M. G. BENJAMIN.

ELECTRICALLY CONTROLLED DOOR OPERATING MECHANISM.

APPLICATION FILED AUG. 12, 1914.

1,235,639.

Patented Aug. 7, 1917.

2 SHEETS—SHEET 1.

Fig. 2.

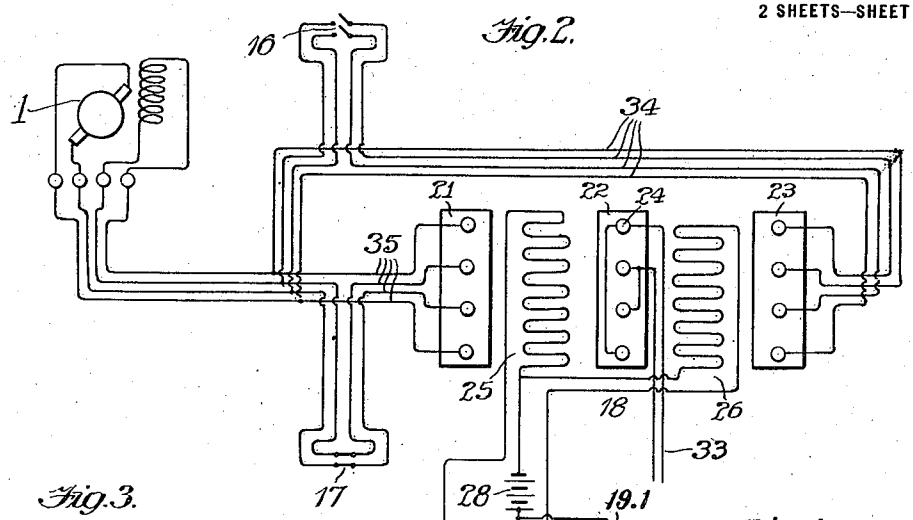


Fig. 3.

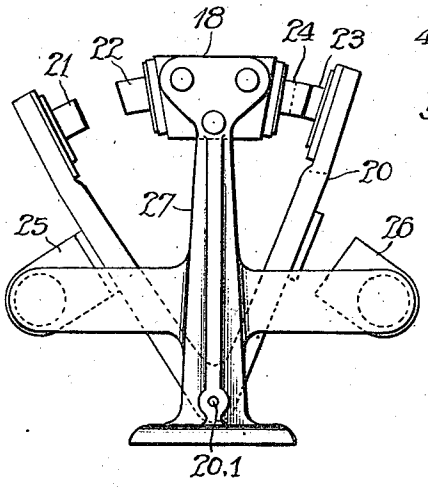


Fig. 4.

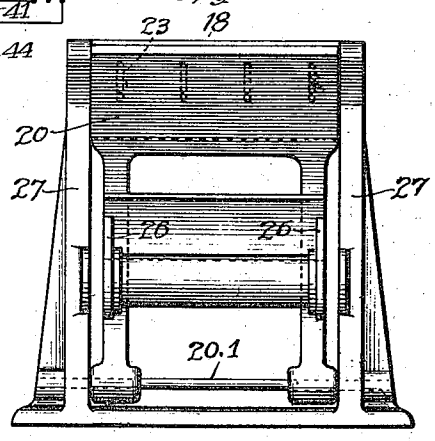
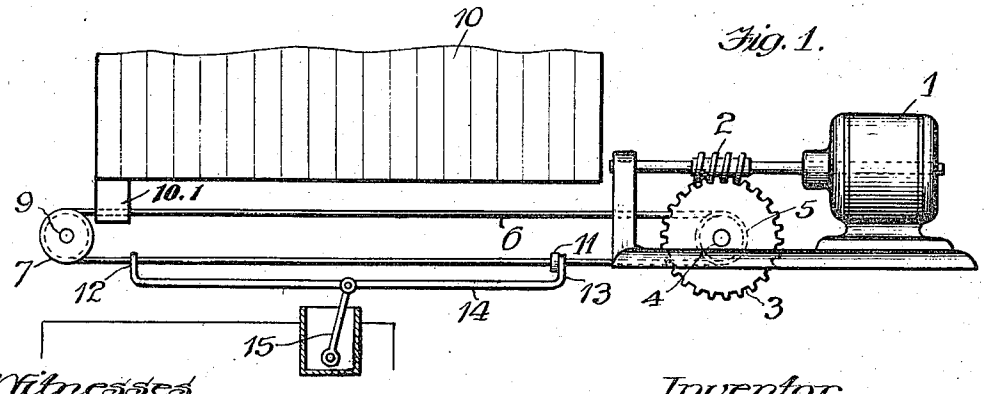


Fig. 1.



