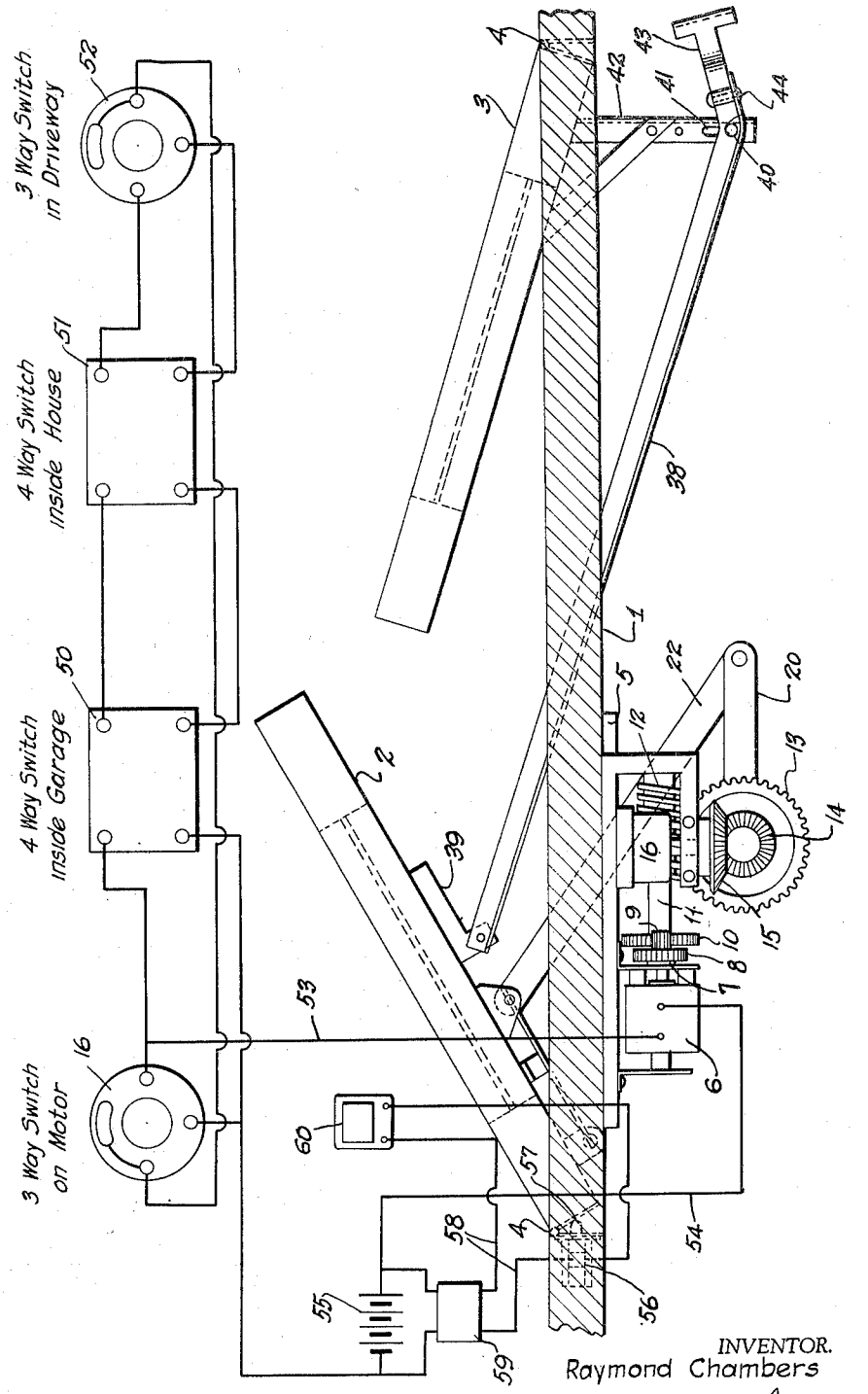


Fig. 3

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DOOR OPERATING MECHANISM

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Fig. 5

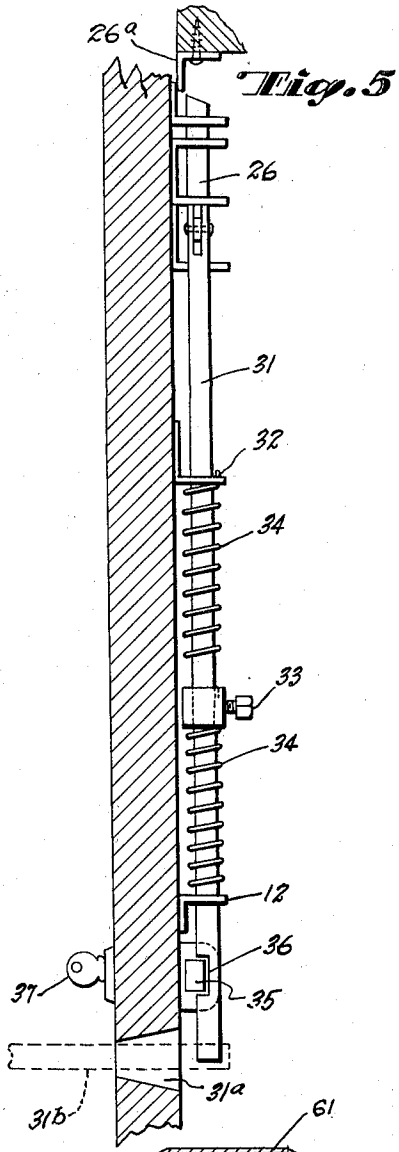
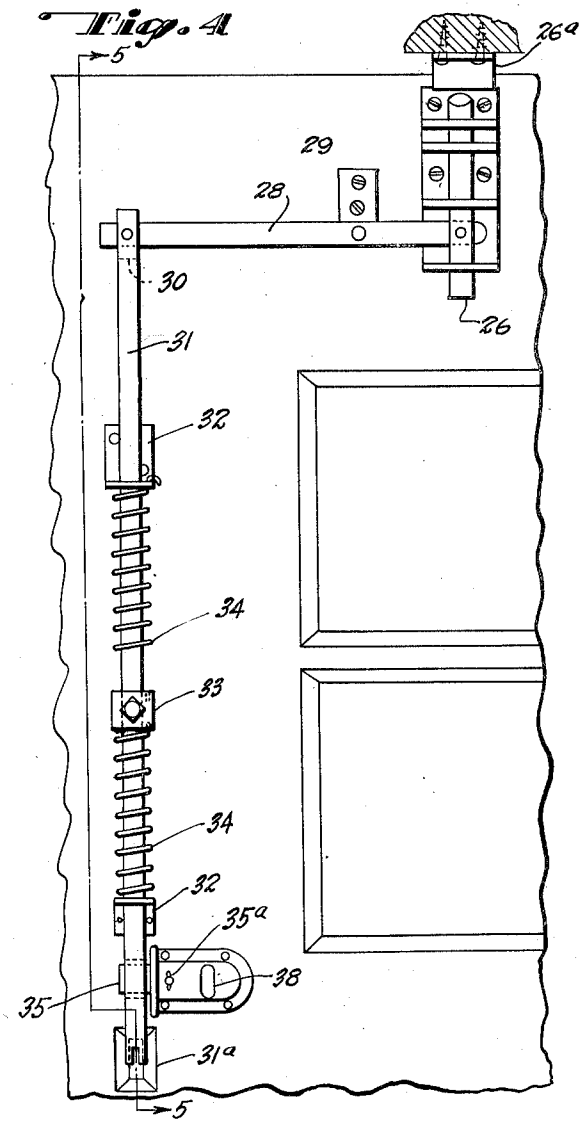


Fig. 4



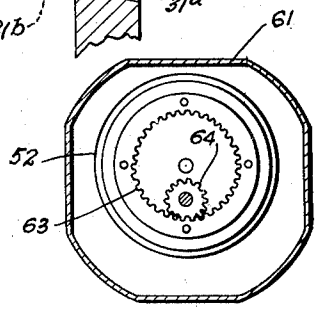


Fig. 7

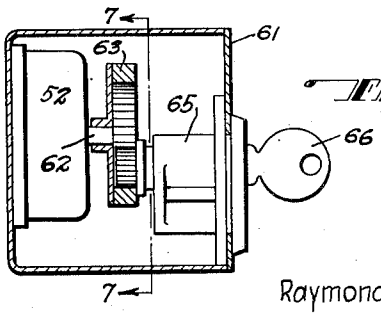


Fig. 6

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UNITED STATES PATENT OFFICE

2,218,505

DOOR OPERATING MECHANISM

Raymond Chambers, Queens Village, N. Y.

