July 1, 1930. O. A. RITON 1,768,714

SWITCH MECHANISM FOR CONTROLLING ELECTRIC CIRCUITS

Filed Dec. 27, 1926 4 Sheets-Sheet 1

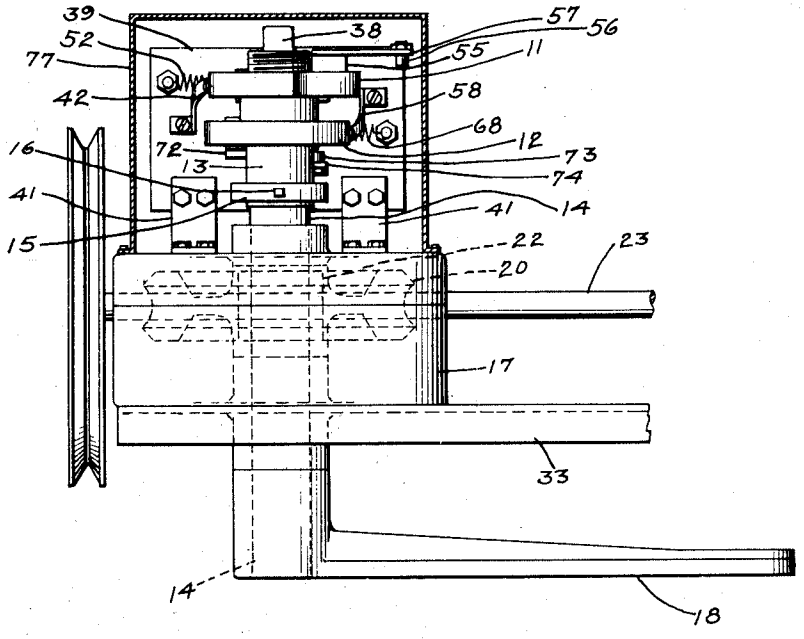


FIG. 1

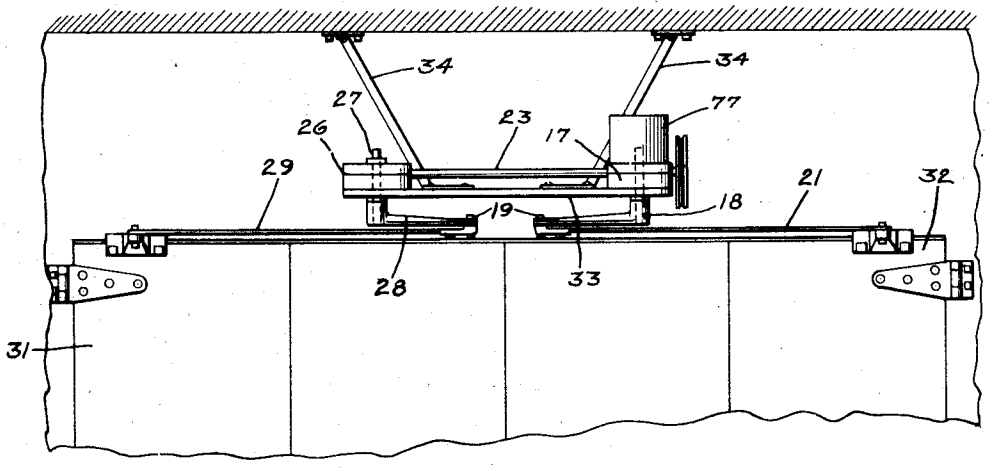


FIG. 6

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SWITCH MECHANISM FOR CONTROLLING ELECTRIC CIRCUITS

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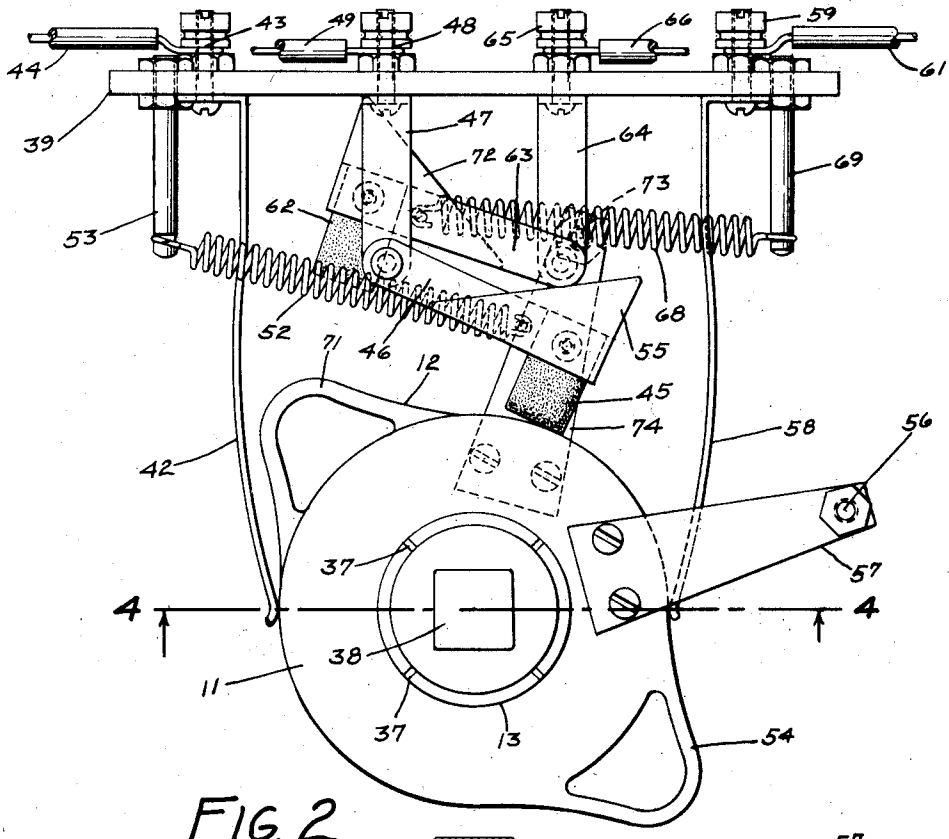