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2 SHEETS—SHEET 2.

Fig. 5.

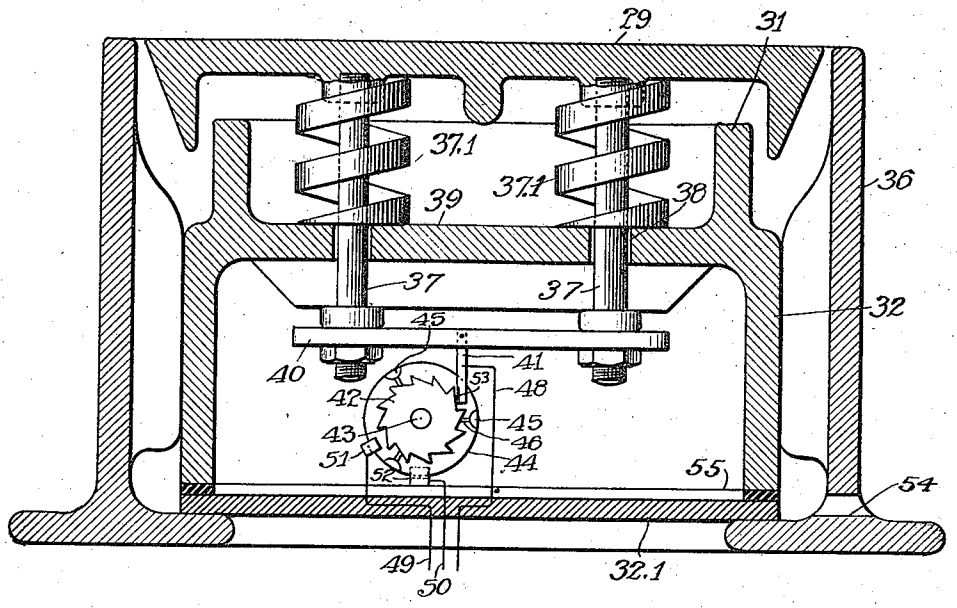


Fig. 6.

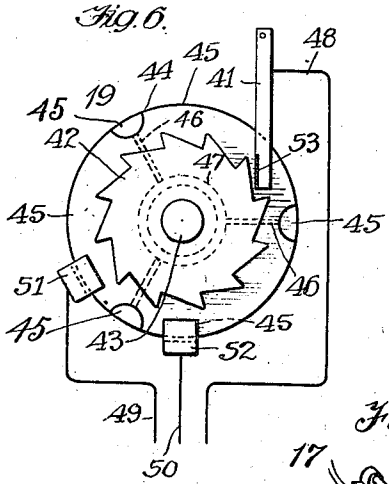


Fig. 7.

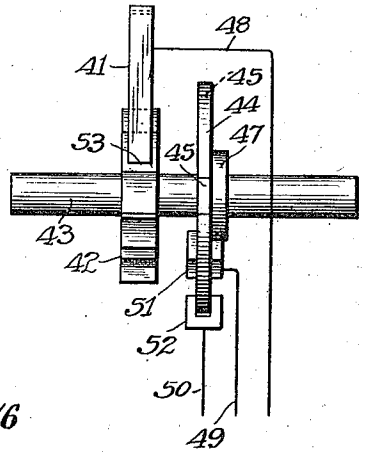
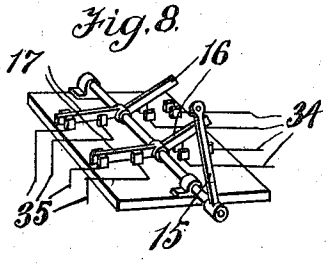


Fig. 8.



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UNITED STATES PATENT OFFICE.

MERRILL G. BENJAMIN, OF CHAMPAIGN, ILLINOIS.

ELECTRICALLY-CONTROLLED DOOR-OPERATING MECHANISM.

1,235,639. Specification of Letters Patent. Patented Aug. 7, 1917.

