Oct. 30, 1945. V. E. REDDING ET AL 2,388,182

GARAGE DOOR

Filed June 28, 1943 2 Sheets-Sheet 1

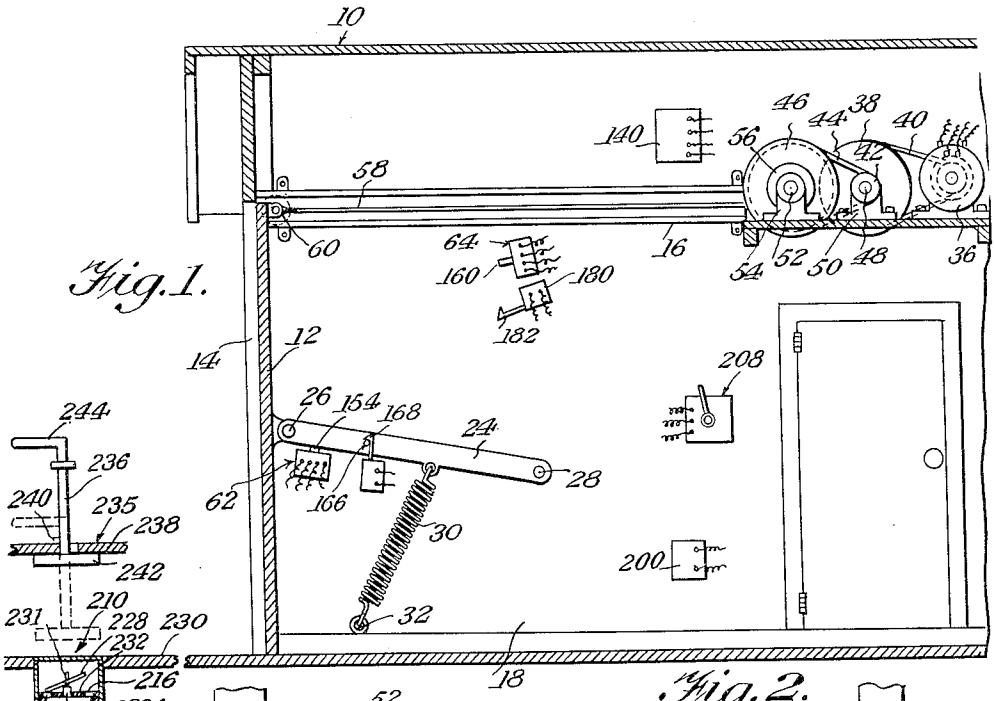


Fig. 1.

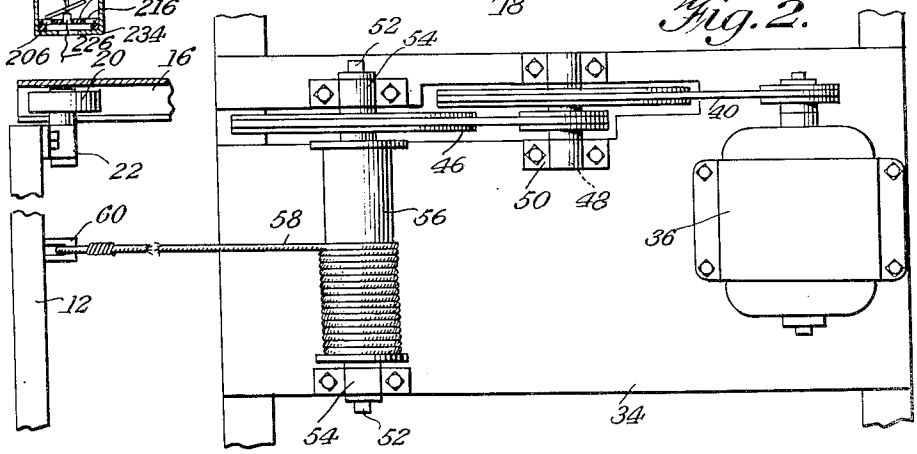


Fig. 2.