FIG. 2

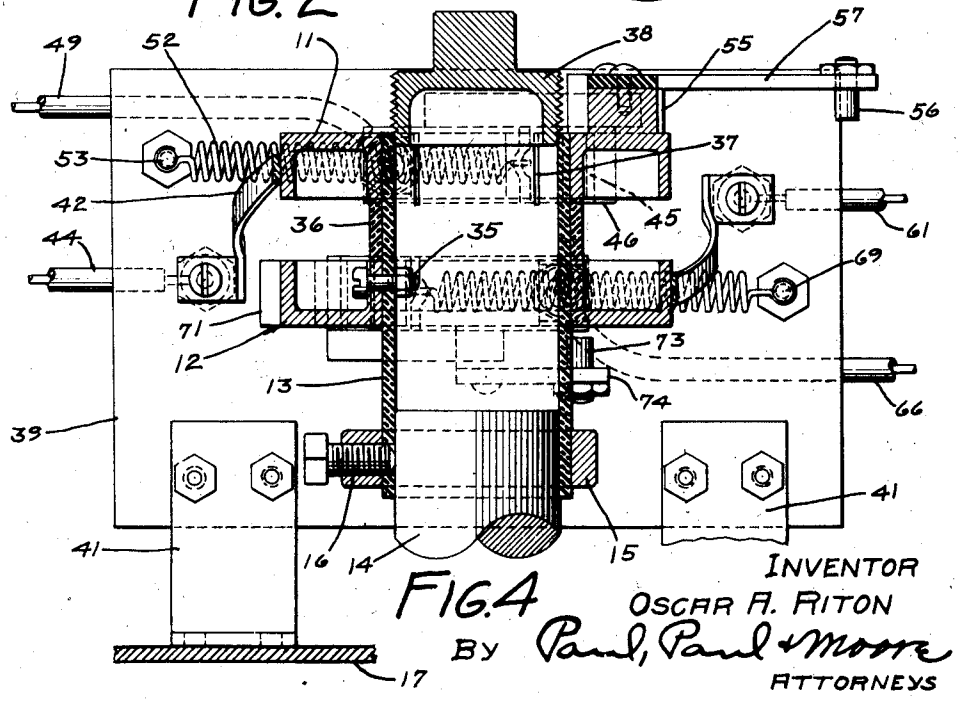


FIG. 4

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SWITCH MECHANISM FOR CONTROLLING ELECTRIC CIRCUITS

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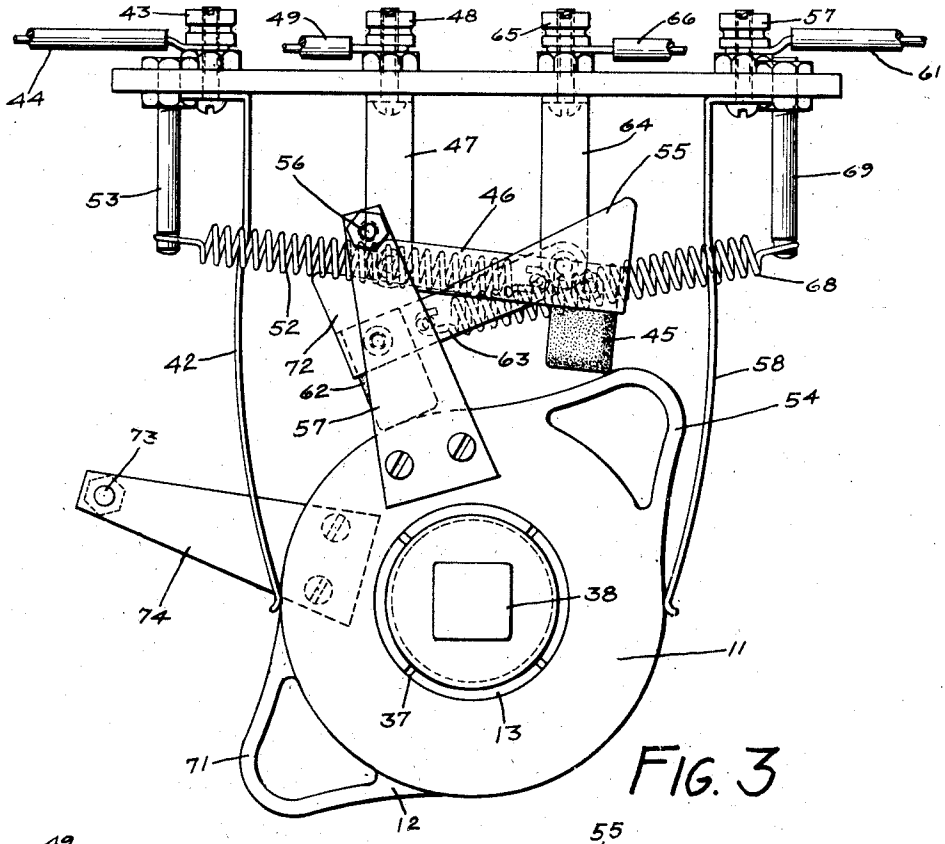