Application filed August 12, 1914. Serial No. 856,336.

To all whom it may concern:

Be it known that I, MERRILL G. BENJAMIN, a citizen of the United States of America, and a resident of Champaign, county of Champaign, and State of Illinois, have invented certain new and useful Improvements in Electrically-Controlled Door-Operating Mechanisms, of which the following is a specification.

The main objects of this invention are to provide an improved electrically controlled means for opening and closing doors, particularly adapted for controlling the opening and closing of garage doors as required by a vehicle approaching or leaving a garage. To this end a depressible plate is provided adapted through pressure received from the wheels of a vehicle to close switches controlling the operation of a motor having connections for opening and closing a door. Further objects of the invention may be understood from the following description:

An illustrative embodiment of this invention is shown in the accompanying drawings, in which—

Figure 1 is a front elevation showing a door partly broken away and a motor with connections for driving the door to its open or closed position.

Fig. 2 is a diagram of circuits for controlling the motor and motor switch.

Figs. 3 and 4 are details of a switch for controlling the motor circuits.

Fig. 5 is a detail in section of a device for automatically controlling the motor switch under pressure received from the wheels of vehicles passing thereover.

Figs. 6 and 7 are details of a contact device shown in Fig. 5.

Fig. 8 is a view in perspective of a switch under the control of the movable door, and employed for changing the circuit connections of the motor.

In general terms this invention comprises a motor having a worm gearing arranged to drive a door to its open or closed position according to the direction of rotatin of the motor. The worm gearing makes it impossible to operate the door by hand and accordingly the door is always locked in whatever position it is left by the operation of the motor. The motor circuit may be closed by hand operated switches within the building to which the door is applied or it may be closed through means of a depressible plate in position to be engaged by the wheels of a vehicle entering or leaving the building. The circuits and mechanism of the invention are so arranged that alternate depressions of the plate are idle so that it is effective to control the operation of the motor only when acted upon by the wheels of a vehicle which engage it first. For instance, if a vehicle is entering a garage, the engagement of the front wheels with the plate will result in the door opening and the engagement of the rear wheels with the plate will not affect the operation of the motor. The door may be opened or closed from within the building by buttons or hand operated switches connected in the motor circuit in parallel with the depressible plate which is outside of the building.

The mechanism is so arranged that the operation of the door results in an adjustment of switches so that the motor circuit is opened at the proper time and put in such condition that the next closing thereof will result in the reverse operation of the motor. In this way the device is effective to meet varying conditions; for example, if a vehicle is entering a garage, the depression of the plate through contact with one of the front wheels of the vehicle will control the opening of the door. The second depression of the plate by the rear wheel of the vehicle is idle. The opening of the door places the mechanism in such condition that upon the next depression of the plate the door will automatically close, for instance, when the vehicle is leaving the garage, and one of its wheels strikes the depressible plate.

In the drawings the invention is shown applied to sliding doors such as garage doors, and includes a motor 1 shown provided with a worm 2 having engagement with a wheel 3 fast on a shaft 4. Fast to shaft 4 is a pulley 5 adapted for driving an endless cable 6, passing around pulley 5 and a pulley 7 journaled on a fixed spindle 9. A garage door 10 arranged for sliding movement is secured to cable 6 by a fastening means 10.1. By this mechanism the door may be opened or closed, depending upon the direction in which the cable 6 is driven by the motor. The cable also operates

switches in the motor circuits for the purpose of placing them in such condition that when the current is applied the motor will drive the door in the proper direction. When the door reaches its open position, the switches are operated so that the next time the motor circuit is closed the door will be closed. Similarly, when the door reaches its closed position the switches are operated so that upon the next closing of the motor circuit the door will be driven to its open position. To this end a block 11 is secured to cable 7 in such position that when the door 10 reaches either its open or closed position, the block will engage the ends 12 or 13 of a yoke 14 carried by a switch operating arm 15. The switch arm 15 controls the opening and closing of two sets of switches 16 and 17, Fig. 2. When the switches 16 are closed the motor circuit upon the application of current will be properly energized to drive the motor in a forward direction, whereas when the switches 17 are closed the application of current will result in reverse rotation of the motor. It may therefore be seen that when the door is either in its fully open or closed position the switch 16 or 17 will be closed. When the current is applied to the circuit, the motor will be driven in the proper direction for either opening or closing the door. The motor circuit is finally closed by a magnetically operated switch 18, in turn under the control of a switch 19, shown diagrammatically in Fig. 2, in a local battery circuit. The local circuit is shown by way of example only, as a branch of the main line circuit would serve equally as well for the same purpose.

