

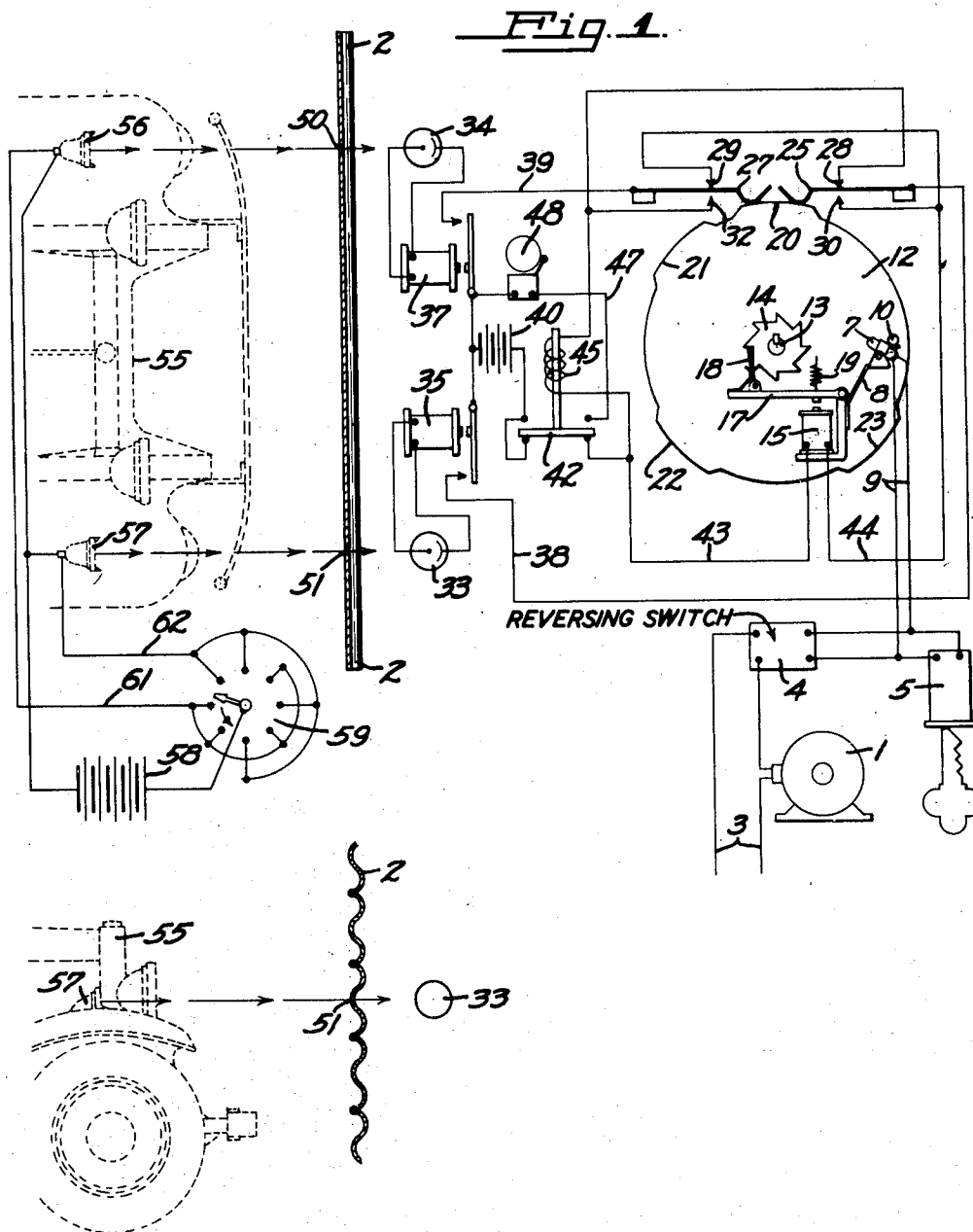
Oct. 12, 1937.

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2,095,688

CIRCUIT CONTROL MECHANISM

Filed Oct. 17, 1933



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2,095,688

CIRCUIT CONTROL MECHANISM

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Application October 17, 1933, Serial No. 693,933

5 Claims. (Cl. 177—314)

My invention relates to circuit control mechanism, and particularly to devices for controlling the doors of garages and the like by light or tone-operated relays.