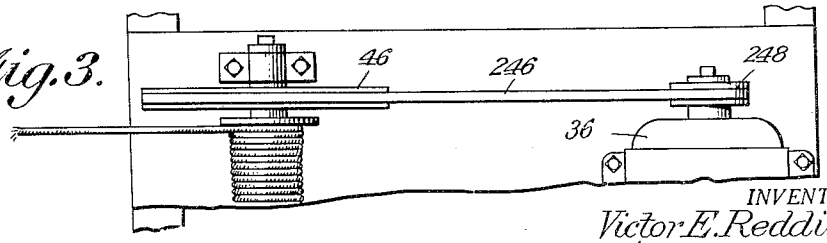


Fig. 3.

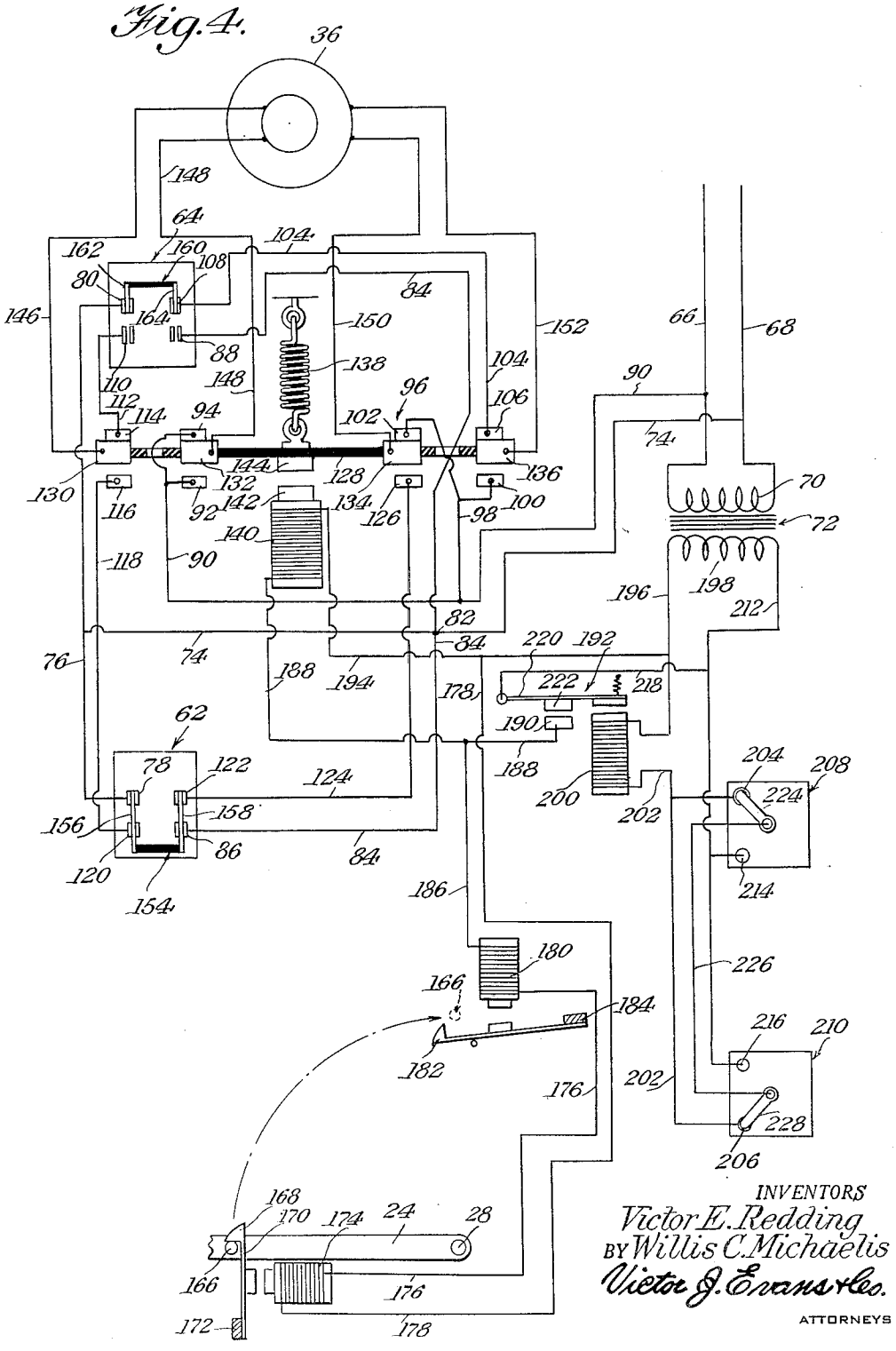
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Fig. 4.



