Sept. 26, 1961 S. R. GEROSOLINA 3,002,131

REMOTE CONTROL DEVICE FOR ELECTRIC CIRCUITS

Filed April 15, 1958 2 Sheets-Sheet 1

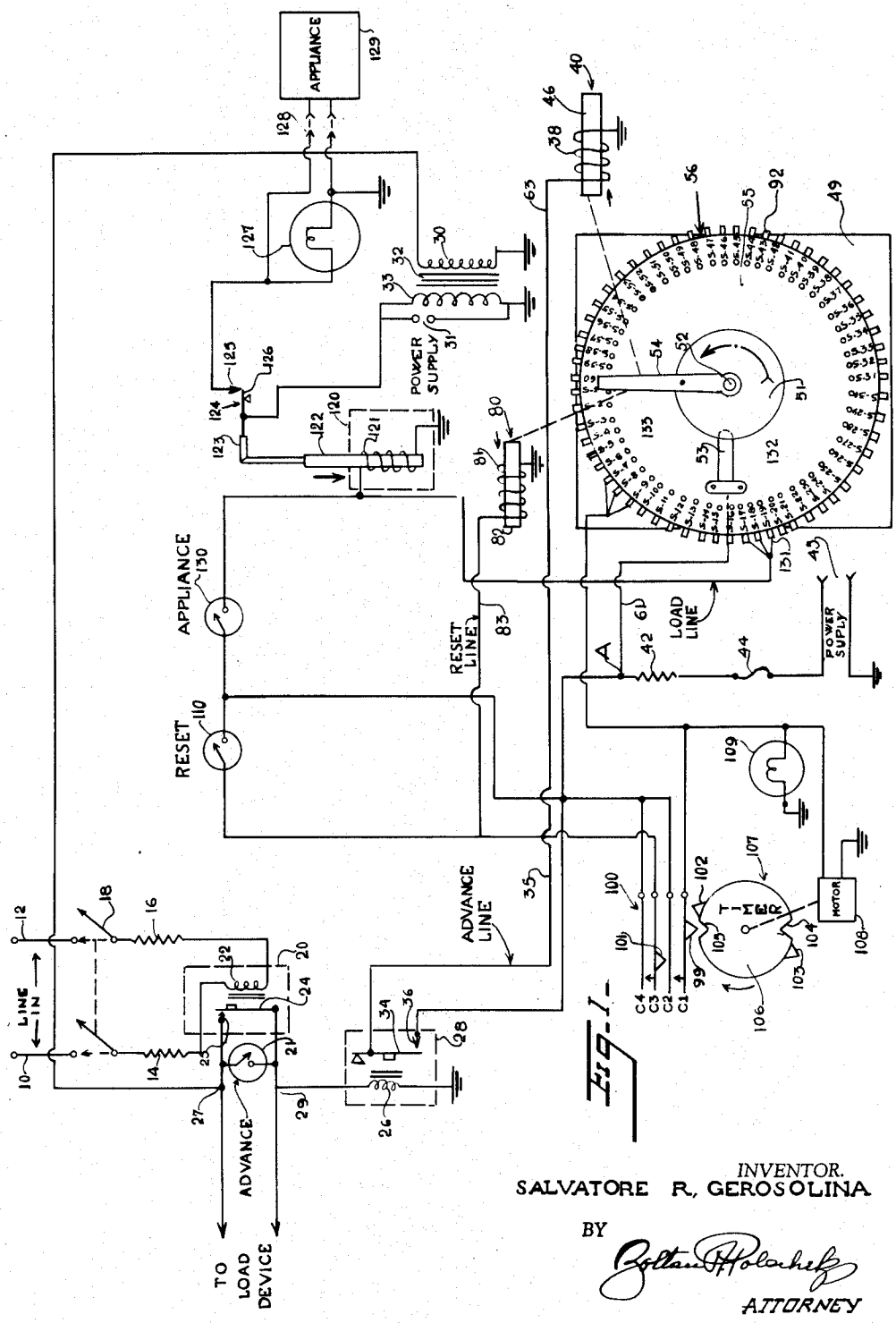


Fig. 1

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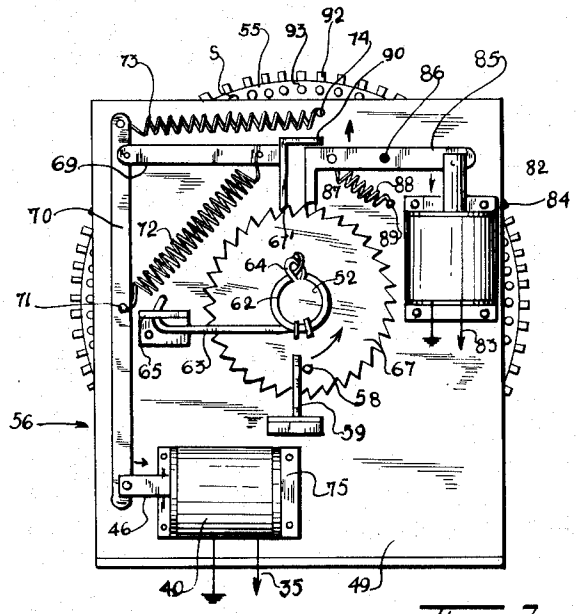


Fig. 2

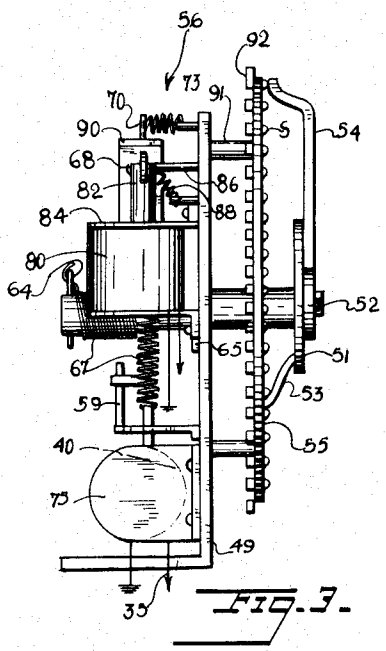


Fig. 3

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REMOTE CONTROL DEVICE FOR ELECTRIC CIRCUITS

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This invention concerns a remote control device for an electrical circuit and is particularly adapted for use with a telephone ringing or signaling means.

A principal object of the invention is to provide a remote control means for an electrical circuit of an appliance or other load device.

A further object is to provide a means for using a telephone for actuating a remote control device without interfering with normal operation of the telephone.

For further comprehension of the invention, and of the objects and advantages thereof, reference will be had to the following description and accompanying drawings, and to the appended claims in which the various novel features of the invention are more particularly set forth.

In the accompanying drawings forming a material part of this disclosure:

FIG. 1 shows schematically an electrical diagram of a remote control device involving a preferred embodiment of the invention.

FIG. 2 is a rear view of a ratchet switch employed in the device.

FIG. 3 is an end view of the ratchet switch of FIG. 2.

In FIG. 1 there is shown an input line consisting of conductors **10** and **12**. This line may be a telephone line, a line from a microphone or any other source capable of delivering a signal to the control device. In series with the conductors respectively are resistors **14** and **16**. A double pole switch **18** may be