5 Among the objects of my invention are: To provide a means for controlling the opening or closing of a garage door without leaving the automobile or other vehicle which is to use the door; to provide a device of the character described 10 which is operative upon the application of a series of dissimilar impulses applied in accordance with a preselected code and is responsive to that code only; to provide a device which is rendered inoperative by the application of an incorrect sequence of code impulses; to provide a device of 15 the character described which will signal the application of an incorrect code; and to provide a device which is at once simple, rugged, and unlikely to get out of order. A further object of my invention is to provide a system which does not 20 preclude alternative operation by a key-actuated switch.

Other objects of my invention will be apparent or will be specifically pointed out in the description forming a part of this specification, but I 25 do not limit myself to the embodiment of the invention herein described, as various forms may be adopted within the scope of the claims.

Referring to the drawing:

30 Figure 1 is a schematic diagram showing the essential elements and circuits involved in the device of my invention, the automobile and the door which is operated therefrom being indicated in plan.

35 Figure 2 is a fragmentary view, also diagrammatic in nature, indicating, in elevation, the positioning of the actuating mechanism and responsive light cells.

40 Considered broadly, the apparatus of my invention comprises a pair of actuating elements which are responsive to signals of different characteristics. These elements may be photoelectric cells responsive to lights of different color or 45 to lights of the same color differently directed, or they may be, within the scope of this invention, tone-actuated relays responsive to tones of different frequency. A step-by-step mechanism is provided which actuates the switch of the door-operating circuit at its final step or phase 50 of operation, and this mechanism carries switching means to which the actuating elements are connected. The circuits are so arranged that in each step of operation one of the actuating elements is connected to advance the step-by-step 55 mechanism a further step, while the second of

the actuating elements is connected to actuate a supervisory circuit. The supervisory circuit may control either an alarm, a circuit breaker which disconnects the entire apparatus and renders it inoperative further to advance the step-by-step mechanism, or, preferably both. There 5 is also preferably provided, mounted on the automobile, a switch which is operative to generate the correct series of code impulses to operate the actuating elements in their proper order. The 10 switch which is closed by the final operation of the step-by-step mechanism is preferably connected in parallel to the usual key-operated switch which is used to control motor-operated 15 doors of the type referred to, it being understood that the motor and actual door mechanisms are already well known and form no part of this invention.

In the diagram of Figure 1 this conventional door-operating mechanism is symbolized by the 20 motor 1, which operates the door 2. The motor is supplied from power mains 3, and controlled by a reversing switch 4 so that it is operative to open the door upon one operation of the key-actuated switch 5 and to close the door upon 25 the next operation of said switch.

The selective circuit actuating mechanism of my invention is preferably connected in parallel 30 with the key-operated switch 5, and comprises a mercury switch 7 which is tiltably mounted on a suitable bracket 8, and is connected by the leads 9, to the key-switch circuit.

The mercury switch is so balanced as to hold the circuit normally open, but to close it when 35 the switch is tilted by a pin 10 which is carried on the edge of a cam disk 12.

The disk 12 is keyed to the shaft 13 carrying a ratchet wheel 14, and this ratchet wheel is operated by a step-by-step mechanism. An electromagnet 15 carries a pivotally mounted arma- 40 ture 17, mounted at the end whereof is a spring-actuated pawl 18 which engages the ratchet wheel. When the magnet 15 is energized the armature is attracted and the pawl engages a succeeding tooth on the ratchet. The de-energization of the magnet 15 permits the spring 19 45 to retract the armature, thus advancing the mechanism by one step.

The periphery of the disk 12 carries or actuates 50 switching mechanism which controls the energization of the magnet 15. This switching mechanism may be embodied in many variant forms. Segmental contacts of the commutator type may be embedded in the edge of the disk, pins, carried 55 by the disk, may be used to operate mercury

switches similar to the switch 7, and many other modifications are possible. The form shown, however, has the virtue of simplicity of construction and of illustration, and is entirely practical in use.

5 In this form the disc 12, which is formed of a non-conductor such as bakelite or hard fiber, carries on its periphery a plurality of cam lands 20, 21, 22, and 23. These lands are distributed about the disc in accordance with the code which
10 is to operate the device. Since the ratchet 14 is shown as having eight teeth, the periphery of the disc may be considered as subdivided into eight parts. The presence of a cam land in one of these segments is adapted to cause an operation
15 of one type to advance the disc by means of the step-by-step mechanism. The absence of a land in a segment causes a different setup, and a different type of operation to advance the disc. Eight operations of one or the other type complete
20 the cycle and actuate the switching mechanism.

