Dec. 5, 1950 J. C. KAYTOR 2,532,722

GARAGE DOOR AND A REMOTE CONTROL THEREFOR

Filed Oct. 22, 1945 3 Sheets-Sheet 1

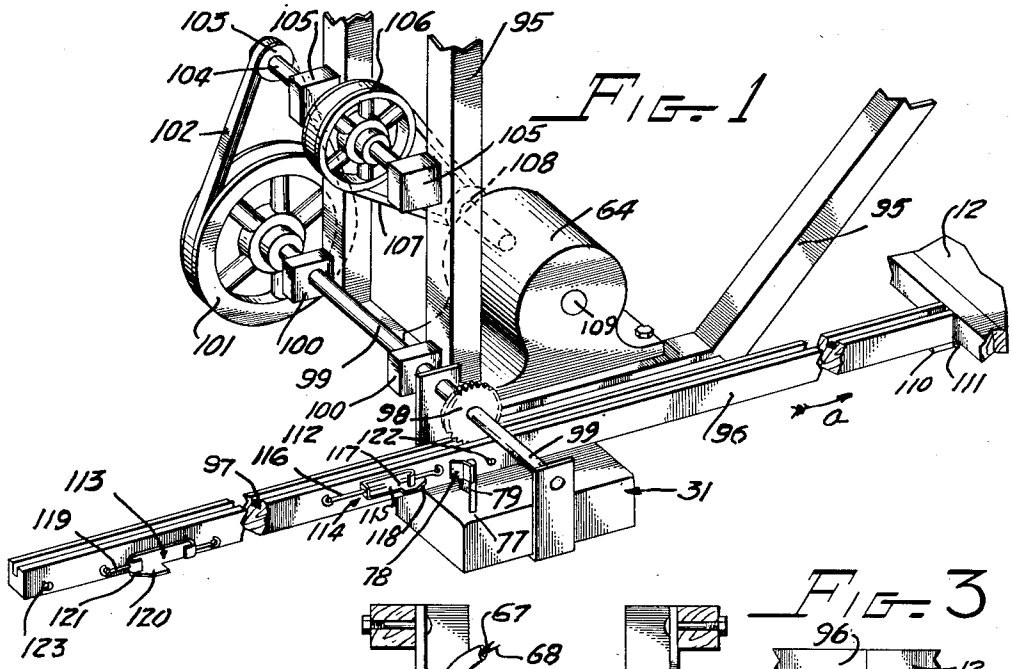

FIG. 1

FIG. 3

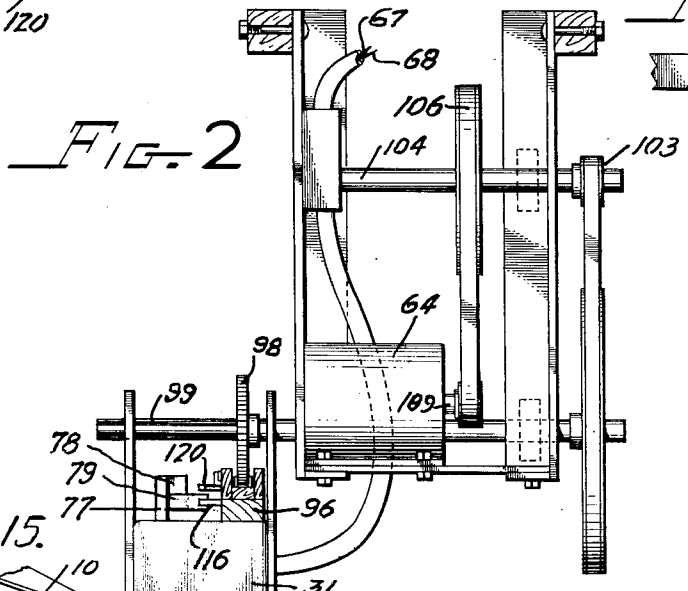

FIG. 2

FIG. 15.

