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2,589,478

GARAGE DOOR OPERATOR

Filed Dec. 7, 1946

2 SHEETS—SHEET 1

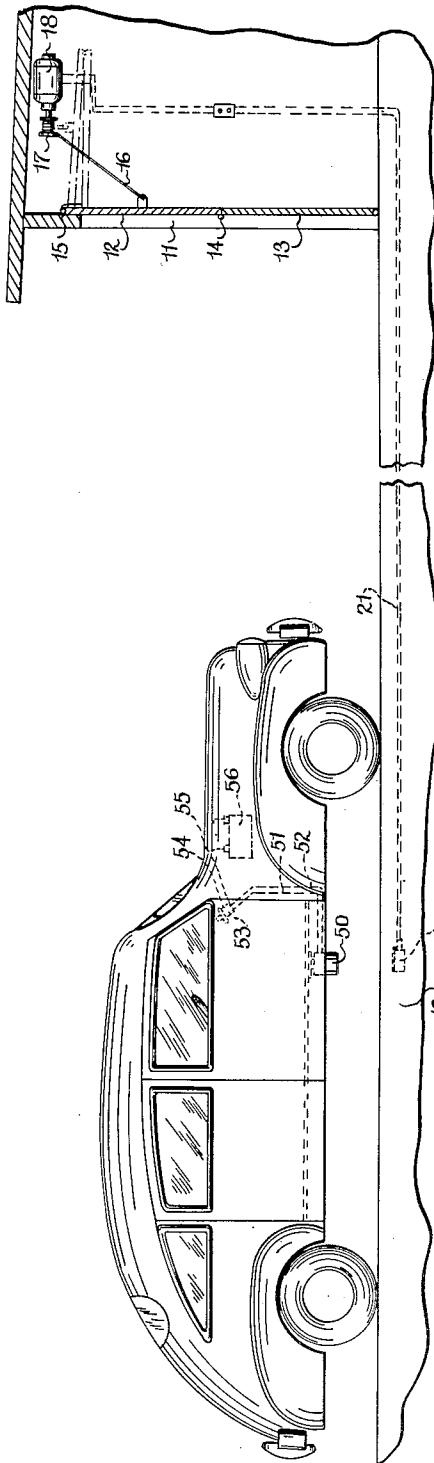
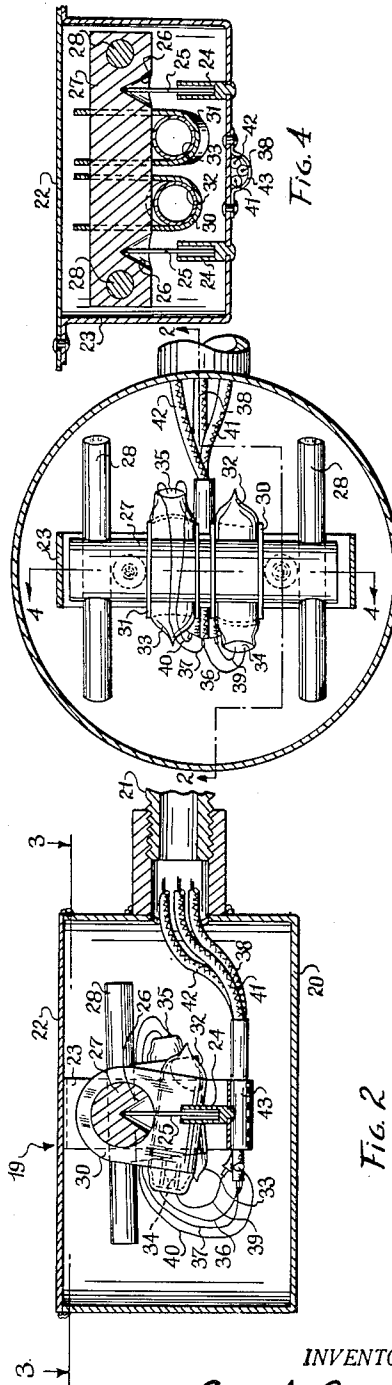
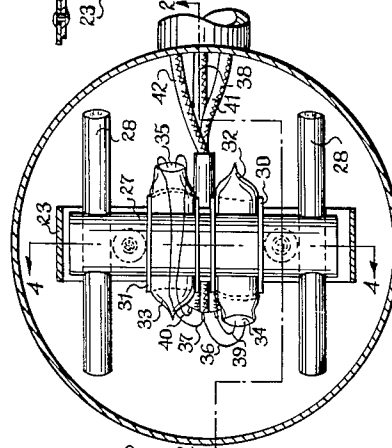
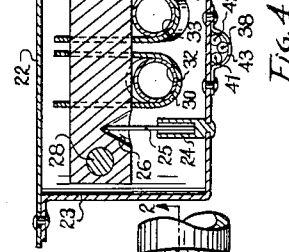