FIG. 3

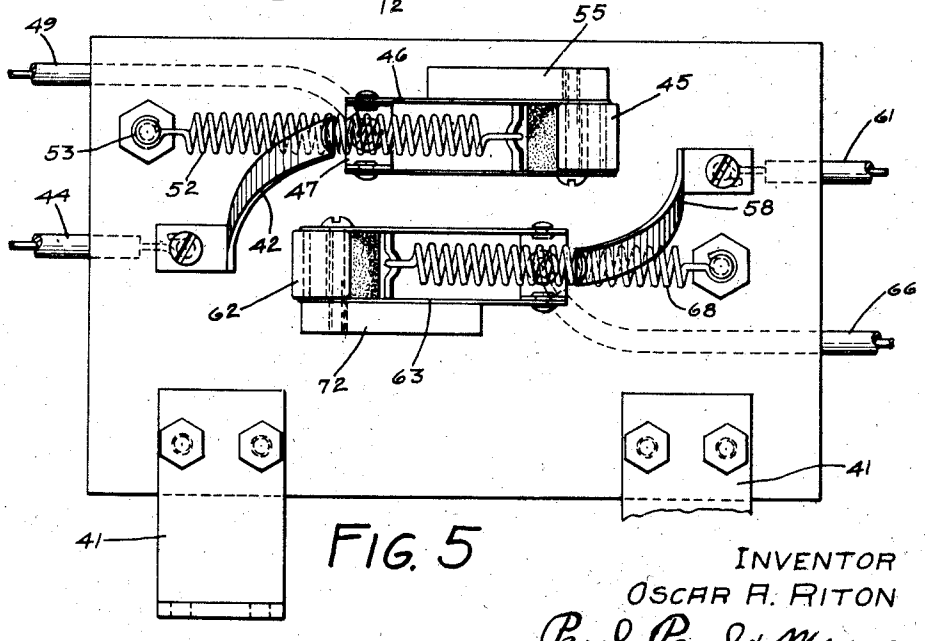


FIG. 5

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SWITCH MECHANISM FOR CONTROLLING ELECTRIC CIRCUITS

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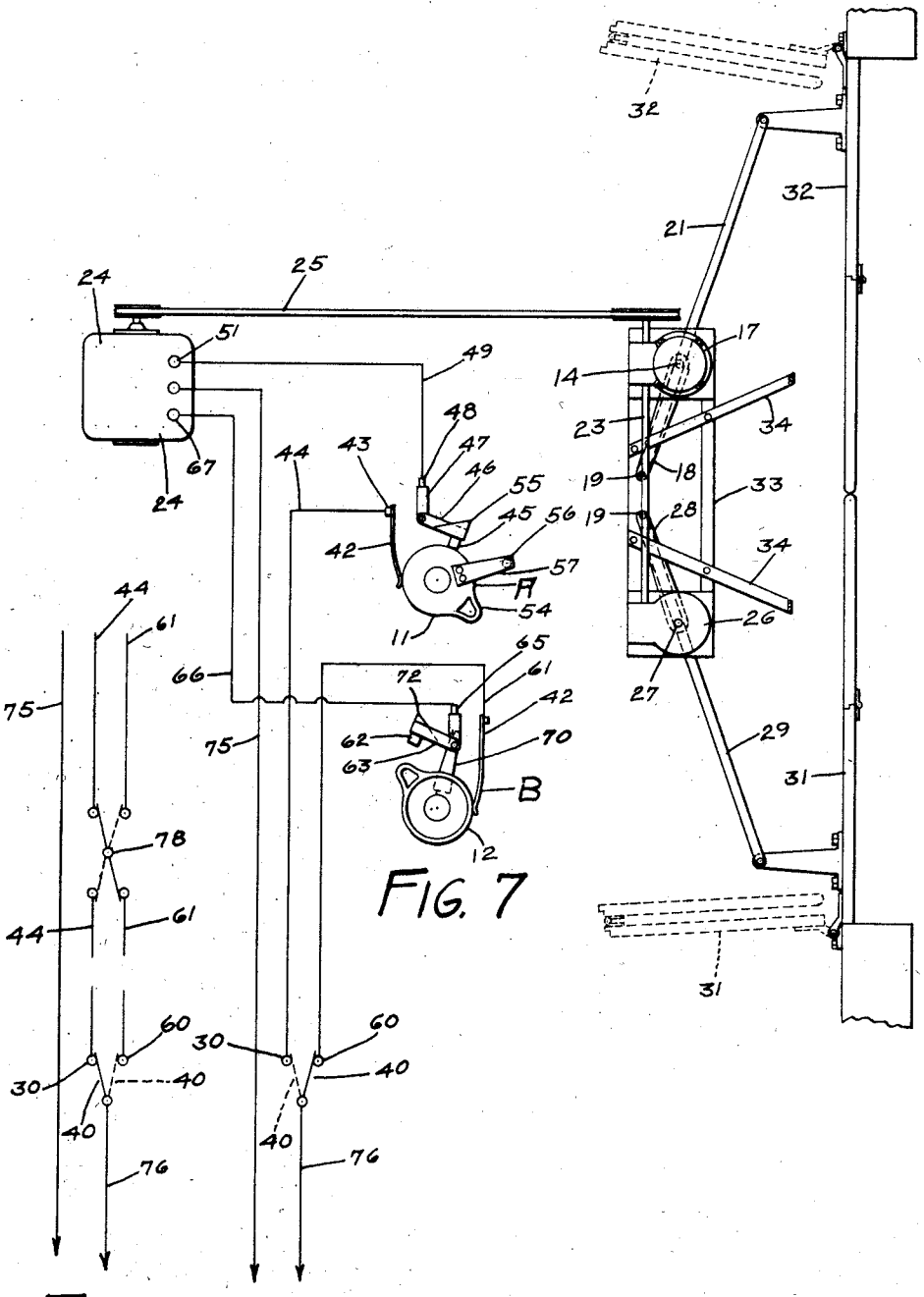


FIG. 7

FIG. 8

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UNITED STATES PATENT OFFICE

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SWITCH MECHANISM FOR CONTROLLING ELECTRIC CIRCUITS

Application filed December 27, 1926. Serial No. 157,198.

This invention relates to an improved switch mechanism adapted for use in connection with a reversible motor to control the directional flow of the current through the windings thereof to control the rotation of the motor, and an object of the invention is to provide such a mechanism adapted to be controlled by the manipulation of a single control switch.

A further object of the invention is to provide a switch mechanism particularly adapted for use in connection with a reversible motor to control the rotation thereof, and which mechanism is so arranged that when the control switch therefor is initially actuated to start the motor, the latter will continue to rotate in one direction for a predetermined period of time, after which the motor will automatically come to rest, and, when the control switch is again actuated, the motor will again function, but its direction of rotation will be reversed, the motor continuing in such reversed direction of rotation for a predetermined time interval until its rotation is again automatically interrupted.

A further object is to provide a switch mechanism of the above type adapted for use to control the operation of a reversible motor having a connection with a movable member such, for instance, as a garage door or doors, and, which is so constructed and arranged that the opening and closing of the door is conveniently brought about at will by the simple manipulation of a single control switch mounted adjacent the door or remote therefrom.