Application August 24, 1937, Serial No. 160,593

1 Claim. (Cl. 292—278)

This invention is a door operating mechanism and is directed more particularly to the automatic, electrical operation of hinged or swinging doors, such as are commonly used on garages, warehouses and other places where a relatively wide, unobstructed opening is desired.

The primary object of the present invention is to provide for the efficient operation of swinging doors in a novel and automatic manner, under remote control and the invention is designed more especially for use in the operation of garage doors in such manner that a person desiring to enter the garage may initiate an automatic operation of mechanical and electrical parts to bring about an opening of the door without requiring the occupant of the car to leave the car, or to permit the doors to be closed in a like manner after the car has left the garage.

A further object of the invention is to permit of the initiation of operation of such doors from various control points, for example, somewhere along the drive leading to the garage, within the garage proper, as well as somewhere within the residence with which the garage is associated, and to associate with these various points of control an automatic shut-off, cooperating with the operating mechanism and adapted to de-energize electrical operating circuits after the doors have been fully opened or fully closed, as the case may be.

Another object of the invention is to incorporate, in mechanism of the character described, certain safety measures which, for example, will preclude operation of the doors by unauthorized persons from without; the giving of a warning signal during the opening and closing of the doors; and the construction of power mechanism in such manner that, if the doors meet an obstruction, the mechanism will not be damaged nor injury to the person made possible.

A further object of the invention is to provide for the automatic locking and unlocking of the doors in both open and closed positions and to so arrange the parts that, when the doors are opened, the parts will not be subjected to undue strains in the event of high wind pressure against the doors.

A further object of the invention is to so constitute the doors and interconnect them with the door frame that the presenec of snow or other obstruction, close to the ground exteriorly of the doors, will not interfere with their proper operation. This is accomplished, in accordance with the present invention, by providing the lower portion of the doors with hinged sections, so connected with the door frame that, as the doors are opened, these hinged sections pivoted upwardly but are lowered again when the doors are closed.

Features of the invention, other than those adverted to, will be apparent from the hereinafter detailed description and claims when read in conjunction with the accompanying drawings.

The accompanying drawings illustrate one practical embodiment of the invention, but the construction therein shown is to be understood as illustrative, only, and not as defining the limits of the invention.

Figure 1 is a fragmental perspective of a door and doorway looking from the interior of a garage with the present invention associated with two doors, parts of which are broken away to permit of the showing of the invention on large scale. In Figure 1 the doors are shown in closed position.

Figure 2 is a fragmentary perspective view of one lower corner of a door and jamb, showing the lower hinged door section connected to the jamb in such a way as to bring about pivotal movement of the lower section when the door is opened or closed.

Figure 3 is a plan section looking down on the construction of Figure 1 with the doors partly opened. This view also shows the wiring diagram which I preferably employ.

Figure 4 is a fragmental elevation of the inside face of one door showing the manner of disconnecting the operating mechanism from the door if and when desired.

Figure 5 is a section on the line 5—5 of Figure 4.

Figure 6 is a partial section through a key operated remote control switch which I employ as hereinafter described.

Figure 7 is a section on the line 7—7 of Figure 6.

Referring to the drawings 1 designates a door frame with which is associated two doors 2 and 3 of any appropriate kind and hinged in any suitable way as, for example, by hinges 4 shown in Figure 3. The door and the door frame are conventional and are simply illustrative of one installation with which the present invention may be associated, but, for the purpose of this description, they will be referred to as conventional parts of a garage.

Supported on the door frame 1, above the door opening thereof, is a mounting 5 for a motor and associated gearing. The motor 6 is of the in-

duction type, is rigidly supported on the mounting, and its armature shaft carries the pinion 7 beneath and meshing with a larger gear 8 which, in turn, carries a small pinion 9, meshing with a larger gear 10. This larger gear 10 is fixed on a worm shaft 11 rigid with the worm 12. All the shafts have appropriate bearings in the mounting and motor support and the several gears 7—10 constitute, in effect, a speed reducing gear train, so that I am able to use a relatively light high speed motor to generate sufficient power to do the work required and thus have economical current consumption and compactness.