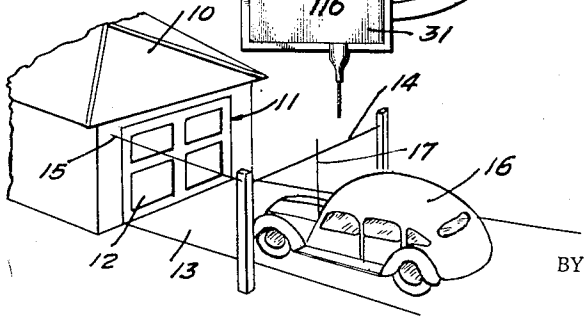

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Fig. 4

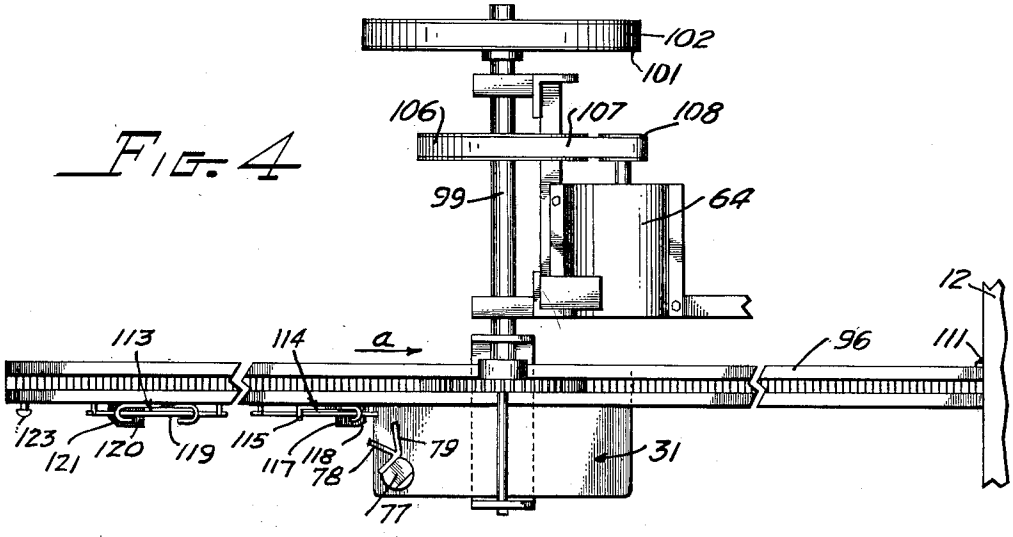

Fig. 5

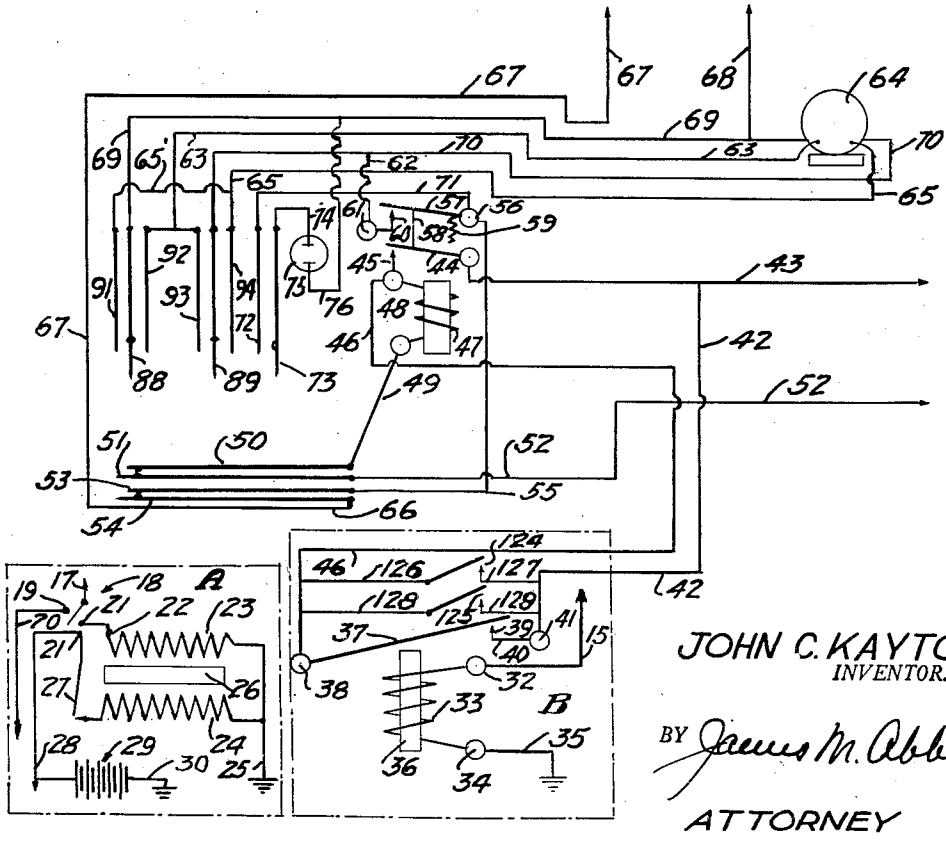

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FIG. 6

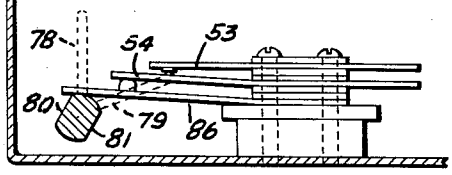


FIG. 7

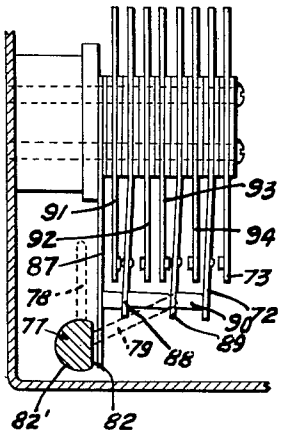


FIG. 8

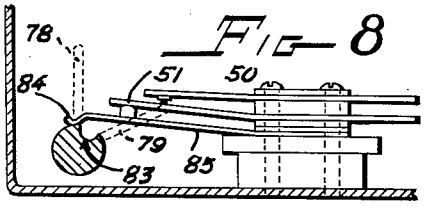


FIG. 9

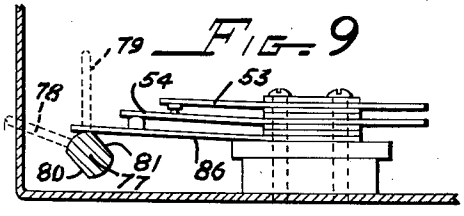


FIG. 10

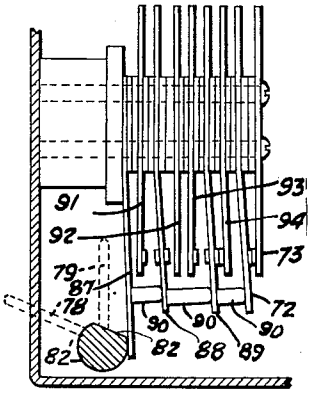


FIG. 11

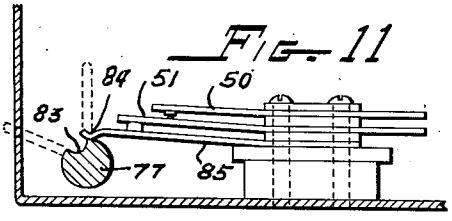


FIG. 12

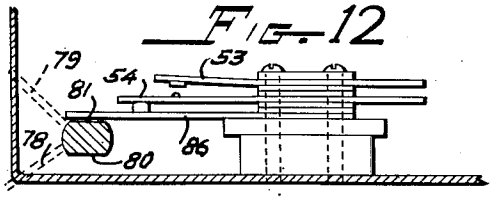


FIG. 13

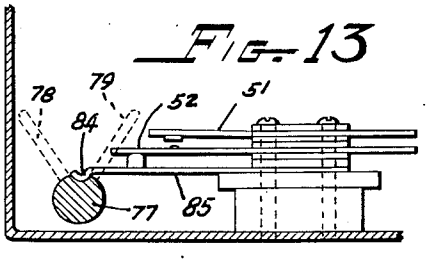
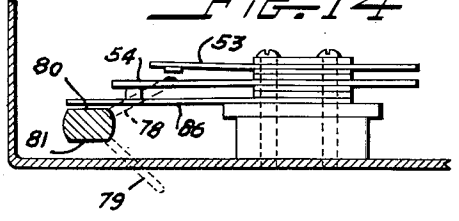


FIG. 14



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UNITED STATES PATENT OFFICE

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GARAGE DOOR AND A REMOTE CONTROL THEREFOR

John C. Kaytor, Lynwood, Calif.

Application October 22, 1945, Serial No. 623,785

4 Claims. (Cl. 318—266)

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This invention relates to door operating mechanism and particularly pertains to a garage door and a remote control therefor.

