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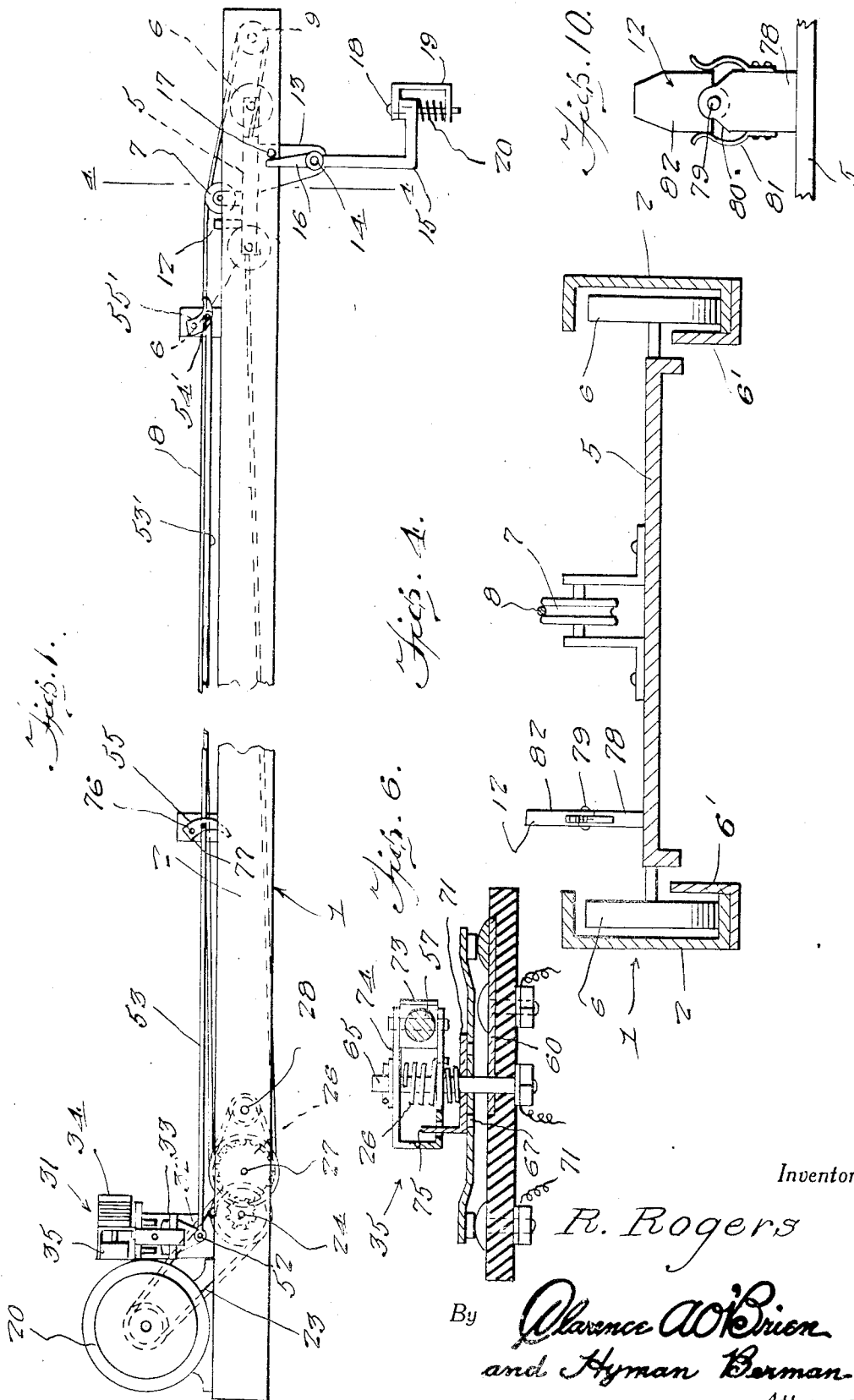
R. ROGERS