provided in the line to deactivate the input to the control device. A relay **20** has its coil **22** connected across the input line at the ends of resistors **14** and **16**. The coil of relay **20** is in series with the resistors **14** and **16** and together they constitute a resistance-inductance circuit which has an inherent time delay in response to applied pulses, so that the relay **20** will not respond unless a pulse of sufficient amplitude and time duration is applied thereto. Fixed contact **25** and movable contact **24** of relay **20** are connected in series with coil **26** of relay **28**. Coil **26** is energized when contacts **24** and **25** are closed by the output of secondary winding **30** of power transformer **32**. Primary winding **33** is connected across an A.C. power supply at terminals **31**.

A push button switch **21** is connected across contacts **24** and **25** for manually closing the circuit between the terminals **27**, **29** of the contacts and independent of the relay **20**. At terminals **27**, **29** may be connected a signal device which will be active as long as contacts **24**, **25** are open.

Movable contact **34** and fixed contact **36** of relay **28** are connected in series with coil **38** of a solenoid **40** by "advance" line **35**. Coil **38** and contacts **34**, **36** are also in series with a voltage dropping resistor **42**, fuse **44** and a power supply source **45**. Instead of resistor **42** a lamp may be used to limit the current applied to coil **38** of solenoid **40**. Solenoid **40** has a plunger **46** arranged to advance a rotary contact arm **54** of a multi-contact ratchet switch **56**. The switch includes a stationary circular disc or plate **55** made of insulation material and mounted on a base plate **49**. The arm **54** is carried on a shaft **52**.