Garages are constructed with doors which swing horizontally, lift and shift vertically, and also slide horizontally. When driving an automobile into a garage it is necessary for someone to open the door, and after driving out of the garage it is necessary for the door to be closed. It is desirable, therefore, to provide means by which garage doors may be opened and closed automatically as an automobile reaches a specified point of operation, and it is also desirable to render such a device ineffective in the event the opening of the doors is not required. It is the principal object of the present invention, therefore, to provide a door operating mechanism associated with the doors of a garage or the like, and to provide an optionally controlled actuating means in the automobile whereby the door operating mechanism will be set into motion when the automobile approaches the garage and reaches a predetermined point.

The present invention contemplates the provision of a power driven mechanism which may be applied to horizontally swinging, horizontally sliding, and vertically moving doors, the power driven mechanism having electric controls associated therewith to initiate and interrupt the driving operation, said controls being connected with an aerial disposed at a point in the path of travel of an approaching automobile, and to be encountered by the radio aerial on the automobile, the radio aerial being associated with a source of electric energy which will pass from the radio aerial to the garage aerial when the two aerials are in electrical contact.

The invention is illustrated by way of example in the accompanying drawings in which:

Figure 1 is a view in perspective showing the garage door operating unit with which the present invention is concerned.

Fig. 2 is a view in side elevation showing the operating unit.

Fig. 3 is a fragmentary view showing the door hinge structure.

Fig. 4 is a view in plan showing the operating structure and further indicates the rack and pinion arrangement and the trip mechanism.

Fig. 5 is a wiring diagram showing the arrangement of the relays and the various motor controls.

Fig. 6 is an enlarged fragmentary view showing the safety switch in a closed position and the trip in the position it assumes when the door is closed.

Fig. 7 is a view showing the position of the combination forward and reverse switch and the

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garage light switch when the trip member is in the position shown in Fig. 6.

Fig. 8 is a fragmentary view in elevation showing the relay limit control switch when the trip mechanism is in the position shown in Fig. 6.

Fig. 9 is a fragmentary view showing the safety switch with the trip in the position it occupies when the door is open.

Fig. 10 is a fragmentary view showing the combination forward and reverse switch and the garage light switch with the trip in the position shown in Fig. 9.

Fig. 11 is a view showing the relay limit control switch in the position it occupies when the trip is in the position as shown in Fig. 9.

Fig. 12 is a fragmentary view of the safety switch when the switch is open and the trip cam has turned beyond its normal stationary position in one direction.

Fig. 13 is a view showing the relay limit control switch in the position occupied when the trip cam moves momentarily from one position to the other.

Fig. 14 is a view similar to Fig. 12 showing the trip cam when rotated to the opposite extreme position from that shown in Fig. 12.

Fig. 15 is a view in perspective showing the application of the present invention.

Referring more particularly to the drawings, 10 indicates a garage having a doorway 11 within which a garage door 12 is mounted. The present invention is concerned with means for moving the garage door to and from its closed position. The driving mechanism will operate satisfactorily upon doors which slide, doors which swing on vertical hinges at the edge of the doorway, and doors which are mounted upon side hangers and can swing upwardly and into the garage over the car. The invention is described by way of example when used with this last named type of door, it being understood that the invention is not limited to that use. Disposed in advance of the garage and supported across the driveway 13 at a suitable height is a fixed antenna or contact wire 14 which connects with a lead wire 15 extending to the garage. The height of the contact wire is such as to insure that an automobile 16 may pass beneath the wire as it approaches the garage and to insure also that the aerial 17 carried by the automobile will strike the wire 14 and flex under it as the car proceeds into the garage. The automobile is equipped with an actuating unit mounted upon the dashboard of the automobile and which may be connected with the aerial 17. This unit is generally indicated on the wiring diagram shown in Fig. 5 and in the portion enclosed by the dotted lines A. The unit