2,309,984

OVERHEAD DOOR OPERATING MEANS

Filed Nov. 15, 1939

3 Sheets-Sheet 1



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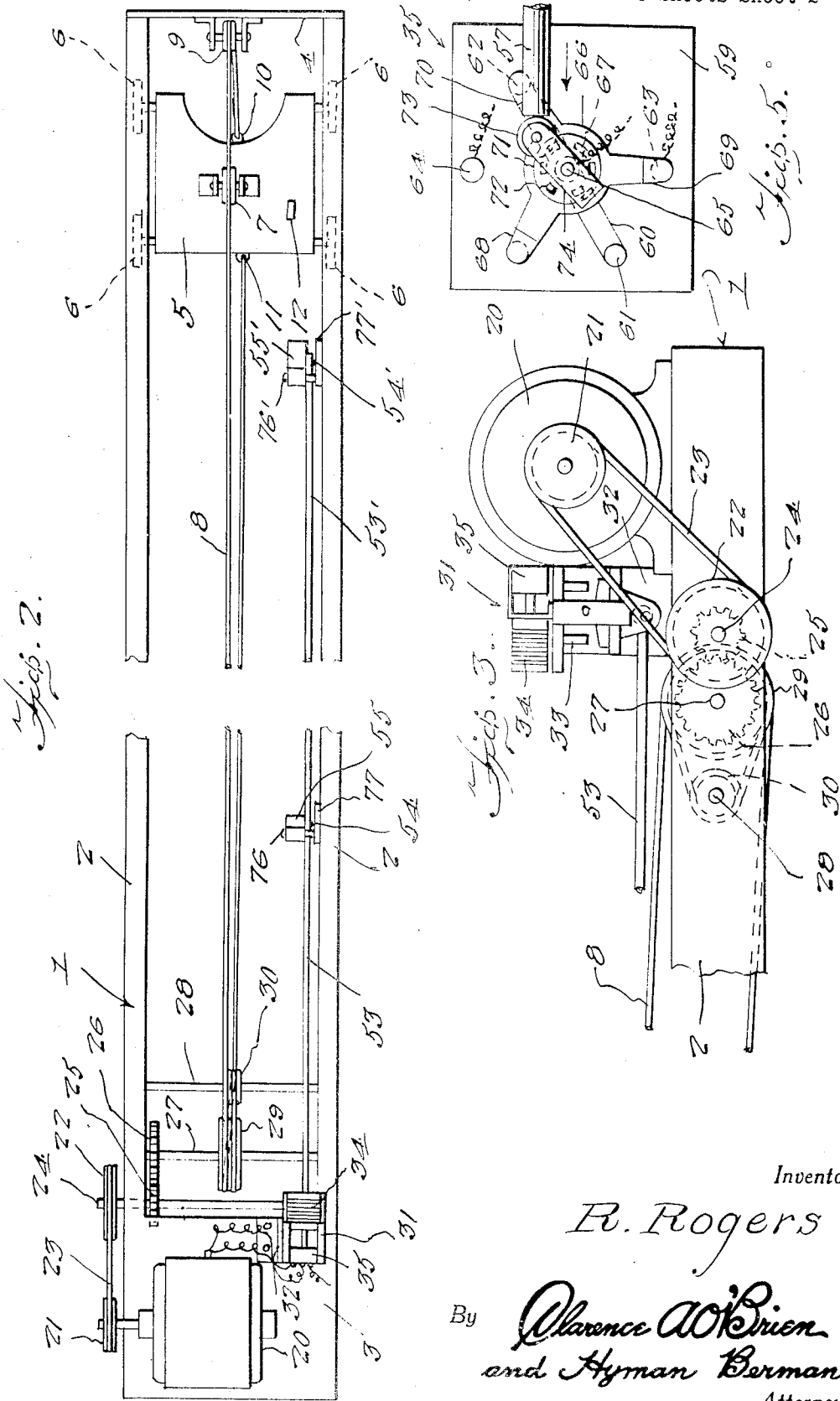