Mounted circumferentially on the plate **55** are a plurality of spaced fixed contacts S numbered S1–S60. The contacts are so arranged that one contact at a time is touched by the contact arm **54** during its rotation around

the plate. Arm **54** is secured to a metal disc **51** and rotates therewith on shaft **52**. A stationary slider contact **53** makes continuous contact with disc **51**. Arm **54** is thus electrically connected to power supply **45** via disc **51**, contact **53**, wire **61**, resistor **42** and fuse **44**. Arm **54** is normally biased by a coil spring **62** to the first or starting position S1. The spring **62** is mounted on shaft **52** at the rear of the switch, as best shown in FIGS. 2 and 3.

Referring to FIGS. 2 and 3, it will be noted that spring **62** is connected at one end **63** to plate **65** which is mounted on plate **49**. At its other end the spring **62** is engaged in pin **64** mounted on the rear end of shaft **52**. Spring **62** serves to bias and hold the arm **54** in starting position S1.

A ratchet gear wheel **67** is also mounted on shaft **52** and turns with it. This wheel carries a pin **58** which abuts a pin stop member **59** supported on plate **49**. The pin stop member is so placed that the shaft, ratchet and arm are limited to only one revolution from switch position S1 to switch position S60. Gear wheel **67** is disposed to be turned by the hooked extension **68** of link **69**. Link **69** is pivotally attached to lever **70**. This lever pivots on pin **71** which is secured to plate **49**. A coil spring **72** is secured between lever **70** and link **69**. Another spring **73** is secured between the upper end of lever **70** and pin **74** on plate **49**.

By the arrangement shown, plunger **46** is retracted when solenoid **40** is energized to pivot lever **70** forwardly over the adjacent tooth **67'** of wheel **67**. The spring **72** is then tensioned and retracts to cause hook **68** to pull or advance ratchet wheel **67** by one tooth so that arm **54** moves one switch position against increasing tension in spring **62**. Solenoid **40** is supported by bracket members **75** on plate **49**.

A second solenoid **80** has its coil **81** connected to "reset" line **83** as shown in FIG. 1. This solenoid has a plunger **82** operatively connected to the ratchet switch to reset or restore arm **54** to its initial or starting position S1 whenever the solenoid is energized. Solenoid **80** is mounted by brackets **84** on plate **49**. Pivotally attached to plunger **82** is a lever **85**. The lever pivots on pin **86** mounted on plate **49**. The free end of the lever has a depending finger **87** which normally rests on the periphery of gear **67**. Spring **88** is secured between lever **85** and pin **89** to hold the finger **87** down. Hook **68** has an extension **90** which projects over lever **85**. When solenoid **80** is energized, plunger **82** is retracted and lever **85** pivots to lift hook **68** out of engagement with the teeth of the ratchet so that tension spring **62** unwinds and returns the ratchet and arm to the starting position shown in FIGS. 1 and 2. The disc **55** is supported on plate **49** by stand-off spacers **91**. Each of contacts S is connected by short lead **93** to a lug **92** mounted on disc **55**.

Referring now to FIG. 1, it will be noted that coil **81** is connected via reset line **83** to a movable contact C3 of a four-contact switch **100**. Contact C3 is associated with a fixed contact C4 which is connected at tie point A to the power supply **45** via resistor **42** and fuse **44**. Coil **81** is also disposed in a manual reset circuit in series with a push button or single pole switch **110**, resistor **42**, fuse **44** and power supply **45**. Switch **110** is connected across normally open contacts C3 and C4.

Switch **100** has spring contacts C1, C2, C3 and C4 all normally open. Element **101** between contacts C2 and C3 is made of insulation material to separate the contacts electrically. Contact C1 carries an insulation member **99** disposed to touch the periphery of a rotatable disc **106** of a timer **107** for closing contacts C1—C2. Two diametrally opposed notches **104** and **105** are provided in the disc. The locations of these notches fix

the ends of a timing cycle. Projections 102 and 103 made of insulation material are mounted on the periphery of disc 106 at diametrally opposed positions and serve to engage member 99 and close contacts C1—C2 and C3—C4 electrically. When member 99 projects into notch 105 as shown in the drawing, contacts C1—C2 are open. When member 99 is riding on the periphery of the disc 106 only contacts C1—C2 are closed and contacts C3—C4 are open. Contacts C3—C4 are closed only momentarily when member 99 rides over projection 102 or 103 at which time the closed contacts C1—C2 push the normally open contacts C3—C4 closed.