Fig. 1



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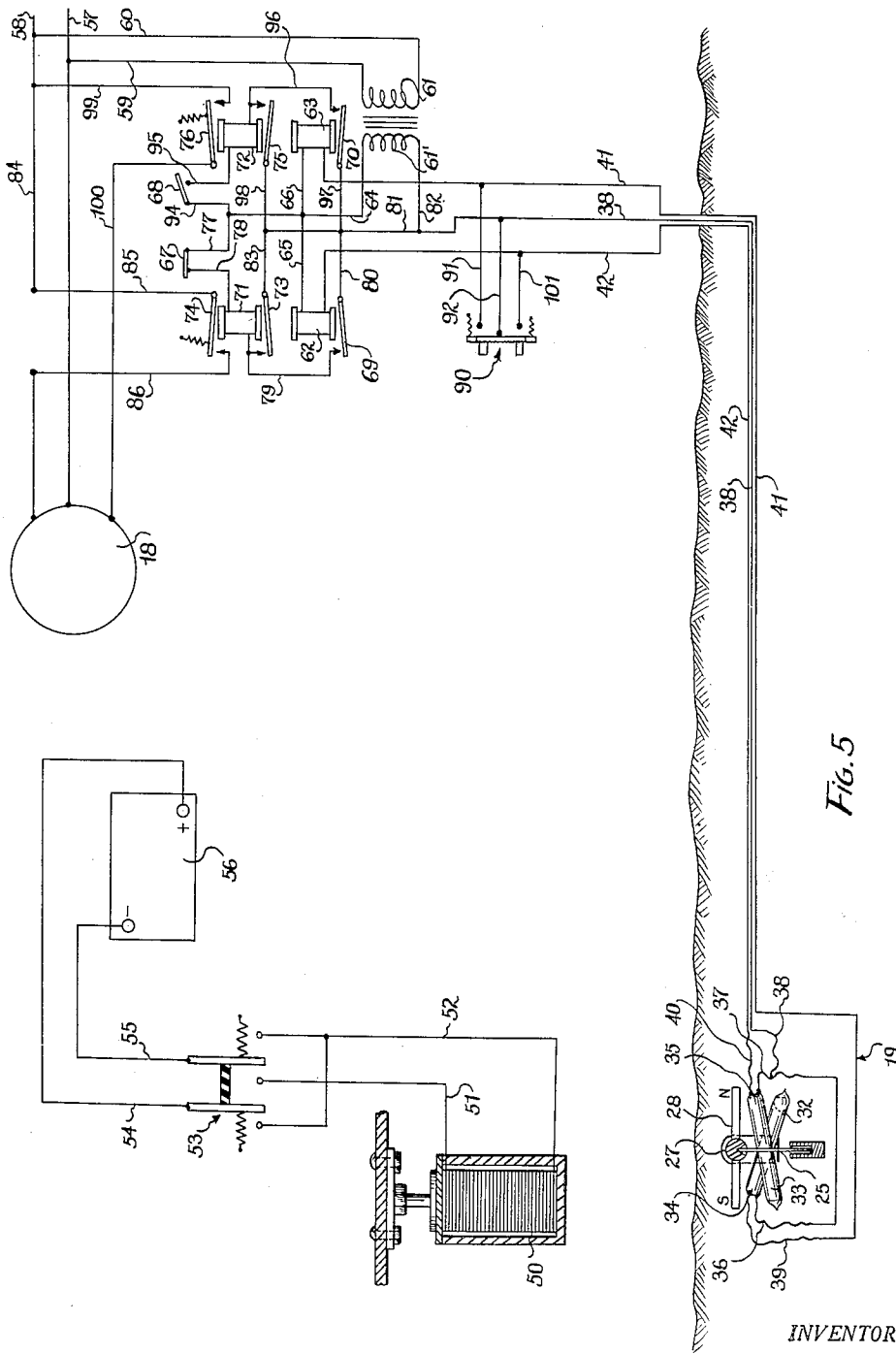
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2 SHEETS—SHEET 2