A further and important object of the invention is to provide such a switch mechanism particularly adapted for use to automatically open and close a garage door from a remote point, which is so constructed that the movement of the door, in either direction, may be interrupted at any point in its travel, after which the door will automatically be returned to its starting position, whether such position be opened or closed position, or, if desired, the operator may, by the simple manipulation of a control switch, cause the door to be partially opened, thence partially returned to its starting position, and upon further manipulation of the same control switch, cause the door to resume and complete its initial movement, whether such movement be a closing or opening movement.

A further object is to provide a switch mechanism for controlling electric circuits, including a rotary circuit-breaker mounted remote from the motor and functioning to automatically open one of the control circuits for the motor to interrupt its function at the end of each movement of the operated member, such as a garage door, after said control circuit has been initially closed to start the motor by the manipulation of a control switch and, which circuit-breaker will, at the same time, condition another control circuit through the circuit-breaker in such a manner that when the control switch is again actuated, the motor will function to return the operated member to its normal position.

A further object is to provide a switch mechanism of the class described, of simple and inexpensive construction, comprising comparatively few parts, and which will be positive and efficient in performance.

Other objects of the invention will appear from the following description and the accompanying drawings, and will be pointed out in the annexed claims.

In the accompanying drawings there has been disclosed a structure designed to carry out the various objects of the invention, but it is to be understood that the invention is not confined to the exact features shown, as various changes may be made within the scope of the claims which follow.

In the accompanying drawings forming a part of this specification,

Figure 1 is an elevational view of the circuit-breaker mechanism showing the same operatively connected to a gear drive;

Figure 2 is an enlarged plan view of the circuit-breaker showing the upper parts positioned as shown at "A" in Figure 7, and the lower parts positioned as shown at "B" in the same figure;

Figure 3 is a similar view but with the parts shown in different positions, the cam on the upper contact member being about to

move its complementary brush out of contact with the contact member to open the motor circuit to stop the motor;

Figure 4 is a sectional elevation on the line 4—4 of Figure 2;

Figure 5 is an elevational view of the movable contacts;

Figure 6 is a view showing the invention operatively connected to a pair of garage doors;

Figure 7 is a diagrammatic representation of the invention as applied to a pair of garage doors; and

Figure 8 is a diagrammatic view showing two control switches in the motor circuit.

In order to afford a clear description and understanding of the novel switch mechanism featured in this mechanism, the mechanism is shown operatively connected to a pair of swinging doors such as the doors of a garage.

Circuit-breakers are provided for automatically opening the circuits to the motor at the end of each movement of the doors and are shown in detail in Figures 2, 3, 4 and 5. These circuit-breakers comprise rotary contact members 11 and 12 mounted upon an insulating sleeve 13 terminally secured to an operating shaft 14 by a collar 15 and set screw 16. The shaft 14 is mounted in suitable bearings provided in a gear casing 17 and has a crank arm 18 secured to the lower end thereof having a crank pin 19 mounted therein adapted to receive one end of a connecting rod 21, as shown in Figure 6. A worm gear 20 is mounted upon the shaft 14 within the casing 17 and meshes with a worm pinion 22 secured to a shaft 23 also mounted in bearings provided in the casing 17. Power is transmitted to the shaft 23 from a motor 24 having a belt drive 25 connecting it with the shaft 23 (see Figure 7). The opposite end of the shaft 23 is mounted in a similar gear casing 26 also having an upright shaft 27 therein, to the lower end of which a crank arm 28 is secured, as shown in Figure 6. A connecting rod 29 connects this crank arm with the door 31 while the connecting rod 21 is operatively connected with the door 32. The two gear cases 17 and 26 are mounted upon a frame 33 supported by suitable hangers 34, as shown in Figure 6.

The lower rotary contact member 12 is secured to the insulating sleeve 13 by such means as a screw or bolt 35, and the upper contact member 11 is adjustably mounted upon the sleeve 13 and is spaced from the lower contact member 12 by a spacing collar 36. The upper end of the sleeve 13 is provided with slots 37, as shown in Figures 2 and 4, and is interiorly threaded to receive an expansion plug 38 received in threaded engagement therewith. This plug is slightly tapered so that when it is terminally screwed into the sleeve 13, it will expand the walls of the sleeve against the bore of the rotary member 11 to secure it to the sleeve for rotation therewith as a unit. By thus adjustably securing the contact member 11 to the sleeve 13, it may be relatively rotated thereon to adjust its position with respect to the lower contact member 12 to control the oscillatory movement of the shaft 14 or the swinging movement of the doors, operatively connected therewith.