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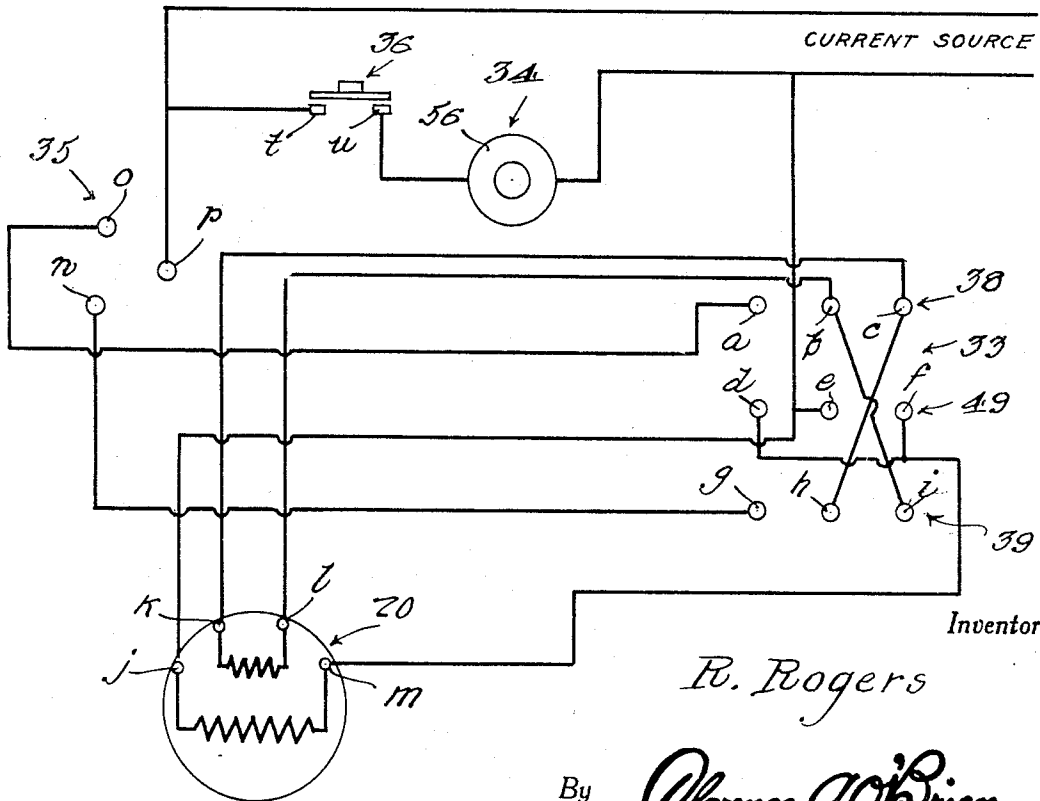
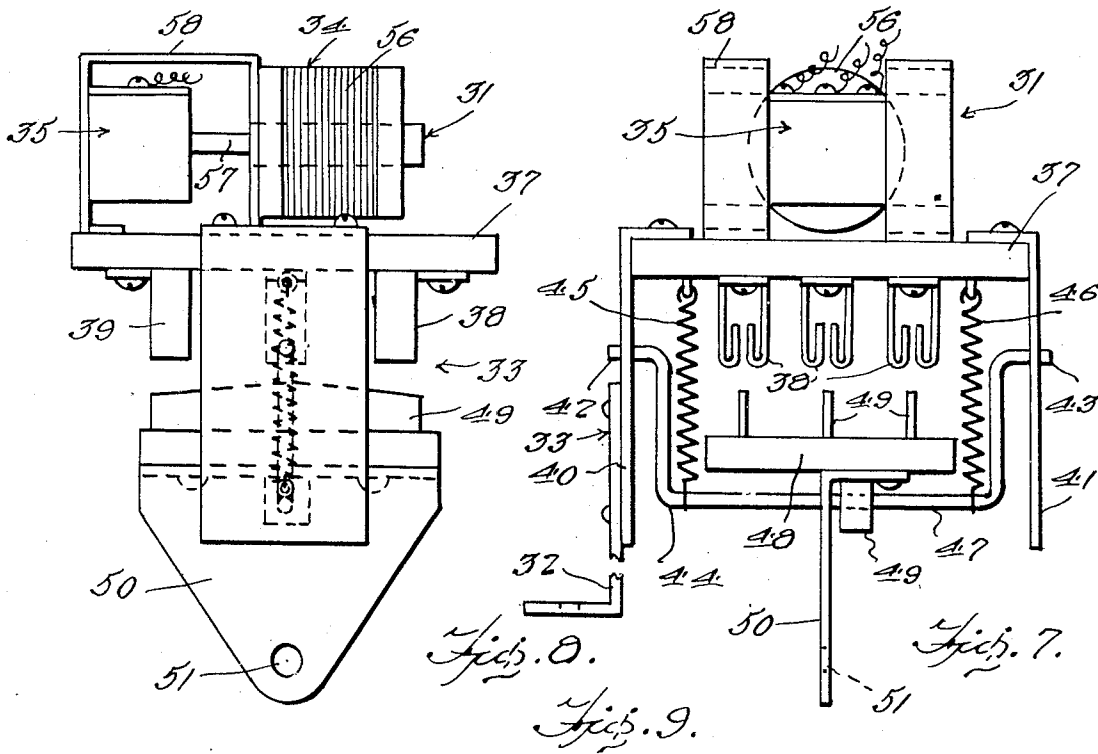
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UNITED STATES PATENT OFFICE