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Patented Oct. 30, 1945

2,388,182

UNITED STATES PATENT OFFICE

2,388,182

GARAGE DOOR

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Minneapolis, Minn.

Application June 28, 1943, Serial No. 492,564

1 Claim. (Cl. 268—74)

Our invention relates to garage doors and the like, and has among its objects and advantages the provision of an improved electric circuit for opening and closing the door.

In the accompanying drawings:

Figure 1 is a vertical sectional view through a garage illustrating our invention applied thereto;

Figure 2 is a top plan view of the structure of Figure 1;

Figure 3 is a view similar to Figure 2 but illustrating a different form of driving connection between the motor and the door-lifting means; and

Figure 4 is a diagrammatic view of the electric circuit.

In the embodiment selected for illustration, Figure 1 illustrates a garage 10 having a door 12 for closing the door opening 14. Figures 1 and 2 illustrate a horizontal track 16 secured to the garage wall 18. Two such tracks are employed, one for each side of the door. Since both tracks are of the same construction, the description of one will apply to both. In Figure 2, a wheel 20 is carried by a bearing 22 secured to the door 12. When swung to an open position, the door 12 lies overhead and its two wheels ride on the tracks 16.

One end of a lever 24 is pivotally mounted at 26 to the door 12 intermediate its top and bottom ends, with the opposite end of the lever pivotally connected at 28 to the garage wall 18. One end of a tension spring 30 is connected with the lever 24 and its opposite end connected at 32 to the wall structure of the garage. Movement of the door 12 to its open position pivots the lever 24 upwardly, which movement places the door 12 in a horizontal position when fully opened. The spring 30 exerts a pull on the lever 24 for urging the door to its closed position.

Upon a platform 34 inside the garage is mounted a reversible electric motor 36, which motor drives a large grooved wheel 38 through the medium of a V belt 40. A small grooved wheel 42 rotates, as a unit with the wheel 38 and connects with a V belt 44 passing around a grooved wheel 46. Figure 2 illustrates the wheels 38 and 42 as being mounted on a shaft 48 supported in bearings 50. The wheel 46 is mounted on a shaft 52 supported in bearings 54. To the shaft 52 is fixedly secured a drum 56 to which is connected one end of a door opening cable 58, the other end of the cable being connected with an eye 60 secured to the door at its upper end. Thus rotation of the drum 56 in one direction winds the cable on the drum for moving the door to its open position.

Upon the wall 18 and in the path of the lever 24 are two limit switches 62 and 64. Lever 24 is brought into engagement with the limit switch 62 as the door 12 reaches a closed position for opening the circuit through the motor 36. While the spring 30 and the balanced arrangement of the door 12 tend to move the door to a closed position, the motor 36 is operated during the closing movement of the door for the purpose of unwinding the cable 58 and turning the belt drive. The frictional resistance of these parts exceeds the closing forces acting on the door. When the door is swung to its fully opened position, the lever 24 engages the limit switch 64 for breaking the circuit through the motor. Both limit switches 62 and 64 automatically take closed positions in the absence of lever pressure.

In Figure 4, line wires 66 and 68 connect with the primary winding 70 of a transformer 72. To the wire 68 is connected a wire 74 connected with a wire 76 connected with a terminal 78 of the limit switch 62. The opposite end of the wire 76 is connected with a terminal 80 of the limit switch 64. Wire 74 is connected at 82 with a wire 84 having one end connected with a terminal 86 of the limit switch 62 and its opposite end connected with a terminal 88 of the limit switch 64.

To the wire 66 is connected one end of a wire 90 electrically connected with stationary contacts 92 and 94 of a reversing switch 96. A wire 98 electrically connects the wire 90 with stationary contacts 100 and 102 of the reversing switch 96. A wire 104 electrically connects a stationary contact 106 with a terminal 108 of the limit switch 64. The fourth terminal 110 of the limit switch 64 is electrically connected with a wire 112 leading to a fixed contact 114. To a fixed contact 116 is connected a wire 118 leading to a terminal 120 of the limit switch 62, the fourth terminal 122 of this limit switch being connected with a wire 124 leading to a fixed contact 126.