Meshing with the worm 12 is a worm wheel 13, mounted on an upright shaft and carrying rigid therewith a beveled gear 14 which meshes with a beveled gear 15 fixed on the shaft or spindle of a three-way switch 16, supported on the mounting 5. The motor 6 is thus enabled to drive the worm wheel 13 and operate the three-way switch 16, in proper timed relation to the other operating parts.

The mounting 5, the motor, the gearing and the switch to which I have referred are all contained and housed within a substantially dust-tight casing 17, shown in Figure 1. The only part which projects from said casing is the hub 18 of the worm wheel 13 which extends downwardly through a hole in the bottom of the casing and to which is rigidly secured a plate 19. To this plate is fixed an operating arm 20 which extends for a distance substantially equal to half of the throw required to open the door and is secured, by a pivot 21, to a link 22. This link is made in two sections, at least one of which is slotted at 23 and screws or bolts 24 pass through the slot to permit of adjustment of the length of the link in order that the closed position of the door may be accurately adjusted. The other end of the link 22 is provided with a perforation 25 and this perforation is adapted to receive a pivot stud 26 guided for vertical reciprocation in brackets 27. The lower portion of this pivot stud is slotted to receive one end of a lever 28, pivoted intermediate its ends, on an appropriate bracket 29, mounted on one of the doors, while the other end of the lever 28 passes through a slot 30 in the upper end of a rod 31, as shown in Figures 1, 4 and 5. Rod 31 extends vertically along the inner face of the door and is guided in brackets 32 for vertical reciprocation.

On the rod 31 between the brackets 32 is positioned an adjustable collar having a locking screw 33 and above and below the collar are springs 34. Both of these springs are sufficiently short so that the collar may be shifted and locked in place by the locking screw to render the rod responsive to the operations of either spring. Under ordinary conditions the collar is locked in the position shown in Figure 2, so as to render the rod 31 responsive to the lower spring 34 which tends to push the rod 31 upwardly to withdraw the pivot stud 26 from the pitman and thus detach the pitman from the door. However, the rod is normally held in restraint, with the pitman secured to the door, by a key controlled bolt 35 received in a notch 36 in said rod. The bolt may conveniently form the part of an ordinary snap-lock combination, such as is generally used on garage doors and is adapted to be actuated from the outside by a key 37 and from the inside by a knob 38, seen in Figures 4 and 5.

When the bolt is in the position shown in these figures, the pivot stud 26 will secure the corresponding end of the pitman 22 to the door and render said door controllable by the motor, exclusively. However, if anything should possibly go wrong with the apparatus, such, for example, as the burning out of a fuse due to thunderstorm or for any other reason, the operating mechanism may be disconnected from the doors through operation of the key 37 from the outside or by operation of the knob 36 from the inside, to permit of manual operation of the doors.

It will be apparent that, when the pitman 22 is detached from the door 2, some means should be provided to lock the door shut. To accomplish this result the locking screw 33 is loosened and the collar moved upwardly out of engagement with the lower spring 34 and into cooperative relation with the upper spring 34 and the bolt 35 is locked in retracted position by shifting the snap catch 35*a*, generally provided on snap locks. As a result of this change the rod 31 will be normally depressed by the lower spring 34 sufficiently to cause the upper end of the pivot stud to act as a bolt, cooperating with a stop 26*a* on the top of the door frame in order to lock the doors closed when they are manually operated. The door 2 is provided, adjacent the lower end of the rod 31, with a small hole 31*a* and an implement 31*b*, such as a screw driver, may be passed through said hole from the outside to retract the pivot stud and permit of opening of the doors from the outside, although a pivoted finger piece may be provided for this purpose, if desired.