2,309,984

OVERHEAD DOOR OPERATING MEANS

Roy Rogers, Fowlerton, Ind.

Application November 15, 1939, Serial No. 304,635

1 Claim. (Cl. 268—59)

My invention relates to improvements in overhead door mechanism and in the means for controllably operating the same to move the door from fully open position to fully closed position and vice versa, and to and from intermediate positions, and the primary object of the invention is to provide simple and foolproof arrangements of this character which are easily and quickly operated.

Other important objects and advantages of my invention will be apparent from the following description and the drawings wherein for illustrative purposes a preferred embodiment of the invention is shown.

In the drawings:

Figure 1 is a contracted side elevational view of overhead door mechanism in accordance with the present invention.

Figure 2 is a top plan view of Figure 1.

Figure 3 is an enlarged fragmentary side elevational view of the driving and control mechanism showing the side opposite that shown in Figure 1.

Figure 4 is an enlarged transverse vertical sectional view taken through Figure 1 approximately on the line 4—4.

Figure 5 is a top plan view of the rotary snap-switch.

Figure 6 is a transverse vertical sectional view taken through Figure 5.

Figure 7 is a side elevational view of the triple-pole double-throw switch.

Figure 8 is an end elevational view of Figure 7, and

Figure 9 is a schematic wiring diagram showing the operative relations and electrical connections of the present invention.

Figure 10 is an enlarged side elevational view of the upstanding lug.

Referring in detail to the drawings, the numeral 1 generally designates a horizontal frame which is positioned above the top of the door opening (not shown) and comprises laterally spaced longitudinal channels 2 which face each other and are connected at one end by a platform 3 and at the opposite end by a cross-member 4. A flat carriage 5 is provided on the opposite sides with pairs of rollers or wheels 6 which roll along the lower flanges of the respective channels as indicated in Figure 4, with angle irons 6' attached to the flanges and having their vertical flange extending along the laterally inward sides of the paths of the wheels 6, to guide the wheels and retain lubricant. An idler pulley 7 projects above and is attached at the middle of the top of the

carriage 5 and has trained thereover the operating cable 8 which is trained downwardly around the pulley 9 which is secured to the middle of the inner side of the cross-member 4 and passes to the connection indicated by the numeral 10 on the adjacent end of the carriage. A connection 11 on the opposite end of the carriage secures the remaining end of the cable 8 after passing around driving mechanism pulleys described below. The top of the carriage is provided at one side with an upstanding lug 12 for a purpose described further on herein.