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GARAGE DOOR OPERATOR

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2 Claims. (Cl. 318—267)

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This invention relates to improvements in garage door operators. More particularly it relates to electrical means for automatically controlling motor means for opening and closing garage doors through the action of an electromagnet with reversible polarity.

In accordance with the present invention the driver of the automobile may operate a selector switch momentarily to complete a direct current circuit in either direction through the electromagnet while the latter passes over a magnetically responsive switch buried in the driveway, whereby a momentary electrical impulse is imparted to one or the other of two electric control circuits, each of which functions to cause actuation of the door operating motor means in one direction or the other.

One of the objects of the invention is the provision of means responsive to magnetic action for automatically operating a door actuating motor means selectively in either direction.

Another object of the invention is the provision of an electrical system responsive to a momentary electrical impulse in one or the other of two control circuits for operating door actuating motor means in either door opening or door closing direction.

Still another object is the provision of a simple, troubleproof switch assembly adapted to be buried in a pavement, responsive to magnetic lines of force for closing either one of two control circuits.

Other objects and features of novelty will appear as I proceed with the description of that embodiment of the invention which, for the purposes of the present application, I have illustrated in the accompanying drawings, in which

Fig. 1 is an elevational view illustrating the application of the invention.

Fig. 2 is a vertical sectional view of a magnetically responsive switch adapted to be buried in the pavement of a driveway, the view being taken substantially on the line 2—2 of Fig. 3.

Fig. 3 is a plan view partially in section on the line 3—3 of Fig. 2.

Fig. 4 is a vertical sectional view of the switch assembly taken substantially on the line 4—4 of Fig. 3, and

Fig. 5 is a wiring diagram.

In Fig. 1, 10 represents the pavement of a driveway leading to the doorway 11 of a garage which may be closed by a door of any desired character, that illustrated herein being a door of two parts 12 and 13 joined in the middle by a horizontal hinge 14. The upper section 12 is

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hinged at 15 to the rail above the doorway. At the bottom of the door are side rollers, not shown, running in vertical tracks, also not shown, in the stiles of the door frame. A cable 16 secured to the upper door section 12 extends up to and is wound around a drum 17, shown diagrammatically as directly connected to the shaft of a reversible electric motor 18, although of course it is to be understood that in practice gearing would be interposed between the motor and the drum in order to decrease speed and increase torque.

In the pavement 10 I bury one or more switch assemblies 19 encased in non-magnetic housings 20 from which lead conduits 21 for the protection of the necessary electrical conductors. Where a single housing is employed it is placed in line with the center of the doorway 11. Where a pair of such housings are employed they may be spaced a matter of a foot or so on either side of the said center line. The housing itself is made cup-shape and its upper end is closed by a cover plate 22 which may be soldered to the rim of the cup.

Cover 22 carries a stirrup 23 formed of strip metal in the base of which there are mounted two hollow supports 24 which receive loosely pins 25 of hard steel that are preferably pointed at their upper ends. These pins extend into conical cavities 26 formed in the under side of a pivot bar 27 of non-magnetic material. By reason of this construction the points of the pins readily find the apices of the cavities 26 and an excellent pivotal bearing results regardless of possible inaccuracies in machining and assembling the parts. Near its ends the bar 27 is drilled to receive with a snug fit two permanent bar magnets 28, the opposite ends of which project equal distances from the bar 27, so that the parts 27 and 28 together are balanced on the pins 25, the bar magnets 28 normally standing in a substantially horizontal position.