The doors are connected for simultaneous operation by means of a rigid link 38, one end of which is pivotally secured to a bracket 39 on the door 2 to which the link 22 is secured, while the other end of said link 38 carries a pivot 40 extending through a slot 41 in a bracket 42 fixed on the other door adjacent the hinged edge thereof. The link 38 extends slightly beyond its pivot 40 and carries a latch 43 mounted on a pivot 44. The free end of the latch is broadened out somewhat and is provided with a depending flange 45 bent back under the body of the latch at an angle of about 45 degrees and in this flange 45 is a notch 46 sufficiently wide to straddle the main bar of the bracket 42. Furthermore the edge 47 of said flange 45 is beveled away, so that, as the doors approach fully opened position, the edge 47 will ride up over the main bar of the bracket 42 until fully opened position is attained, whereupon the notch 46 will drop over said bar and lock the door 3 in open position and sufficiently tight so that it will not excessively rattle under wind pressure.

It will be noted, however, that there is a pin 48 mounted on said bar of bracket 42 and this pin is so positioned that, when the door 2 starts to close, the pivot 40 will travel along the slot 41 (see Figure 3) until an offset cam surface 49 on the latch engages the pin 48 and causes the latch to be lifted and the door 3 thus released for closing movement.

It will thus be seen that the two doors are secured together by a single rigid link, to be operated in a substantially simultaneous manner when the door 2 is operated by the motor, as will be presently described, but, by reason of the position, size and placement of the brackets 42 and 39 on the respective doors, the door 2 will always open in advance of the door 1, while the door 3 will always close quicker and in advance of the door 2. With this arrangement the free edges of the doors may be rabbeted in the usual

manner to overlap one another and produce a storm-proof joint between them.

The manner in which the doors are operated and the electrical circuits which enter into the control of such operation will next be described.

It will be apparent from the foregoing description of the mechanical parts that the doors are operated through rotation of the crank arm 20 by the motor 6, the throw of this crank arm being so adjusted as to bring about the movement of the doors from opened to closed position and vice versa. The parts are also so arranged that the crank 20 and the link 22 will be on dead centers when the doors are opened, as well as when the doors are closed, so that the door 2 is locked open or closed in its terminal positions. This requires that the operation of the motor be properly timed to bring about a stoppage of the crank in substantially the right position. It is for this reason that I control the switch 16 through the beveled gears 14 and 15 for these beveled gears are secured to the worm wheel 13 which is secured to the crank 20.

The switch 16 is one of several switches entering into the construction and three additional switches are shown in the wiring diagram of Figure 3 and are indicated by the reference characters 50, 51 and 52. Of these switches, the switch 16 is interconnected with the worm wheel 13, as stated, and is automatically operated as the worm wheel is rotated, whereas the switches 50, 51 and 52 are all manually operable switches. Switches 50 and 51 may be snap switches, while the switch 52 is preferably a key operated switch.

In practice, the switch 50 is placed inside of the garage in any convenient position, the switch 51 is placed in any convenient position inside of the house, while the switch 52 is placed outside of the house and outside of the garage, preferably at one side of the driveway through which a car must pass in entering or leaving a garage. The switches 16 and 52 are three way switches, while the switches 50 and 51 are four way switches.

These four switches are connected together in a conventional three-wire multiple switch circuit, as shown in the drawings, such as are commonly used in house wiring to provide a circuit wherein the operation of any particular switch will energize the de-energized circuit, while the operation of any particular switch will de-energize an energizing circuit. In other words, the circuit is substantially conventional for the remote control from a number of points of a common electrical machine or lamp. In the present instance, the machine is the motor 6 and it is connected by a wire 53 into the three-wire multiple switch circuit and, through a wire 54, to the source of power, indicated diagrammatically at 55. As a result of this wiring the motor may be controlled by operating any one of the switches 16, 50, 51 or 52. The control of the switch 16 is automatic and is timed with the motor, but the operation of all of the other switches is manual and at the wall of the operator.

As a practical illustration of operation, suppose that the doors of the garage are closed, all circuit de-energized and that a car desires to enter the garage. As the car approaches the switch 52 in the driveway, the driver stops and turns on the switch. This completes the circuit to the motor which commences to operate as the occupant of the car drives on to place his car into a position to enter the garage when the doors are opened. The motor is a high speed motor and operates rapidly to open the doors as will be apparent from the foregoing description. When the doors are fully opened the switch 16, by virtue of its timed interconnection with the motor, will automatically break the circuit and de-energize the motor. The car may be then driven into the garage and left by the occupant who may initiate the closing of the doors by operating the switch 50 in the garage or if it is more convenient, he may enter the house, deposit bundles which he is carrying, and thereafter operate the switch 52 within the house to again set the motor into operation for the purpose of closing the doors. In other words, the switch 16 is a purely automatic switch, whereas the switches 50, 51 and 52 are remote control switches at convenient locations and are operable manually when desired. The operation of any switch will turn on the power of the motor if the motor is de-energized at the time and the subsequent operation of any switch will de-energize the motor.