The lug 12 comprises the stationary standard 78 tapered at its upper end as indicated by the numeral 80, the said upper end being rounded and offset and traversed by a pivot 79 which traverses a similar formation on the lower end of the tapered yielding tip 82. Leaf springs 81 attached to the opposite edges of the standard 78 bear their free ends against the related edges of the tip 82 so as to yieldably support the latter normally in an erect position. In the operative engagement of the tip 82 with the levers 55 and 55', a mutual yielding cooperation takes place, making for smooth and efficient action. The levers 55 and 55' should be properly spaced and relatively angulated with respect to the perpendicular to provide for the desired timing of the device and to allow for some slight over-run of the carriage 5 when a stop is made.

Fixed to depend from the carriage 5 is a rigid bracket 13 which has a lateral pin 14 on which is pivotally mounted the upper end of an L-shaped arm 15 having an extension stop 16 disposed slightly to the rear of the arm when the arm is in normal vertical position and in this position to engage the stop lug 17 on the frame 1 and thereby support the weight of the door (not shown) in a vertical position by reason of connection of the said door with the extremity of the horizontal portion of the L-shaped arm 15, the said connection including a vertical pin 18 passing through said horizontal portion and through both legs of a U-shaped element 19 with a helical spring 20 circumposed on the pin 18 between the bottom of the horizontal portion and the top of the lower leg of the element 19 in a shock absorbing arrangement.

The driving mechanism shown in Figure 3 comprises a reversible split-phase electric motor 20 which is mounted on the platform 3 at the opposite end of the frame 1 from the pulley 9 and the normal vertical position of the door (not shown). The shaft of the motor has a pulley 21 aligned with a pulley 22 and connected thereto

by the belt 23 at a point at one side of the frame 1 as indicated in Figure 2, the pulley 22 being fixed on a shaft 24 mounted in and between the channels of the frame and equipped with a pinion 25 in mesh with a gear wheel 26. The gear wheel 26 is fixed on the shaft 27 which lies alongside of another shaft 28, both shafts being mounted to and between the channels of the frame in positions longitudinally inwardly from the platform 3. The shaft 27 has fixed thereto at a point substantially equidistant from the channels of the frame, a double-grooved pulley 29 in one groove of which is trained the upper flight of the cable 8. From here the cable 8 passes around a pulley 30 on the shaft 28 and again passes around the pulley 29 to the point of connection 11 with the adjacent end of the carriage 5, whereby starting, running and stopping of the motor in either direction will operate the carriage along the frame 1 and correspondingly change the position of the door attached to the arm 15 from vertical to elevated horizontal and vice versa.

The means for starting, stopping and reversing the motor 20 comprises the electro-mechanical switching unit 31 which includes the bracket 32 by which it is mounted on the platform 3, the triple-pole double-throw switch 33, with the solenoid 34, and the rotary snap-switch 35 mounted thereon, as well as the connecting wires and the push-button operating switch 36 to be described.