Between the cavities 26 the pivot bar 27 carries a pair of sheet metal loops 30 and 31 which are fixed to the bar and disposed at the same angle with the vertical but on opposite sides of the plane through the pins 25. In these loops are mounted mercury tube switches 32 and 33 which face in opposite directions. In the normal condition of the switch assembly, illustrated in the drawings, the mercury globules in the switch tubes are inoperative. In the then upper ends 34 and 35 of the two tubes there are pairs of terminals adapted to be joined by the mercury globules in the tubes. Flexible conductors 36 and 37 leading from the terminal ends of the two

switches are joined to a conductor 38, while flexible conductors 39 and 40 are joined with conductors 41 and 42. The three conductors 38, 41 and 42 which provide parts of two low voltage control circuits are fixed to the lower surface of stirrup 23 by a clip 43 or other similar means, so that movements of the switch assembly upon its pivots produce substantially no relative movement of the conductors 36, 37, 39 and 40. Inasmuch as the contacts in the mercury tube switch are protected against humidity and oxidation, and inasmuch as the only movement in the assembly is the tilting of the pivot bar 27 and supported parts upon the supporting pins 25, the switch assembly, although buried in the ground, has an extended life and requires substantially no servicing.

Suspended from the automobile by any suitable means is a vertically disposed electromagnet 50. From the opposite ends of the coil of this magnet conductors 51 and 52 lead to a double pole, double throw, momentary contact switch 53 mounted on the instrument board of the automobile. The poles of this switch are also connected by conductors 54 and 55 with the positive and negative terminals of the storage battery 56 of the automobile. Switch 53 is biased toward "off" position. It may be swung from this position by the operator to direct current through the electromagnet in either direction, as will be obvious from an inspection of the diagram of Fig. 5. When the automobile is in the right position magnet 50 is close enough to the buried switch assembly to cause the bar magnet or magnets 28 to tilt from the intermediate position illustrated to one in which the north pole or the south pole of the bar magnet is inclined upwardly. When this occurs the switch tubes 32 and 33 are tilted correspondingly and the terminals at one or the other of the two ends 34 and 35 of the tubes are connected by the mercury globules in that tube.

57 and 58 are line conductors from which wires 59 and 60 lead to the primary coil 61 of a step-down transformer. The secondary coil 61' of this transformer supplies low tension current to the conductors of the control circuits. These circuits include the coils of two relays 62 and 63. Current for relay 62 flows from the secondary coil 61' of the transformer through conductors 64 and 65 to the coil and out through conductor 42 to the end 35 of tube 33, and when that end is depressed back through conductor 38 to the transformer. Similarly, current for the coil of relay 63 flows from the transformer through conductors 64 and 66 to the coil, through conductors 41 and 39 to the end 34 of mercury tube 32, and when that end is depressed back through conductors 36 and 38 to the transformer.

67 and 68 (Fig. 5) represent limit switches which are biased toward closed position. These switches are so disposed that when the door 12, 13 reaches fully open position it opens switch 67, and when it reaches fully closed position it opens switch 68. Relays 62 and 63 have armatures 69 and 70. 71 and 72 are holding relays having two armatures 73, 74 and 75, 76 respectively.

Assuming that the door is closed and that relay 62 is energized because lines of magnetic force of the proper polarity tilt the switch assembly 19 in the proper direction, then armature 69 will be raised and will complete a circuit from the transformer through relay 71 by way of conductors 64 and 77, closed switch 67,

conductor 78, the coil of relay 71, conductor 79, armature 69 and conductors 80, 81 and 82 back to the transformer. When this occurs relay 71 is locked-in independently of relay 62. Current for this purpose flows from the transformer through conductors 64 and 77, closed switch 67, conductor 78, the coil of relay 71, raised armature 73 and conductors 83, 81 and 82 back to the transformer.

At the same time armature 74 closes a high voltage circuit from line wire 58 through conductors 84 and 85, armature 74 and conductor 86 to motor 18 and from the motor to line wire 57, causing the motor to rotate in the direction for winding cable 16 on drum 17 to open the door. As soon as the door reaches fully open position it opens limit switch 67, thereby breaking the circuit through the coil of relay 71 and permitting armature 74 to swing up, breaking the motor circuit.