consists of a two-way switch 18 connected to the aerial 17 and provided with a contact 19 to which a conduit 20 is attached and is connected to the automobile radio. The switch also includes a contact 21 provided with a conductor 22 leading to the secondary winding 23 of a spark coil. A primary winding 24 is also provided as a part of the spark coil. These two windings are connected to a ground wire 25. A core 26 is provided and an armature plate 27 is pivoted at the end of the spark coil and makes contact between a battery feed wire 28 and the primary winding 24. The battery feed wire 28 connects with a source of electrical supply 29. The opposite side of the source of electrical supply 29 is connected with a ground wire 30. Thus, when the switch 27 is closed and the switch 18 is set to make contact between the contact member 21 and the aerial 17 the primary and secondary windings of the spark coil will be in series with the electrical supply 29 and a circuit will be completed from the aerial 17 to the antenna 14 and then through the conductor 15 to a sensitive relay structure which is mounted within the garage and at a point where it will not be influenced by the vibration incident to the opening and closing of the garage. This sensitive relay unit connects with a power relay unit 31 in a manner to be hereinafter described. The power relay unit includes all of the electrical equipment shown in Fig. 5 save the portions of the diagram enclosed in the fields A and B indicated by dotted lines. The conductor 15 leads to a binding post 32 which in turn connects to a magnet winding 33 of the sensitive relay unit. The other end of this winding connects to a binding post 34 which in turn is attached to a ground wire 35. The coil 33 is wrapped around the usual magnet core 36. It is intended to actuate an armature 37 which is pivoted at 38 and also serves as a switch blade to engage a contact 39 to which a conductor 40 is attached. A binding post 41 receives the opposite end of the conductor 40 and leads to a low voltage distributing wire 42. This leads to a low voltage feed wire 43. The voltage in this particular line is preferably in the range of 15 to 25 volts and the current may be direct or alternating. The feed wire 43 leads to the pivot of a relay switch blade 44. This blade swings to make contact with a conductor 45 which is connected to a power supply wire 46 leading to a power relay unit 47. The coil 48 of this unit is connected to a conductor 49 leading to blade 50 of a relay control limit switch. The opposite blade of this switch, as indicated at 51, connects with a conductor 52 which is the low voltage feed wire complementary to the feed wire 43. Associated with the relay control limit switch is a safety cut-off switch comprising blades 53 and 54. The blade 53 of the cut-off switch is connected with a conductor 55. This leads to the pivot 56 of a relay switch blade 57. A link 58 ties the relay switch blades 44 and 57 together so that they will move in unison under the influence of the power relay 47 to a closed position. A suitable spring 59 acts to move these switch blades to an open position when the relay 47 is not energized. The relay switch blade 57 moves to contact with a conductor 60 leading to a binding post 61. A conductor 62 is attached to this binding post and leads to a motor feed wire 70. This connects to one side of a driving motor 64 by which the garage door is opened. The other side of the motor is fitted with a conductor 65 which follows a course to be hereinafter described.

Conductors 63 and 65 supply current to drive the motor in a reverse direction. The switch blade 54 of the safety cut-off switch is connected with a conductor 66 leading to the main electric power feed line 67. This line carries the usual domestic current, such for example as 110 volts. A complementary power feed line 68 connects to a conductor 69 leading to the motor 64 and delivers current to drive the motor in its normal direction of rotation. The opposite side of the motor is fitted with the conductor 70 which completes the normal driving circuit through the motor. This current is handled in a manner which will be hereinafter described.

Connected to the binding post 56 of the relay switch blade 57 is a conductor 71. This conductor leads to blade 72 of a light switch, the opposite blade 73 connecting with a conductor 74 attached to one pole of a light socket 75. This is mounted within the garage so that when the door is opened the light is turned on. The opposite pole of the light socket 75 is provided with a conductor 76 which is attached to the feed wire 69. The circuits for establishing and interrupting flow of current to the motor for driving it in a forward or reverse direction are controlled mechanically by a trip shaft 77 which is rotatably mounted in the housing of the relay unit 31. This shaft extends vertically and carries a pair of trip fingers 78 and 79, which are above the housing.