A movable switch element 128 is provided with contacts 130, 132, 134 and 136. Switch element 128 is normally biased to its position of Figure 4 through the medium of a tension spring 138. In the normal position of the switch element, the contact 130 engages the contact 114, the contact 132 engages the contact 94, the contact 134 engages the contact 102 and the contact 136 engages the contact 106. In the other position of the switch element 128, contact 130 engages the contact 116, contact 132 engages the contact 92, the contact 134 engages the contact 126 and the contact 136 engages the contact 100. This may be

brought about through energization of a relay 140 having a core 142 acting on a body 144 attached to the switch element.

Contacts 130 and 132 are respectively provided with wires 146 and 148 leading to the armature of the motor 36. Contacts 134 and 136 are respectively provided with wires 150 and 152 leading to the field of the motor 36.

Limit switch 62 is provided with a switch element 154 having a blade 156 pivoted to the terminal 78 and arranged for electrical engagement with the terminal 120 when the lever 24 is moved out of engagement with the element 154. Switch element 154 is biased to a closed position when the lever 24 is moved out of engagement therewith. Switch element 154 also includes a blade 158 pivotally connected with the terminal 122 and arranged for engagement with the terminal 86 in the absence of lever pressure on the switch element. Limit switch 64 includes a switch element 160 having blades 162 and 164 respectively pivotally connected with the terminals 80 and 108. Blades 162 and 164 are respectively moved into engagement with the terminals 110 and 88 in the absence of lever pressure on the switch element 160. Movement of the door to a closed position brings the lever 24 into engagement with the switch element 160 for moving the blades 162 and 164 out of engagement with the terminals 110 and 88, respectively.

In the closed position of the door 12, a pin 166 on the lever 24 engages underneath a hook 168 on a flexible member 170 mounted on a support 172. Member 170 may be flexed to release the pin 166 through energization of a relay 174, this relay being connected with wires 176 and 178. Wire 176 leads to a second relay 180 for flexing a hook member 182 into the path of the pin 166 as the door is moved to an open position. Deenergization of the relay 180 releases the member 182 to the position of Figure 4. One end of the member 182 is mounted on a support 184, and the member is flexible to operate in the manner of the member 170. A wire 186 leads from the relay 180 to a wire 188 having one end connected with a fixed contact 190 of a switch 192 and its other end leading to the relay 140. The second wire 194 of the relay 140 is connected with a wire 196 of the secondary winding 198. Wire 178 is connected with the wire 194. Wire 196 leads to a relay 200 of the switch 192, and the second wire 202 of the relay is electrically connected with contacts 204 and 206 of control switches 208 and 210, respectively. The second wire 212 of the secondary winding 198 is electrically connected with contacts 214 and 216 of the control switches 208 and 210, respectively. A wire 218 connects the wire 212 with a switch element 220 having a contact 222 arranged to be moved into engagement with the contact 190 through energization of the relay 200, which electrically connects the contact 190 with the secondary winding 198. Switch 208 is provided with a switch element 224 arranged for selective engagement with the contacts 204 and 214 and connected with a wire 226 electrically connected with a switch element 228 of the control switch 210. Such element 228 is arranged for selective engagement with the contacts 206 and 216.

Switch 208 is preferably mounted on one wall of the garage, as illustrated in Figure 1. The switch 210 is incorporated in the driveway 230 leading to the door of the garage.

Switch element 228 is rotatably mounted on a pin 231 for rotation about a vertical axis. Switch element 228 constitutes a bar magnet balanced so that one end thereof drags on the insulative floor 232 of a box 234 enclosing the switch structure. To move the switch element 228 into selective engagement with the contacts 206 and 216, a magnetic actuator 235 is provided. This actuator is mounted on the vehicle to be housed in the garage 10. The actuator 235 comprises a vertical rod 236 slidable in a suitable opening in the floor board 238 of the vehicle. A compression nut 240 may be provided for supporting the rod 236 in different positions. To the lower end of the rod 236 is connected a bar magnet 242 which normally lies adjacent the floor board. Rod 236 is preferably of brass and is provided with a handle 244 so that the bar magnet 242 may be rotated about the axis of the rod 236.