A motor 108 drives the disc 106. This motor is electrically connected to lugs at switch contacts S7, S8 and S9 of the switch 56. Contact C1 is also connected to these contacts. When arm 54 is in certain contact positions such as S7, S8 and S9, motor 108 is energized to start disc 106 rotating. The disc is initially in the position shown in the drawing with projection 99 in notch 105 and contacts C1 and C2 open. As the disc 106 rotates the contacts C1 and C2 close while arm 54 rotates away from contacts S7, S8, S9. The closing of contacts C1 and C2 establishes a holding circuit for the motor 108 so that it continues to rotate until projection 103 is reached whereupon contacts C3 and C4 are closed to actuate the reset circuit of solenoid 80. Upon actuation of solenoid 80 the plunger 82 pivots the lever 85 to release the ratchet wheel, whereupon spring 62 returns the arm 54 to starting position S1. As disc 106 carries projection 103 past projection 99, projection 99 extends into notch 104, whereupon the contacts C1—C2 open and the motor 108 stops. The spacing of the notches 104 and 105 thus define two equal timing cycles, each preferably of about two and one-half minutes' duration. The next timing cycle will start at notch 104 in the same manner as described above and ends when notch 104 reaches projection 99. Each time arm 54 reaches switch contacts S7, S8, S9 a new timing cycle for disc 106 begins. Three switch contacts S7–S9 are employed since the motor 85 will generally require a succession of pulses to advance the notch 104 or 105 past projection 99 sufficiently to cause projection 99 to ride on the periphery of the disc.

A pilot lamp 109 is disposed in parallel with motor 108. It indicates when the motor is rotating during a timing cycle and may serve as a signal or alarm during the timing cycle.

A third solenoid 120 has its coil 121 in series with contacts of switch positions such as S17, S18 and S19 so that when the arm 54 is in any of these positions the solenoid 120 is actuated to push its plunger 122 upwardly. The plunger is operatively connected to handle 123 of switch 124 to close contacts 125, 126 of the switch and provide power at outlet terminals 128 via the power supply terminals 31. A pilot lamp 127 may be provided in parallel with terminals 128 to indicate when they are energized. Terminals 128 may be used to provide power to an electrical appliance, recording device or other power consuming device 129 in accordance with the purpose of the invention. Switch 124 is preferably a snap type of switch which will remain in the position set until the next time the handle 123 is actuated by plunger 122.

A push button or other switch 130 may be connected between coil 121 of solenoid 120 and power supply 45. The connection is most conveniently made at tie point A, at the low voltage end of the voltage dropping resistor 42. This push button serves as a manually operable means for actuating the solenoid 120 to apply power to appliance 129.

One scheme of operation of the device will now be described. In operation of the device, it will be assumed that line 10, 12 is a telephone ringing circuit or a microphone line disposed to pick up the ringing sound of a telephone receiver station bell when the telephone receiver station is called. Switch 18 is presumed closed. Upon receipt of a signal pulse of sufficient magnitude and time duration, coil 22 of relay 20 is energized to close contacts 24, 25 and energize relay 28. At the same time, the circuit to the load device at terminals 27, 29 is closed. If this load device were house lights, a radio, an alarm or other power consuming load it would be operated while contacts 24, 25 were closed. When relay 28 is energized contacts 34, 36 close and coil 38 of solenoid 40 is energized via the advance line 35. Plunger 46 is actuated to advance arm 54. Each pulse applied to relay 28 actuates solenoid 40 once so that arm 54 advances one step or one switch position. At the end of predetermined number of timed pulses the arm 54 reaches switch positions 133 such as S7, S8, S9 so that motor 108 is started and the timing cycle of timer 107 begins. Successive pulses of solenoid 40 move the arm 54 past switch positions S7—S9. Motor 108 continues to rotate disc 106 because the holding circuit has been established through contacts C1—C2. Before the expiration of the timing cycle of disc 106 arm 54 reaches switch positions 132 such as S17—S19 to close the circuit via "load" line 131 which energizes solenoid 120 and the single pole single throw switch 124 is closed or opened depending on the action desired to close or open, respectively, the power supply circuit of appliance 129.

Arm 54 may stop at switch position S19 or may continue to advance. The reset timing cycle of time 107 should be set so that by the time arm 54 reaches switch position S60, the reset timing cycle ends. The reset timing cycle ends when projection 99 rides over projection 102 or 103. This causes the closing of the reset circuit via reset line 83 to actuate solenoid 80 and cause the restoration of arm 54 to its starting position S1.