The shaft 77 is formed with three cam sections of different shape, as shown for example in Figs. 6, 7 and 8 of the drawing. The cam section indicated in Fig. 6 has opposite parallel flat faces 80 and 81 which are cut upon opposite sides of the cylindrical section of the shaft. This cam section is associated with the safety switch, the blades of which have been indicated at 53 and 54. The cam section shown in Fig. 7 comprises a flat face 82 formed on one side of the cylindrical portion of the shaft 77 and operates the forward and reverse motor circuits, which will be hereinafter described. The cam section shown in Fig. 8 is in the form of a recess 83 extending longitudinally of the shaft 77. This momentarily registers with an arcuate end 84 of an actuating finger 85 mounted parallel to the fingers 50 and 51. The safety switch shown in Figs. 6, 12 and 14 is provided with an actuating finger 86 which engages the cam surfaces and operates the switch blades 53 and 54. The combination forward-reverse switch and garage light switch, as shown in Figs. 7 and 10, is provided with an operating finger 87 and oscillating operating fingers 88 and 89. These three fingers are spaced from each other by insulating blocks 90. The oscillating finger 88 moves between pairs of switch blades 91 and 92, and the oscillating finger 89 moves between pairs of switch blades 93 and 94. Blade 72 of the light switch is also associated with the blades 88 and 89 and separated therefrom by an insulating block 90 so that the three blades 88, 90 and 72 will move in unison when the arcuate portion 82' of the cam section shown in Figs. 7 and 10 is in contact with the operating finger 87. By reference to Fig. 7 of the drawing it will be seen that when the pressure of the face 82' is relieved from pressure against the finger 87 the oscillating blade 88 will be in a position to make electric contact with the member 91, and the oscillating blade 89 will be in position to make electric contact with the blade 93. At this time the switch blade 72 will be out of electric contact with the blade 73.

The relay unit 31 is provided to initiate driving operation of the motor 64. The motor 64 is car-

ried upon an overhead supporting frame 95. In the form of the invention here described in which the door 12 is intended to slide upwardly and into the ceiling of the garage a horizontally moving operating rail 96 is provided. This rail is guided by suitable supports not shown in the drawing and slides horizontally across the upper face of the relay unit 31. In its upper face a gear rack 97 is mounted. This rack is engaged by a pinion 98 carried upon a drive shaft 99. The drive shaft is supported in suitable bearings 100. A pulley 101 is mounted upon the opposite end of the shaft 99 and is driven by a belt 102. This belt passes around a pulley 103 mounted upon a jack shaft 104. The jack shaft is carried upon the frame member 95 within bearings 105. A pulley 106 is mounted upon the jack shaft and receives a belt 107. This belt is led around a drive pulley 108 mounted upon the armature shaft 109 of the motor 64.

The door 12 is attached to the operating rail 96 by a hinge 110. The pintle 111 of the hinge is associated with mechanism not shown in the drawing by which it may be withdrawn in case of emergency when the mechanism becomes inoperative.

The trip shaft 77, as previously explained, carries trip fingers 78 and 79. These fingers are substantially at right angles to each other and are at different levels upon the shaft. The shaft, as has been previously explained, is also formed with the three cam sections, shown for example in Figs. 6, 7 and 8. It is intended that when the shaft 77 is in one position and the relay is operated the operating bar 96 will move horizontally to its extreme position, and that as it moves the shaft 77 will be rotated to prepare the various switches for a reverse operation. This requires trip means, as shown in Figs. 1 and 4 of the drawings. Here it will be seen that two trips are provided, one generally indicated at 112, and the other at 113. The trip 112 comprises an angle-shaped member having end portions 114 and 115 formed with aligned openings to receive a mounting bar 116. The member may thus slide longitudinally of the bar and will be held frictionally in a desired position. The horizontal leg of the angle forming the member carries a trip cam 117 formed with an inclined end face 118 which will encounter trip finger 79 when the operating rail 96 moves in the direction of the arrow *a* as indicated in Figs. 1 and 4. The trip 113 is disposed adjacent to the end of the operating rail 96 farthest from the hinge 110. This trip is identical with the one previously described except that it is reversed in position upon a rod 119 and carries a trip cam 120 formed with an inclined face 121. This cam will engage the trip finger 78 and rotate the operating shaft 77 of the relay unit 31 as it moves in a direction counter to that indicated by the arrow *a*. It will be understood that the cams 118 and 120 are spaced apart a distance represented by the normal stroke of the operating bar 96. However, in the event that the operating shaft 77 did not properly interrupt the flow of current to the motor in the driving stroke in either direction of the bar 96, limit means are provided which comprise a trip pin 122 and a trip pin 123. These project from the side of the operating rail 96 at the levels of the cams 118 and 120, respectively, and will thus positively engage the fingers 78 and 79 to interrupt the flow of current completely by a separate switch if the current has not been properly discontinued by the action of the cams 118 and 120.