The triple-pole double-throw switch 33 (shown in Figures 7 and 8) acts as a reversing switch for the motor 20 and consists of a horizontal dielectric block 37 from opposite sides of the longitudinal middle of which depend two pairs of three aligned spring contacts 38 and 39 which are arranged as shown. From the opposite ends of the block depend the brackets 40 and 41 in which are journaled the axially aligned pintles 42 and 43 on the ends of the legs of the U-shaped rocker element 44. Vertically disposed helical overbalancing springs 45 and 46 are stretched between the middle of the bottom of the block 37 and the ends of the bight portion 47 of the U-shaped rocker element 44. A dielectric block 48 has three transverse knives 49 which are tapered toward their opposite ends, the knives being fixed on the top of the block 48 in positions to simultaneously engage between the spring arms of all three contacts 38 or 39 according to the position of the rocker element 44. The block 48 is pivotally mounted on the bight portion 47 of the rocker 44 by a dependent lug 49 through which the bight portion passes. A bracket 50 is secured to the bottom of the block adjacent the lug 49 and depends below the switch and has at its lower end an opening 51 receiving a pivot 52 on the adjacent end of a switch operating rod 53 which has its opposite end pivoted at 54 to the curved tip lever 55 which is pivotally supported at 76 on the bracket 77 which is attached to the adjacent channel 2 of the main frame 1, with the lever 55 in a position to be engaged by the projection 12 on the carriage 5 as the carriage passes toward the right from a position to the left of the lever 55 or passes toward the left from a position to the right of the similar lever 55', the consequent engagements of the projection with the curved lever 55 causing corresponding longitudinal movement of the switch operating rod 53 accompanied by corresponding swinging of the switch rocker 44, the levers 55 and 55' being operatively connected together in the proper relatively angulated positions by the con-

necting rod 53' which is pivoted at 54 to the lever 55 and at 54' to the lever 55'.

The solenoid 34 which is horizontally mounted on the dielectric block 37 includes the electro-magnet 56 and the plunger core 57, this core operating through the casing of the rotary three-point snap-switch 35 which is mounted in position by the bracket 58.

The rotary snap-switch 35, as shown in Figures 5 and 6, consists essentially of a dielectric base 59 in which is embedded a conductive bar 60 which has the contact points 61 and 62 at opposite ends and circumferentially spaced between these are the contact points 63 and 64, all of the contact points being on the same circle. Mounted on a vertical shaft 65 at the center of this circle is a conductive hub 66 which has ratchet openings 67 therein and has radial conductive arms 68, 69 and 70 which are equally circumferentially spaced and have their free ends arranged so that some two adjacent ones of the contact points are always engaged by two of these arms whenever the hub is in a stopped position. On the shaft above the hub turns a ratchet element 71 which has depending ratchet dogs 72 to engage in the ratchet openings 67 in the hub and push the hub around when the ratchet element is partly rotated by the pushing action of the solenoid plunger 57 when the magnet 56 is energized. The end of the plunger 57 engages against a roller 73 mounted between the outer ends of the legs of a U-shaped lever 74 which is pivoted through the legs on the shaft 65 with the opposite end of the lever connected to the ratchet element by a lug 75 rising from said element. A helical spring 76 fixed at one end to the shaft 65 and at the opposite end to the lever 74, returns the lever, and consequently the ratchet element to initial position, ready for another stroke of the plunger 57, and at the same time restores the plunger to inoperative position, whenever the electro-magnet 56 is deenergized.

The push-button switch 36 is of any suitable type such as a toggle, a push-pull or a spring retracted type which is preferably normally in the "off" position and requires to be held by the operator in the "on" position.

Referring now to Figure 9 of the drawings showing the electrical connections, assuming that the door is in a depending vertical closed position with the carriage 5 in the extreme right hand position, and assuming that the rocker 44 of the three-pole double-throw switch is positioned so that the rocker blades 49 are engaging the spring contacts 38 in the relation expressed by the symbols *a-d*, *b-e* and *c-f* on the diagram, and assuming that the operator has closed the push-button switch 36, the contacts *t* and *u* of the push-button switch 36 are bridged by its contactor and the current flows from the source through the electro-magnet 56 of the solenoid 34 and thereby causes the plunger 57 to operate the hub of the three-point snap-switch 35 so that the contact points *p* and *o* are bridged. This passes the supply current to the point *a* of reversing switch 33, to point *d*, from *d* to *f*, to the terminal *m* of the running winding of the motor 20, thence to the running winding terminal *j*, and through the reversing switch points *e* and *b* to the remaining side of the current source, thereby completing the circuit through the running winding of the motor.