An insulating panel 39 is mounted upon the gear casing 17 and is spaced therefrom as shown in Figures 2 and 3. This panel is supported upon the casing by means of suitable brackets 41 as shown in Figure 1. The panel 39 provides means for supporting the terminals or binding posts to which the conductors, connecting the motor and control switch with the circuit-breakers, are connected. A flexible contact finger 42 is mounted upon the panel 39 and has its flexing end in constant electrical contact with the upper rotary contact member 11, as shown in the drawings. The other end of the finger 42 is electrically connected to a terminal post 43 having a conductor 44 leading therefrom to a terminal 30 of a control switch 40, of ordinary construction, and shown in the diagrammatic view, Figure 7. A brush 45 is supported in an arm 46 pivotally mounted upon a supporting member 47 secured to the panel 39 and electrically connected to a binding post 48, having a conductor 49 connecting it with the terminal 51 of the motor 24 as shown in Figure 7. A tension spring 52 has one end connected to the arm 46 and its opposite end secured to the post 53, mounted on the panel 39. This spring is arranged to alternately hold the brush 45 in and out of electrical contact with the rotary contact member 11.

The means provided for automatically moving the brush 45 out of electrical contact with the contact member 11 consists of a cam 54, preferably integrally formed with the contact member 11, as shown in Figure 2. This cam 54 is adapted to engage the brush 45 and move it to the position shown in Figure 3, where it is about to snap out of contact with the member 11 by the action of the spring 52. By reference to Figure 3 it will be noted that the connection of the spring with the arm 46, has been moved to a point substantially in alignment with the pivotal connection of the arm with the support 47, and the connection of the spring with the post 53. Thus it will be seen that as soon as the end of the spring, connected with the arm 46, is moved toward the panel 39 passes out of alignment with the pivotal connection of the arm with the support 47 and the connection of the spring with the post 53, the action of the spring 52 will cause the brush to be moved out of contact with the cam 54, thus making a quick break in the circuit with the resultant elimination of arcing between contacts.

The means provided for moving the brush 45 into contact with the contact member 11, after it has been moved out of contact therewith, as above described, consists of an inclined cam 55 secured to the arm 46 and arranged to be engaged by a pin 56, terminally mounted upon an insulating arm 57 secured to the contact member 11, as shown in Figures 2, 3 and 4. During the oscillatory movement of the contact member 11 from the position shown in Figure 2 to that shown in Figure 3, the pin 56 will pass over the cam 55 before the latter is moved outwardly away from the contact member 11 by the action of the cam 54 engaging the brush 45. Thus when the brush is moved out of engagement with the contact member 11 by the action of the spring 52, and the movement of the contact member 11 is reversed, by the manipulation of the control switch 40, the cam 55 will be positioned in the path of the pin 56 so that it will be engaged by the latter and moved towards the contact member 11 until the connection of the spring with the arm 46 passes over an imaginary center line, drawn through the pivotal connection of the arm 46 with the support 47 and the connection of the spring 52 with the post 53, after which the action of the spring will cause the brush to be immediately moved into electrical contact with the contact member 11. Thus it will be noted that the moving of the brush 45 out of and into electrical contact with the contact member 11 is controlled respectively by the cams 54 and 71.

The lower rotary contact member 12 is likewise provided with a complementary flexible contact finger 58 having one end in constant electrical contact with the member and its other end mounted upon the panel 39 and electrically connected to a terminal post 59, having a conductor 61 connecting it with the terminal 60 of the control switch 40. A similar brush 62 is adapted to be moved into and out of electrical contact with the contact member 12, and is supported in an arm 63 pivotally mounted upon a support 64 mounted upon the panel 39 and electrically connected to a binding post 65, having a conductor 66 connecting it with the terminal 67 of the motor 24. This arm 63 is likewise held in and out of electrical contact with the contact member 12 by means of a spring 68, having one end connected with the arm 63 and its other end secured to a post 69, as shown in Figures 2 and 3. The function of this spring is similar to that of the spring 52. A cam 71 is peripherally formed upon the contact member 12 adapted to engage the brush 62 to move it out of contact therewith, as shown in Figure 2. The arm 63 also has a cam 72 adapted to be engaged by a pin 73 carried by an insulating arm 74, to move the brush into engagement with the contact member 12, in a manner similar to the operation of the cam 55 and pin 56.