Switch element 228 is in the nature of a bar and is therefore comparable to a compass needle with the exception that the bar is frictionally restrained from rotation to prevent it from turning to a north-south position. Switch element 228 may be rotated through rotation of the magnet bar 242 for bringing the switch element into selective engagement with the contacts 206 and 216. Figure 1 illustrates the magnet bar 242 in a dotted line position, in addition to its normal position underneath the floor 238, which brings the bar magnet in closer relationship with the control switch 210, so as to render the bar magnet more effective in influencing the switch element 228.

In Figure 4, rotation of the switch element 228 into engagement with the contact 216 closes the circuit through the relay 200. Energization of this relay brings the contact 222 into engagement with the contact 190 so as to electrically connect the secondary winding 198 with the relay 140, the wire 194 connecting this relay with the wire 196 leading to the secondary winding. As the relay 200 is energized, the relays 174 and 180 are also energized for respectively unlatching the lever 24 and bringing the member 182 into the path of the pin 166 as the lever 24 pivots with the door to an open position. Energization of the relay 140 shifts the switch element 128 to bring its contacts 130, 132, 134 and 136 into respective engagement with the contacts 116, 92, 126 and 100. Such movement of the switch element 128 passes current to the motor 36 so that the latter may operate the drum 56 and lift the door 12 to an open position. Both switch elements 154 and 160 are in closed positions during movement of the door to its open position. However, the contacts 130, 132, 134 and 136 are spaced from the contacts 114, 94, 102 and 106, respectively, so that the motor 36 will turn in a door opening position only. As the door is moved to a full open position, the switch element 160 is moved to an open position through engagement with the door to break the circuit through the motor 36.

With the vehicle positioned inside the garage, the switch element 224 is moved into engagement with the contact 214, the switch element 228 remaining in engagement with the contact 216, which breaks the circuit through the relay 140 as well as through the relays 174, 180 and 200. Spring 138 moves the switch element 128 to the position of Figure 4 which energizes the motor for rotation in the opposite direction. The motor will continue operating until the door 12 is brought into engagement with the switch element 154 for breaking the circuit through the motor.

Rotation of the switch element 228 is easily effected through rotation of the bar magnet 242 to shift its poles and impart rotation to the switch element 228. Thus the switch 210 may be actuated from a position inside the car, both when the vehicle is to be driven into the garage as well as after it has been driven to a position exteriorly thereof on the runway 230. With the vehicle inside the garage and the door 12 in a closed position, the door is opened through actuation of the switch 208.

By arranging the bar magnet 242 and the switch element 228 at different angles, it is possible to make any number of combinations so that the bar magnet on one car will be ineffective with respect to a magnet switch 210 of another owner's garage. Because of the small current carrying capacity of the magnetic switch 210, the sensitive relay 200 operates to engage the contacts 222 and 190 for electrically connecting the wires 188 and 218 with the wire 212 leading to the secondary winding 198.

Figure 3 illustrates a modified form of driving connection between the motor 36 and the wheel 46, wherein a belt 246 connects the motor driven wheel 248 with the wheel 46 in lieu of the two-belt drive of Figure 2.

Without further elaboration, the foregoing will so fully illustrate our invention, that others may, by applying current knowledge, readily adapt the same for use under various conditions of service.

We claim:

The combination of a garage door, a reversible motor operatively connected with the door to move the latter to open and closed positions, an electric circuit having a reversing switch connected with the motor, a closed door limit switch and an open door limit switch respectively opened through movement of the door to closed and opened positions, a transformer circuit connected with said first mentioned circuit, a relay means for actuating said reversing switch, a relay actuated switch electrically connecting said relay means with said transformer circuit, first and second switches interposed in said transformer circuit electrically connected with said relay actuated switch to selectively energize and deenergize said relay means to actuate said reversing switch, a member for actuating said circuit switches connected to the door for operation thereby to actuate the open door limit switch when the door reaches open position, means for moving said member during the closing of the door to actuate said closed door circuit switch when the door reaches closed position, latches cooperating with said switch actuating member for latching the door in its closed and open positions, and relay means electrically connected with said first and second switches for actuating the latches.

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