At the same time the current flows to the starting winding of the motor via the snap-

switch point *o*, the point *a* of the reversing switch to the point *d*, to point *f* to *c* to the terminal *k* of the starting winding to the starting winding terminal *l* to point *b* of the reversing switch, to its point *e* to the current source, thereby causing the motor 20 to run and start the carriage 5 moving toward the left in a door elevating and opening movement. There are several types of suitable doors and door supporting arrangements available which the invention can successfully operate in a well-known manner.

As the carriage 5 moves toward the left from the position shown in Figures 1 and 2, to a position in which the door will be almost completely opened or raised the projection 12 on the carriage passes under the lever 55', the lever being in a raised position, and reaches and operates the lever 55 and thereby throws the rocker of the reversing switch to the position opposite that described above the spring arrangement finishing the switching action, so that its contacts *a-d*, *b-e* and *c-f* are opened and the contacts *g-d*, *h-e* and *i-f* closed. The opening of the originally engaged group of contacts stops the motor 20 thereby halting the carriage 5 and the closing of the second mentioned group of contacts conditions operation of the motor in the opposite or reverse direction for closing the door whenever the push-button switch 36 is again closed, the door remaining in the open or raised position until the push-button 36 is so operated. The described operation of the lever 55 lowers the lever 55' into operative position to be engaged by the lug 12 on the reverse pass of the carriage 5, and at the same time the lever 55 is raised to clearance position.

When the push-button switch 36 is again closed, the solenoid 34 operates the snap-switch 35 so as to bridge the contacts *p* and *h* which passes the current from the source to the point *g* of the reversing switch 33, to the point *d*, to *f*, to the terminal *m* of the running winding of the motor to the terminal *j* thereof, to the point *e* of the switch 33 to the remaining side of the current source. At the same time, current from the source passes from the point *h* of the rotary snap-switch 35 to the point *g* of the switch 33, thence to *d*, from *d* to *f*, from *f* to *i*, from *i* to *b*, thence to the terminal *l* of the starting winding of the motor, through the winding to the terminal *k*, to the point *c* of the switch 33, to *h*, from *h* to *e*, and back to the remaining side of the current source. This reverses the current through the starting winding of the motor 20 and causes the motor to move the carriage toward the right and drop the door toward its closed position. As the carriage

nears that position in which the door would be almost closed the projection 12 strikes the lug 55 on the rod 53 from the opposite direction and throws the rocker of the switch 33 to the first described position, thereby completing the cycle of operation.

The carriage 5 and hence the door may be halted in any intermediate position for convenience or to avoid damage by or to the door, by operating the push-button switch 36 while the door is moving thereby stopping it and conditioning opposite movement of the door by the next operation of the push-button switch.

Although I have shown and described herein a preferred embodiment of my invention, it is to be definitely understood that I do not wish to limit the application of the invention thereto, except as may be required by the scope of the subjoined claim.

Having described the invention, what is claimed as new is:

Control for the electric driving motor of an overhead door operating mechanism of the type comprising a carriage connected to the door and an elevated track along which the carriage moves toward either end of the track to fully open or fully close the door; said control comprising a reversing switch mounted at one end of the track and having an operating lever, a pair of tiltable levers mounted on the track in positions to be operatively engaged by said carriage as the carriage approaches corresponding extreme positions on the track, coordinating means operatively connected between said tiltable levers and the operating lever of the reversing switch whereby engagement of a portion of the carriage with either of said tiltable levers throws the operating lever of the reversing switch to the opposite position thereby deenergizing the motor and conditioning flow of current through the motor in the reverse direction, said tiltable levers being initially positioned at different angles whereby the return transit of the carriage effects resetting of both of the tiltable levers, a solenoid operated position setting switch connected between said reversing switch and its source of energy for the motor, and a manual momentarily operable switch connected between said source and said resetting switch whereby after initial operation of said manual switch and consequent operation of said carriage next operation of said manual switch effects stopping of the carriage in an intermediate position between said tiltable levers and conditions said motor for reverse operation.

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