In the event it is desired to operate the garage doors without the aid of the unit shown in the dotted line field A of Fig. 5 a pair of switches 124 and 125 are provided. The switch 124 may be located within an adjoining dwelling and is provided with a conductor 126 leading to the wire 46 and a conductor 127 leading to the wire 42. The switch 125 may be located at the garage and is provided with a conductor 128 connected to the wire 46 and a conductor 129 connected to the wire 42.

In operation of the present invention it will be assumed that the structure is made and assembled as shown in the drawings, and that the garage door 12 is closed. At this time the operating bar 96 will be in its extreme position to the right when Figs. 1 and 4 are considered. It will be understood that Figs. 1 and 4 indicate the operating bar and the door in their open positions. When the door is closed the safety switch, comprising blades 53 and 54, is in the position indicated in Fig. 6 of the drawing. The combination forward-reverse switch and garage light switch are in the positions indicated in Fig. 7 of the drawing with the blades 89 and 93 in register, and with the blades 88 and 91 in register. At this time the light switch blades 72 and 73 are not in contact. When the door is closed the relay limit control switch, comprising blades 50 and 51, is in its closed position, as shown in Fig. 8. The approaching automobile 16 normally has the switch 18 making contact with the member 19 and the radio lead wire 20. This gives a normal electrical connection to the radio aerial 17. As the car approaches the garage the switch 18 is turned to establish a connection between the aerial 17 and the contact 21. It is to be understood that the circuit set up in the spark coil comprising windings 23 and 24 will cause the automobile to which the circuit is grounded to act as a condenser so that a complete induction circuit will be made through the automobile, the aerial and antenna and the sensitive relay coil 33 to the ground. When a circuit is set up through the induction coil unit, comprising windings 23 and 24, this unit will be energized from the battery 29 through conductor 28 as the circuit is completed through ground wires 25 and 26. This causes a high voltage induced current to be delivered to the aerial 17. When the aerial encounters the antenna 14, which is stretched across and above the driveway, this induced current passes to the antenna 14 and then through the lead wire 15 to the relay winding 33, which is mounted separately within the garage. The current will there energize the relay magnet comprising winding 33 and core 36 and complete a circuit to ground through the conductor 35. When the coil 33 is energized it will draw the switch blade 37 into contact with the switch member 39. Thus, a low voltage circuit will be established from the low voltage feed line 43 to conductor 42, to the contact 39, and thence through the switch blade 37, through conductor 46, to the winding 47 of the power relay, after which the circuit is completed through conductor 49 to blade 50 of the relay limit control switch, and then through blade 51 of this switch to the low voltage power line 52. It is understood that the blades 50 and 51 are held in electrical contact at this time, as shown in Fig. 8 of the drawing. When the power relay 47 is energized switch blades 57 and 44 will be drawn downwardly to

contact switch elements 60 and 45, respectively. This will cause motor circuits to be established as follows, since at this particular time the safety switch and the combination forward-reverse switch are in the positions shown in Figs. 6 and 7. Current will flow from the feed line 67 to conductor 66 connected with blade 54 of the safety switch. This blade is in contact with blade 53 of the safety switch which is connected by conductor 55 to the post 56 carrying the switch blade 57. This switch blade has been actuated by the power relay 47 and thus a circuit is established through conductor 62 to the motor lead wire 70. This is attached to the forward driving windings of the motor 64. A circuit is then completed through conductor 69 to the feed wire 68 for driving the motor. At the same time a circuit will be established from the wire 70 to blade 89 of the forward and reverse switch, and since that switch blade is in contact with blade 93 a circuit will be completed through conductor 63 to one side of the reverse winding of the motor 64. The opposite side of this winding is connected to conductor 65, which in turn connects with conductor 65' attached to the switch blade 91. This blade is in contact with the blade 88 leading to the wire 69 and the return feed wire 68. When this takes place the motor 64 will be energized to raise the door 12 by driving the operating bar 96 along its guides as the gear 98 engages the rack 97. It should also be pointed out that at this time the trip fingers 78 and 79 are in the dotted line positions shown in Figs. 6 to 8, inclusive, and that the finger 78 is in the plane of the trip cam 118. Thus, as the operating bar 96 moves to bring the trip cam 118 into engagement with the finger 79 the shaft 77 will be rotated and will dispose the various switch elements in the positions shown in Figs. 9, 10 and 11. Here it will be seen that the positions of the contacts in the safety switch, as shown in Fig. 9, remain closed, that the positions of the switch blades in the combination forward and reverse switch are reversed, and that the switch blades 72 and 73 controlling the garage lights are moved into contact. It will also be noted that during the interval the shaft 77 rotates from the position represented in Figs. 5, 6 and 7 to the position represented in Figs. 9, 10 and 11 the relay limit control switch, which includes the groove 83 to receive the arcuate end 84 of an operating blade 85, as shown in Fig. 13, will momentarily open. This will break the circuit through the relay 47, and since the circuit through the relay 33 was only energized during the period when the aerial 17 contacted and passed beneath the antenna 14 all of the circuits will be broken save the light circuit through the socket 75.