The switch mechanism therefore comprises two circuit-breakers; one connected in series with the conductors 49 and 44, connecting the terminal 51 of the motor with the terminal 30 of the control switch 40, and the other similarly connected with the conductors 61 and 66, connecting the terminal 67 of the motor with the terminal 60 of the control switch. The conductor 75 of the motor 24 leads directly therefrom to the supply circuit, not shown. A conductor 76 also connects the control switch 40 with the other side of the supply circuit.

The operation of the doors 31 and 32 is brought about by the simple manipulation of the control switch 40 which, as shown in Figure 7, is of the ordinary 3-way type. When the control switch is positioned as shown in Figure 7, the apparatus will be inoperative as a result of the brush 62 being out of contact with the contact member 12. However, when the mechanism is thus positioned it will be noted that the brush 45 is in electrical contact with the contact member 11, thus conditioning or presenting a circuit to the motor as follows: From the control switch through the conductor 44, terminal post 43, contact finger 42, rotary contact member 11, brush 45, arm 46, support 47, terminal post 48, through the conductor 49 to the terminal 51 of the motor, thence from the motor 24 through the conductor 75 to one side of the supply circuit. Thus when the control switch 40 is moved from the full to the dotted-line position shown in Figure 7, the above described circuit will be closed to the motor, thereby causing the motor to start with the resultant operation of the upright shaft 14 and therefore the crank arms 18 and 28. The motor will thereafter continue to rotate in one direction until the cam 54 engages the brush 45 and moves it out of electrical contact with the contact member 11, which will automatically open the motor circuit with the resultant interruption of the motor. During such movement of the shaft 14 the pin 73, carried by the contact member 12, will engage the cam 72 and move the brush 62 into electrical contact with the rotary contact member 12, thereby presenting another circuit to the motor which, when closed by the control switch 40, will cause the motor to rotate in a reverse direction of rotation. Thus, by the simple manipulation of the control switch 40, the crank arms 18 and 28 may be caused to oscillate, at will, in either direction to open or close the doors 31 and 32 as desired. The circuit-breakers are so arranged that a circuit will always be presented to the motor through one of the circuit-breakers.

After the control switch has been operated to start the motor to open the doors, and it

is desired to return the doors to their closed position before the opening movement thereof has been completed, it is only necessary to again manipulate the control switch to close the other circuit of the motor which will thereafter cause the immediate reversal of the motor to return the doors to their closed position. Thus the movement of the doors in either direction is controlled at will by the simple manipulation of the control switch 40.

The circuit-breakers are not a part of the motor nor are they mounted thereon. They are carried by the gear casing 17 as shown in Figure 1. A housing 77 is mounted upon the gear casing 17 and provides a closure for the circuit-breakers. The mechanism is very simple and comprises few operating parts as compared with switch mechanisms now in use. Its construction is such that all parts are accessible and may readily be interchanged for new parts, when worn, should the occasion arise.

Figure 8 illustrates a motor control circuit wherein two switches are employed for controlling the operation of the motor. A switch 78 of the ordinary 4-way type is electrically connected with the conductors 61 and 44 and functions in a manner similar to the control switch 40, to alternately effect the closing of the motor circuits. Obviously, two or more control switches may be employed in connection with the control switch 40 so that the opening and closing of the doors may be effected from remote places in a building as, for instance, one switch may be positioned adjacent the doors, another in an office near by, and a third switch may be located at some other point in the garage, so that when it is desired to open or close the doors it may be conveniently brought about by the manipulation of any one of the control switches thus located at various places in the building.

I claim as my invention:

1. A switch mechanism comprising a circuit, a rotary contact member electrically connected with said circuit, means for operating said member, a switch element also connected with the circuit and adapted to engage said rotary member, means on the periphery of said rotary member adapted to move said switch element out of electrical connection with said member, and means also carried by the rotary member adapted to move the element into electrical connection with said rotary member to alternately open and close said circuit.

2. A switch mechanism comprising a circuit, rotary contact members, insulated from one another and each electrically connected with said circuit, means for simultaneously operating said rotary members, a switch element for each rotary member also connected with said circuit, and means on said contact members operable to move said switch elements into and out of electrical connection therewith to alternately open and close said circuit.

3. A switch mechanism comprising a circuit, rotary contact members, insulated from one another and each electrically connected with said circuit, means for simultaneously operating said rotary members, a switch element for each rotary member also connected with the circuit, a cam on each rotary member operable to move its complementary switch element out of electrical connection therewith, and means on said contact members adapted to move said switch elements into electrical connection with their complementary rotary members.

4. A switch mechanism comprising a circuit, rotary contact members electrically connected with said circuit, means for operating said members, said rotary members being insulated from one another and adapted for simultaneous operation, a switch element for each rotary member also electrically connected with said circuit, and means carried by said rotary contact members adapted to alternately move said switch elements into and out of electrical connection with their respective contact members, whereby one of said switch elements will always be in circuit-closing position.