The multi-position switch 56 in association with timer 107, relays 20 and 28 and solenoids 40 and 80 provide means for coding the operation of the system by requiring that a plurality of predetermined time intervals be arbitrarily set. For example, if a first predetermined time interval after each pulse is applied to relay 20, the relay closes. If any pulse is not of required magnitude and duration, determined by the resistance-inductance parameters of resistors 14, 16 and coil 22, the relay will not close. During a second time interval while relay 20 is repeatedly opened and closed as a succession of timed pulses is applied thereto, arm 54 steps from position S1 to switch positions 133, and motor 180 starts to rotate and to drive timer disc 106. The position-spacing of switch contacts 133 from position S1 determines the duration of the second time interval. After disc 106 rotates for a third time interval determined by the spacing of notch 104 or 105 from projection 102 or 103 respectively, arm 54 is reset to position S1. After arm 54 rotates for a fourth predetermined time interval determined by the spacing of contacts 133 from contacts 132, arm 54 reaches contacts 132 and the appliance 129 is turned on or off as desired.

If desired, line 10, 12 could be connected directly to coil 26 and relay 20 may be omitted. Relay 28 may then receive successive pulses on line 10, 12. As each pulse in received the solenoid 40 will be actuated once to advance the arm 54 one step. In this arrangement there will be three predetermined time intervals setting the coding of the system. The first time interval will be the number of steps required by the ratchet or stepping switch 56 to reach the timing contacts 133. The second time interval will be the duration of the reset timing cycle, for arm 54 set by the number, spacing and locations of notches and projections on disc 106. The third time interval will be the number of steps required by the stepping switch to reach contacts 132 when actuation of the load line circuit occurs. The end of the second time interval when reset of arm 54 is effected should always occur after the end of the third time interval. The reset

of arm 54 at the end or the second time interval may be set to occur at any point beyond contacts 132 up to and including switch position S60.

Three wire taps are shown at each of the switch positions 132 and 133. More or less taps may be used but in general three taps will be sufficient for solenoid 120 to be actuated to close the load circuit at switch 124 and for motor 108 to be actuated to close the holding circuit through contacts C1—C2.

While I have illustrated and described the preferred embodiments of my invention, it is to be understood that I do not limit myself to the precise constructions herein disclosed and that various changes and modifications may be made within the scope of the invention as defined in the appended claims.

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

1. A remote control device, comprising a first means responsive to received timed signal pulses, a ratchet switch having a plurality of spaced, fixed contacts and a rotatable contact arm adapted to contact each of the fixed contacts in turn during rotation of the arm, a first solenoid operatively connected to ratchet for rotating said arm from a starting position at one of said fixed contacts to successive fixed contacts in turn, said means being operatively connected to said solenoid for initiating rotation of said arm a first predetermined time interval after each of said signal pulses is received by said means, a solenoid reset means for resetting said arm to the starting position, said reset means including a timing device having a preset timing cycle in circuit with certain of said fixed contacts so that the timing cycle of said device is initiated at the end of a second predetermined time interval when said arm reaches said certain fixed contacts, said timing device being operative at the end of a third predetermined time interval set by said timing device to actuate the reset means, release the ratchet and reset the arm to the starting position, an appliance load circuit, and a switching means in circuit with at least one other of said fixed contacts for operating said load circuit at the end of a fourth predetermined time interval and when said arm reaches said one other fixed contact, said first means comprising a time delay circuit and switch means arranged in circuit with said first solenoid.

2. A remote control device, comprising a first time delay means responsive to timed signal pulses each extending for at least a first predetermined time interval to receive timed signal pulses each extending for at least a first predetermined time interval; a ratchet switch having a plurality of fixed contacts and a rotatable contact arm adapted to contact each of the fixed contacts in turn during rotation of the arm, a first solenoid operatively connected to said arm for rotating said arm from a starting position at one of said fixed contacts to successive fixed contacts in turn against a spring tension, said means being operatively connected to said solenoid for rotating the arm during a second time interval while said signal pulses are received by said means after the first time interval, a second solenoid for resetting said arm and ratchet to the starting position, a timing device having a preset timing cycle in circuit with certain of said fixed contacts so that the timing device is actuated at the end of the second predetermined time interval when said arm reaches said cerain fixed contacts, said timing device being operative at the end of a third predetermined time interval set by said timing cycle to actuate the second solenoid to release said spring tension and reset the arm to the starting position, an appliance load circuit, and a switching means in circuit with at least one other of said fixed contacts for operating said load circuit at the end of a fourth predetermined time interval and when said arm reaches said one other fixed contact, said first means comprising a relay coil in series circuit with at least one resistor, said first solenoid being operative by said relay; said timing device comprising a rotatable disc having at least one notch therein and at least one projection, two pairs of switch contacts actuatable by contact between the disc and another projection on one of the switch contacts, one pair of switch contacts providing a holding means, and a motor in circuit with said holding means and arranged to rotate said disc, the other pair of said switch contacts being arranged to actuate said second solenoid.

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