The switch 19 is shown in detail in Figs. 5, 6 and 7. The local circuit operates switch 18 to bring either the contacts 21 into engagement with contacts 22, or the contacts 23 into engagement with the contacts 24. These two sets of contacts serve to connect either the wires 34 or 35 with the line 33. Each set of conductors 34 or 35 provides means for carrying the current around the field and armature of the motor, but in different directions, so that the motor may be controlled as to its direction of rotation by means of switch 18.

The switch 18 comprises a pair of arms 20 preferably formed out of one piece, as shown in Fig. 3, and pivoted at 20.1 to a supporting frame 27. This frame also carries a pair of magnets 25 and 26 for operating the switch, and the coils of these magnets are shown in the drawings connected to receive energy from battery 28 through operation of switch 19. The latter is controlled in its operation by a depressible plate 29 located at any convenient distance from the door to be operated and in position to be engaged by the wheels of a vehicle approaching the door.

Plate 29 is mounted within a box-like structure 36 adapted to be embedded in the concrete or other material of a driveway so that plate 29 is about even with the surface of the driveway. Bolts 37 secured to plate 29 extend downwardly through holes 38 in a partition 39 forming part of a casting 32 resting within the casing 36. These bolts are surrounded by springs 37.1 between plate 29 and the partition 39 and at their lower ends carry a plate 40 to which is pivoted a pawl 41 in position to actuate a ratchet wheel 42 secured to shaft 43 journaled in the casting 32. A disk 44 made of insulating material is also secured to shaft 43 and carries three contacts 45 having electrical connections 46 with a metallic collar 47 of disk 44. A conductor 48 connects pawl 41 with one side of battery 28, and the other side of the battery is connected by wires 49 and 50 with the coils 25 and 26 carried by frame 27 of switch 18. The circuit of either coil 25 or 26 is completed through conductors 49 or 50, contacts 51 and 52, contacts 45, conductor 46, collar 47, shaft 43, ratchet 42 to pawl 41 and conductor 48. Both of these circuits are normally open whether or not contacts 45 engage the contacts 49 or 50, as pawl 41 normally does not electrically contact with ratchet 42, it being provided with a facing of insulation 53 where it normally rests against the side of ratchet 42. When plate 29 is depressed, the end of the pawl engages the ratchet and therefore completes the circuit through one or the other of coils 25 or 26, provided one of the contacts 51 or 52 are in engagement with one of contacts 45. The circuit of coil 25 is closed through contact 51 and the circuit of coil 26 is closed through contact 52; thus either one of these contacts is made effective on alternate depressions of plate 29, and switch 18 is thrown to one side or the other through the action of coils 25 and 26 and in this manner closing the motor circuit as required for forward or reverse operation of the motor.

The structure shown in Fig. 5 is arranged to protect the switching device 19 from moisture, the walls of the inner member 32 being spaced away from the walls of casing 36 and the latter being provided with suitable drain openings 54. The inner member 32 also has upwardly extending flanges 31 to prevent the water from making its way through openings 38 into the compartment containing the switching device. The member 32 is also closed at its bottom by a plate 32.1 at rest in the bottom of casing 36. A rubber gasket 55 is compressed between the member 32 and plate 32.1.

The operation of the device is as follows: Assuming that switching device 19 is at a blank position, and all circuits are open. the engagement with plate 29 of the front wheel of the vehicle approaching the door to