At the start of the door opening movement limit switch 68 was permitted to close. It remains closed until the door again assumes fully closed position. After the door is opened the automobile will be driven into the garage. The operator may close the door by manipulating a manual switch 90 which may be located in any convenient position, as for example inside the house on the same premises. This switch may also be a momentary contact switch and may be similar to switch 53, but as herein shown is a two pushbutton type of switch. By operating this switch to connect conductors 91 and 92 the operator may cause current to flow from coil 61' of the transformer through conductors 64 and 66 to the coil of relay 63, through conductors 41 and 91 to switch 90 and through conductors 92, 38 and 82 back to the transformer. When this occurs armature 70 is raised and current flows from the transformer through conductors 64 and 94, the then closed limit switch 68, conductor 95, the coil of relay 72, conductor 96, armature 70 and conductors 97, 81 and 82, back to the transformer. Armature 75 is thereby raised and relay 72 is locked-in by current flowing from the transformer through conductors 64 and 94, limit switch 68, conductor 95, the coil of relay 72, raised armature 75 and conductors 98, 81 and 82 back to the transformer. Armature 76 is of course swung down by the energization of relay 72 and a circuit through motor 18 is set up for rotation of the motor in a direction opposite to that first described, by way of line wire 58, conductor 99, armature 76 and conductor 100 to the motor and back through line wire 57.

As soon as the door starts away from open position switch 67 closes, and when the door reaches closed position switch 68 opens. Now with the automobile in the garage, if the operator wishes to open the door he presses on the lower pushbutton of the switch 90 to connect conductors 42 and 38 through conductors 101 and 92, the control circuits operating in the same manner as though the conductors 42 and 38 had been connected by the operation of the switch assembly 19. When the door has been opened the automobile may be backed out of the garage and as it passes over the switch assembly 19 the operator may move switch 53 to produce current flow through conductors 52 and 51 in a direction opposite to that first described. The bar magnets 28 will then be tilted in the opposite direction, that is with the south poles uppermost, and a control circuit will thereby be set up

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though conductors 41 and 38, energizing relays 63 and 72, causing the door to close.

It will be appreciated that although I have shown in the drawings a single reversible motor 18 with means for causing it to operate in either direction depending upon which of the two control circuits is energized, separate motors for opening and closing the doors could be employed and controlled by substantially the same control circuits. Other variations from the described structure may be employed. Accordingly, I desire it to be understood that the scope of the invention is to be regarded as defined exclusively by the appended claims rather than by the foregoing description or the accompanying illustrations.

Having thus described my invention, I claim:

1. In motor driven means for opening and closing a garage door, two electrical control circuits, a balanced switch assembly adapted to be buried in the pavement in front of said door, said assembly comprising a pivotally mounted bar magnet and switch means secured to said magnet responsive to movement of the latter about its pivot in one direction or the other for selectively closing either one of said circuits, an electromagnet adapted to be suspended from an automobile and means for reversing the current through said magnet for tilting said bar magnet in one direction or the other, and means responsive to current in one or the other of said circuits for energizing said motor driven means for opening or closing said door.

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2. In motor driven means for opening and closing a garage door, two electrical control circuits, a balanced switch assembly adapted to be buried in the pavement in front of said door, said assembly comprising a pivotally mounted bar magnet and a pair of oppositely disposed mercury switches secured to said magnet, each of said control circuits being adapted to be closed by one of said switches as the bar magnet tilts in one direction or the other, an electromagnet adapted to be suspended from an automobile and means for reversing the current through said magnet for tilting said bar magnet in one direction or the other, and means responsive to current in one or the other of said circuits for energizing said motor driven means for opening or closing said door.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
898,766	Mott	Sept. 15, 1908
1,935,017	Capre	Nov. 14, 1933
1,951,409	Havener et al.	Mar. 6, 1934
2,118,930	Lilja	May 31, 1938
2,186,311	Weathers	Jan. 9, 1940
2,240,891	Marchant	May 6, 1941
2,412,871	Clark	Dec. 17, 1946
2,435,440	Graham	Feb. 3, 1948