When it is desired to close the door as the car is backed out of the garage the switch 18 may be set as previously described, so that a high voltage induced current will be delivered to the antenna 14 when it encounters the aerial 17. This will again energize the relay winding 33, setting up a low voltage circuit to the power relay 47. The switch blades 44 and 57 will then be drawn into engagement with their contacts 45 and 60, respectively. A circuit will then be completed from the high voltage feed wire 67 to conductor 66, and then through blades 54 and 53 of the safety cut-off switch to the conductor 55, after which current will flow through the switch blade 57 to the contact 60, and thence through conductor 70' to the conductor 70. The current will then flow through conductor 70 to one side of the forward winding of the motor 64 and will be completed through conductor 69 to the opposite feed line 68. At the same time current from the conductor 70' will flow through switch blade 89 to the switch blade 94 and thence along conductor 65 to one side of the reverse winding in motor 64. The opposite side of the reverse winding is connected to conductor 63, which leads to switch blade 62. The circuit then continues through switch blade 88 to conductor 69 and to the opposite feed wire 68. When this takes place a reverse operation of the motor will be established to shift the operating bar 96 and to close the door. As the door reaches its closed position the trip cam 120 will encounter the finger 79 on the cam shaft 77 to restore the cams and switches to the positions shown in Figs. 6, 7 and 8 preparatory to a new operating position. In the event the engagement of the trip cams 116 and 120 with the fingers 78 and 79 does not completely interrupt the circuits further travel of the operating bar 96 will cause the members 122 and 123 to encounter the fingers 78 and 79 and turn the cam shaft 77 to either of the two extreme positions shown in Figs. 12 and 14, where the current through the switch blades 53 and 54 will be completely interrupted.

In the event it is desired to operate the door when an automobile is not present switches 124 or 125 may be closed manually. It should also be pointed out that in the event the power operating mechanism becomes inoperative the operating bar 96 may be detached from the door 12 by withdrawing the hinge pintle 111 from the outside.

It will thus be seen that the garage door operating mechanism here disclosed is simple in construction, that it may be easily adapted to garage doors of any type so that the doors will automatically open and close when an automobile is in proximity to them, and so that the doors may be automatically opened and closed by a manual control when desired.

While I have shown the preferred form of my invention as now known to me, it will be understood that various changes may be made in combination, construction and arrangement of parts by those skilled in the art, without departing from the spirit of the invention as claimed.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. In combination, a motor, a power relay switch, an electric circuit including the driving motor, the power relay switch and a source of electric energy, a normally open electric control circuit for the power relay including a source of electric energy, a control relay for closing said control circuit, a partial electric operating circuit for said control relay including a fixed contact member, and a mobile source of electric energy including a member to be moved into engagement with said fixed contact whereby a circuit to the control relay will be completed to actuate the same.

2. In combination, a driving motor, a source of electric energy, and a power relay, an antenna connected with said relay and disposed in the path of a mobile electric circuit including an aerial adapted to contact the antenna whereby the power relay will be energized to close the motor circuit.

3. The structure of claim 2 including means acting automatically to interrupt said circuit when the motor has completed a predetermined period of energization.

4. In combination, an electric circuit including a source of electric energy, a motor and a relay switch, a separate circuit including a source of electric energy, the magnet of the relay switch and a control relay switch, a partially prepared circuit including the magnet of the control relay switch, a relatively fixed contact member attached to said partial circuit, and a mobile electric unit adapted to engage said contact member and impart an induced current into said partially prepared circuit whereby the magnet of the control relay will be energized.

JOHN C. KAYTOR.

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