be entered causes pawl 41 to engage ratchet 42, and rotate it one tooth space, thus closing, for example, the circuit of magnet coil 26 through one of contacts 45 and contact 52. The current may then momentarily pass through coil 26 during the length of time that pawl 53 remains in engagement with ratchet 42, and while contact 52 engages one of the contacts 45. The switch arms 20 of switch 18 will be thrown to the right, Fig. 3, separating contacts 24 and 23 and bringing contacts 21 and 22 into engagement. The motor circuit is in this manner energized as required for driving the motor in the proper direction for opening the door, the line circuit being closed from the line 33 through contacts 22 and 21, the two sets of conductors 35, including switch 17 and the armature and field of motor 1, as shown in Fig. 2. The motor drives the door to its open position through worm 2 and wheel 3 and driving belt 6 to which the door is attached by the fastening device 10.1, Fig. 1. When the door reaches its open position the block 11 carried by the belt 6 strikes one of the upwardly extending arms of yoke 14, the arm 13 rocking the switch operating arm 15 to the position in which it is shown in Fig. 1, and opening the switch 17 and closing the switch 16. In this manner the motor circuit which had been closed through the conductors 35 is opened and the door is permitted to remain at rest in its open position. After the controlling circuits for the door have been operated as described to open the door by the first depression of plate 29, the plate is then engaged by a rear wheel of the vehicle, but its depression is idle as the ratchet wheel 42 is then moved to a blank position where neither contacts 51 nor 52 engage one of the contacts 45.

The door may be closed by a switch 19.1 within the building having connections which are in parallel with the switching device 19, but in case the door is permitted to remain open until the vehicle again leaves the building, the first contact of one of its wheels with plate 29 will depress this plate and cause the ratchet wheel to be rotated one step farther, bringing one of the contacts 45 into contact with contact 51. For the length of time that pawl 48 remains in engagement with the ratchet wheel the current from battery 28 will pass through coil 25 returning switch arms 20 to the position in which they are shown in Fig. 3 with the contacts 23 and 24 in engagement. The line 33 will then be electrically connected with the motor through conductors 34, switch 16 being closed by the previous movement of the door. The conductors 34 are connected to the motor for the purpose of reversely rotating it and accordingly the door is returned to its closed position, at which time block 11 on belt 6 engages the arm 12 of the yoke 14, again rocking switch operating arm 15 opening the switch 16 and closing switch 17, as shown in Fig. 2.

When the vehicle is inside the building and the door is closed, the door may be opened by switch 19.1 within the building parallel with the switch device 19, which operation results in reversing the position of switches 16, 17 and 18, leaving the device in such condition that the direction of rotation of the motor is alternated on successive operations.

Although but one specific embodiment of this invention has been herein shown and described, it will be understood that numerous details of the construction shown may be altered or omitted without departing from the spirit of this invention as defined by the following claims.

I claim:

1. The combination of a door, a motor having connections for opening and closing said door, and a switch controlling said motor for alternately opening and closing said door, said switch including an operating member and interposed ratchet mechanism constructed so that successive operations of said member will be alternately idle and active.

2. In a device of the class described the combination of a door, mechanism for opening and closing the door, an electric switch adapted to control said mechanism for respectively opening and closing the door, a yielding platform located adjacent to said door in position to be depressed by the wheels of a vehicle approaching or leaving the door, and mechanism connecting said platform with said switch for operating the latter through the depression of said platform, said connecting mechanism including ratchet means whereby the successive depressions of said platform will be alternately active and idle with respect to the operation of said switch.

3. In a device of the class described, a door, a motor having connections for opening or closing said door, a depressible plate in position to be engaged by a vehicle approaching said door, said plate having connections for closing the motor circuit only on alternate depression thereof.

4. In a device of the class described, a door, a motor having connections for opening or closing said door, a depressible plate in position to be engaged by a vehicle approaching said door, said plate having connections for controlling the motor for alternately opening and closing said door only on every alternate depression of said plate.

5. The combination of a door, motor driven mechanism for opening and closing said door, electrically controlled means adapted to control the operation of said mechanism and arranged to be actuated by

the wheels of a vehicle traveling toward or away from said door, said electrically controlled means being adapted on successive alternate operations to cause the opening and closing of the door respectively.

6. The combination of a door, a motor having connections for opening and closing said door, and a switch controlling said motor for alternately opening and closing said door, said switch including an operating member constructed so that successive operations of said member will be alternately idle and active.

7. The combination of a door, operating means having connections for opening and closing said door, and movable means for controlling said operating means, said movable means being arranged to be alternately active and idle on successive operations thereof.

8. The combination of a door, operating means having connections for opening and closing said door, a depressible plate in position to be engaged by a vehicle approaching said door, said plate being arranged to cause said operating means to be effective for actuating said door only on alternate depressions thereof, and a separate manipulative device also arranged to control said operating means.

Signed at Champaign this 20th day of Feby, 1914.

MERRILL G. BENJAMIN.

Witnesses:

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R. L. MAXSON.