It is not considered necessary to describe here all possible combinations or permutations of the various circuits entering into this multiple switch system, as the wiring diagram shown in the drawings will be perfectly clear to those skilled in the art, when it is borne in mind that the individual instruments are conventional.

It is here worthy of note that the motor employed as a prime mover for the doors is of the induction type, so that if the doors meet any obstruction, while either opening or closing, the motor will simply stop without burning out or without doing any damage.

As a further safety measure, I preferably incorporate in the door jamb a push button switch 56, the button 57 of which projects from the jamb of the door, so as to be actuated as the door 2 is opened or closed. This switch is included in a circuit 58, fed from the source of current supply 55 through a transformer 59 and this circuit includes a buzzer 60 which is actuated when the door is opened and when the door is closed, so that persons standing in the path of the door will be advised of its operation and can move out of the way.

As a protective measure against unauthorized operation of the doors from without the garage, as when the doors are closed and locked, I preferably make the switch 52 in the driveway a key operated switch and details of this mechanism are shown in Figures 6 and 7. In this showing the switch 52 is contained within a casing 61 with the operating spindle 62 of the switch secured to a ring gear 63. A pinion 64 meshes with this ring gear and is secured to the barrel of a conventional barrel lock 65, rigidly secured to the casing 61 and operable by a key 66. The key is adapted to be retained in the possession of authorized persons who are thus enabled to exclusively control the circuit, at will, from the driveway.

I have found in the operation of the doors by mechanical means, that the presence of snow or ice about the outside of garage doors creates a serious problem. I therefore provide, according to this invention, simple and efficient means for overcoming this difficulty. Thus, as shown in Figure 2, the lower portion of each door is in the form of a hinged flap or section 67 secured to the main portion of the door by hinges 68. Each door also carries an anti-friction roller 69 and a cable 70 is secured at one of its ends to the flap 67 and at its other end to the door casing 1, at a

point spaced from the inner face of the door. As soon as the door starts to open, the tension on this cable causes the flap 67 to be hinged upwardly and sufficiently out of the way of clear snow which ordinarily accumulates in front of garage doors in the winter. The flaps are held up as long as the doors are open, but when the doors are closed the flaps gravitate into their lowered positions and are held against swinging inwardly by the conventional abutment strips on the door frame.

My experience of the door operating mechanism, as hereinbefore described, has shown the same to be thoroughly satisfactory in all respects. The parts are of rugged construction, well able to withstand hard usage through indefinite periods without getting out of order or requiring any servicing whatsoever. The motor employed is small and economical to use, both from the standpoint of installation and subsequent operation. The connections between the motor and the door, as well as between the two doors, are so disposed as to transmit the maximum force with the minimum of applied power. Multiplicity of costly equipment has been eliminated and the construction is just about as simple as can be provided to do the work required. In actual use the invention provides a great convenience to the driver of a car, for he or she does not have to get in and out of the car to open and close the doors, as the operation of the push buttons is all that is necessary to initiate and conclude operation of such doors.

The foregoing detailed description sets forth the invention in its preferred practical form, but the invention is to be understood as fully commensurate with the appended claims.

Having thus fully described the invention, what I claim as new and desire to secure by Letters Patent is:

An assembly of the character described comprising a pair of hinged doors, the first of which is provided with a relatively short bracket and the second of which is provided with a relatively long bracket having therein an elongated slot, a link, one end of which is secured to the short bracket and the other end portion of which carries a pivot extending through the slot in the long bracket, a latch pivotally mounted on the latter end of the link and adapted to gravitate into locking engagement with the long bracket when the second door reaches fully opened position to lock the latter door in such position, and camming devices on the long bracket and on the latch adapted to engage one another to release the latch from the long bracket when the pivot is slid longitudinally of the slot through longitudinal movement of the link initiated by the closing of the first door.

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