In the embodiment illustrated the cam land and intervening valleys serve to actuate a pair of leaf switches 25 and 27. Each of these switches is provided with upper and lower contacts, so
25 that when the leaves rest upon a land, (as illustrated upon the land 20) the upper contacts 28 and 29 respectively are closed, while if the disc be so positioned that the switches contact the disc in one of the valleys between the lands the con-
30 tacts 30 and 32 make contact with the spring leaf.

The two switches 25 and 27 serve to connect one or the other of two actuating elements to operate the magnet of the step-by-step mechanism. In the present instance these actuating
35 elements comprise a pair of photoelectric cells 33 and 34. These cells are preferably of the copper oxide type, which, under the influence of light, generate sufficient current to excite the relays 35 and 37 respectively, but it is to be understood
40 that other types of photosensitive cells may be used, or tone actuated relays may be substituted therefor without departing from the spirit of this invention.

One contact of the relay 35 connects through
45 a lead 38 with the spring member of switch 25. The corresponding contact of the relay 37 connects through the lead 39 with the spring member of a switch 27. The other contacts of both relays are connected together and to a battery or other
50 power source 40.

From the battery 40 the relay circuit leads through the contacts of a circuit breaker relay 42 to a divided circuit, one branch of which com-
55 prising the leads 43 and 44 connects through the step-by-step magnet 15 to contacts 29 and 30 of the switches 25 and 27. The other branch leads through the operating coil 45 of the relay 42 to contacts 28 and 32 respectively of the switches
25 and 27.

60 The relay 42 is preferably of the manually restored type, i. e., when in the position shown it will remain there until the coil 45 is actuated. After actuation of the coil, breaking the circuit between the battery 40 and the lead 43, this cir-
65 cuit will remain open until manually closed. An additional circuit is also preferably provided which closes as the other opens, this circuit being traced from the battery 40 through the upper contacts to the relay 42, a lead 47 and an alarm bell 48, back to the battery.
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We may now trace the operation of the device. Supposing the photocell 34 to be actuated by a light projected through the aperture 50 in the door 2, the relay 37 will close. The circuit may
75 then be traced from the battery 40 through the

contact of relay 37 and the lead 39 to the switch-
arm 27, and thence through contact 29, lead 44, magnet 15, lead 43, and the contacts of relay 42 back to the battery. The armature 17 is therefore retracted by the magnet, engaging the next tooth on the ratchet, so that as soon as the photocell 34 is deactivated the step-by-step mechanism will advance one step.

If, however, instead of the photocell 34 being excited, the cell 33 is energized, relay 35 will close,
10 completing the circuit from the battery 40 through the relay contact, lead 38, switch-arm 25 and contact 28, through the supervisory circuit including the relay coil 45 and thence back to the battery 40 through the contacts of the relay 42.
15 This breaks the circuit from the battery through the step-by-step mechanism and renders the entire device inoperative, at the same time energizing the alarm bell 48 and indicating an attempt to actuate the device improperly. It will
20 of course, be obvious that either the circuit breaker feature or the alarm bell feature of the relay 42 may be eliminated.

If, instead of being in the position shown, the cam disc be so positioned that the switches 25
25 and 27 are resting in one of the valleys between the lands, the functions of the photocells 33 and 34 are interchanged. Under these conditions, if cell 33 be energized, the operation will close relay 35 and complete the circuit from the battery 40
30 through line 38, contact 30 of switch 25, magnet 15 and lead 43 back to the battery, thus advancing the step-by-step ratchet when the relay 35 again opens. If, however, under like circumstances the cell 34 be excited, the closing of relay 37 will com-
35 plete the circuit comprising lead 39, switch 27, contact 32 and circuit breaker 45, thus actuating the supervisory circuit.

It follows that for each position of the cam-disc there is a "right" and a "wrong" signal. The
40 "right" signal sets in train the operations which will advance the cam-disc one step when the signal is discontinued; the "wrong" signal immediately excites the supervisory circuit, giving an alarm and rendering the mechanism inoperative.
45 The new position of the cam-disc determines which is the "right" and which the "wrong" signal for effecting the next advance.