5. A switch mechanism comprising a circuit, an insulating sleeve having rotary contact members mounted thereon in spaced relation and each electrically connected with said circuit, means for operating said sleeve and members, a switch element for each rotary member also electrically connected with said circuit, and means carried by said rotary contact members adapted to alternately move said switch elements into and out of electrical connection with their respective contact members, whereby one of said switch elements will always be in circuit-closing position when the other is in circuit-opening position.

6. A switch mechanism comprising a plurality of circuits, a control switch associated with said circuits, a pair of rotary contact members each electrically connected with one of said circuits, means for operating said contact members, a switch element for each circuit adapted to be moved into and out of electrical connection with its complementary rotary contact member, and means carried by said contact members adapted to alternately move said switch elements into and out of electrical connection with their respective rotary contact members, whereby one of said elements will be in circuit-closing position when the other is in circuit-opening position, thereby causing one or the other of said circuits to be conditioned to permit functioning of said conditioned circuit, when said control switch is actuated.

7. A switch mechanism comprising two

circuits connected with a motor and each connected with a supply circuit, a control switch associated with said circuits, two rotary contact members, each electrically connected with one of said circuits, a switch element also connected with each circuit and each adapted to be electrically engaged with one of said rotary contact members to condition one of said circuits, means operable by movement of said contact member to alternately move said switch elements into and out of electrical connection with their respective rotary contact members, the operation of said switch elements being such that when one element is in circuit-closing position, the other will be in circuit-opening position, and whereby said circuits will be alternately conditioned for operation; whereby when said control switch is actuated, one or the other of said circuits will be caused to function.

8. A switch mechanism comprising in combination, a plurality of circuits, an insulating sleeve having rotary contact members mounted in spaced relation thereon and adapted for rotary adjustment with respect to one another, a flexible contact finger for each member constantly engaged therewith and each electrically connected with one of said circuits, a support for said contact fingers, switch elements also mounted upon said support and each adapted to engage one of said rotary members, a tension member for each switch element adapted to retain said elements either in circuit-opening or circuit-closing positions, and means carried by said rotary members and adapted to engage said switch elements to alternately move them into and out of electrical connection with their respective contact members, whereby said circuits will be alternately opened and closed, said switch elements being adapted for a quick make-and-break movement.

9. A switch mechanism comprising in combination, a plurality of circuits, an insulating sleeve having rotary contact members mounted in spaced relation thereon and adapted for rotary adjustment with respect to one another, a flexible contact finger for each member constantly engaged therewith and each electrically connected with one of said circuits, a support for said contact fingers, switch elements also mounted upon said support and each adapted to engage one of said rotary members, a tension spring connected with each switch element and adapted to retain said elements either in circuit-opening or circuit-closing positions, a cam on the periphery of each rotary member adapted to engage their complementary switch elements and to move them out of electrical connection with their respective contact members, and a cam surface on each switch element adapted to be engaged by means on said rotary contact members to move said elements into circuit-closing positions, said cams, cam surfaces and cam surface-engaging means being so arranged as to cause said elements to be alternately moved into and out of electrical connection with their respective contact members whereby, when one circuit is open the other will be closed.

10. A switch mechanism including a circuit, a contact member electrically connected with said circuit and adapted for rotary movement, a switch element also connected with said circuit, means connected with said switch element and adapted to hold it in or out of electrical contact with said rotary contact member, and means operable by movement of the contact member to move said switch element in and out of electrical contact therewith.

11. A switch mechanism including a circuit, a contact member electrically connected with said circuit and adapted for rotary movement, a switch element also connected with said circuit, yieldable means connected with said switch element and adapted to hold it in or out of electrical contact with said rotary contact member, and means operable by movement of the contact member in one direction, to move said switch element into electrical contact therewith, and adapted upon movement of the member in the opposite direction, to move said switch element out of electrical contact therewith.

12. A switch mechanism including a circuit, a contact member electrically connected with said circuit and adapted for rotary movement, a quick make-and-break switch element also connected with said circuit, yieldable means connected with said switch element and adapted to hold it in or out of electrical contact with said rotary contact member, and means carried by said member and adapted, upon movement of the contact member in one direction, to move said switch element into electrical contact therewith, and other means also carried by said rotary contact adapted upon movement of the member in the opposite direction, to move said switch element out of electrical contact therewith.

In witness whereof, I have hereunto set my hand this 21 day of December, 1926.

OSCAR A. RITON.