The actuating elements 33 and 34 must be con-
50 secutively excited in accordance with a predetermined code, and excitation in any order other than that thus predetermined will disconnect the mechanism and render it necessary to use the key-actuated switch 5 in order to open the door. Therefore, in order to insure the operation of the
55 actuating elements in the proper succession, I prefer to provide means permanently set up in accordance with the code, these means being mounted on the automobile using the door.

This portion of the system is shown at the left of Figure 1, the car 55, shown in the dotted
60 lines, carrying the signaling lamps 56 and 57. One switching arrangement for operating these lamps is shown schematically, the circuit shown being substituted for the usual parking light circuit, and the apertures 50 and 51 in the door
65 being so positioned that when the car is immediately in front of the door, in position to enter, the lights and apertures are aligned with the photosensitive elements as shown in Figures 1
70 and 2.

One side of each of the operating lamps, is connected to one pole of the car battery 58. An eight-point switch 59 is conveniently mounted within the car, the other side of the battery
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connecting with the switch arm. Certain of the switch points are connected with the lead 61 leading to the lamp 56, while others connect with the lead 62 connecting with lamp 57. The points are arranged in a succession corresponding with the cams and valleys of the disc 12, so that a single rotation of the switch arm, in the direction shown by the arrow, will carry the step-by-step mechanism through its cycle of operations and open the door. On leaving the garage a similar rotation of the switch (the reversing switch 4 having operated meanwhile through the opening of the door) will again actuate the device to close the door, effectively locking it against intruders.

Where tone-operated relays are substituted for photocells, two horns of different pitch are substituted for the lamps 56 and 57 in a similar circuit.

I claim:

1. Selective circuit operating means comprising a switch to be actuated, an electrically driven step-by-step mechanism, means moved by said step-by-step mechanism for operating said switch, a circuit breaker connected to energize said step-by-step mechanism, a pair of signal-responsive means producing a current, connections energized by said signal responsive means to said circuit breaker and to said step-by-step mechanism, and means actuated by said step-by-step mechanism at a plurality of predetermined steps of its operation to interchange said connections between said pair of signal-responsive means, to connect one of said signal-responsive means as preselected for each step, to operate said mechanism, and to connect the other of said signal-responsive means to operate said circuit breaker.

2. Selective circuit operating means comprising a switch to be actuated, an electrically driven step-by-step mechanism, means moved by said step-by-step mechanism to operate said switch, a circuit breaker connected to energize said step-by-step mechanism, a pair of photoelectric cells, a relay actuated by current from each cell, and switching means operative in accordance with the position of said mechanism for repeatedly interchanging the connections of said relays between said circuit breaker and said step-by-step mechanism to connect one of said relays preselected for each step, to advance said mechanism, and to connect the other of said relays to open said circuit breaker.

3. Selective circuit operating means comprising a switch to be actuated, an electrically driven step-by-step mechanism, means moved by said mechanism to operate said switch, a pair of signal-responsive means producing a current, a supervisory circuit, and switching means actuated in accordance with the position of said step-by-step mechanism for repeatedly interchanging the connections of said signal-responsive means between said supervisory circuit and said step-by-step mechanism, to connect one of said signal-responsive means as preselected for each step, to advance said step-by-step mechanism, and to connect the other of said signal-responsive means to energize said supervisory circuit.

4. A system of control comprising means for initiating a sequence of differentiated impulses, means electrically responsive respectively to each impulse, an electrically driven step-by-step mechanism, an electrically controllable mechanism responsive to a cycle of operation of said step-by-step mechanism, and switching means operative in accordance with the position of said step-by-step mechanism for repeatedly interchanging the connections from said step-by-step mechanism between the respective responsive means to connect one of said responsive means to actuate said mechanism.

5. Selective circuit operating apparatus comprising a switch, a disc carrying positioned means capable of actuating said switch, additional cams on said disc, a ratchet wheel secured to said disc, a resiliently actuated pawl positioned to engage said ratchet wheel and disc in the process of retraction, electromagnetic means for operating said pawl to rotate said disc, a pair of signal-responsive devices producing a current, an auxiliary circuit, and contact means operative in accordance with the position of said cams for connecting one of said signal-responsive elements to said electromagnetic means and to connect the other of said signal-responsive means to said auxiliary circuit, whereby the deactivation following the activation of the connected signal-responsive element will advance said disc by a single step of the ratchet, thereby determining which of said actuating elements must next be operated to cause said disc to advance a succeeding step.

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