Feb. 24, 1942. W. H. MURRAY 2,274,558

SOLENOID SWITCH OPERATOR

Filed April 9, 1940

Fig. 1.

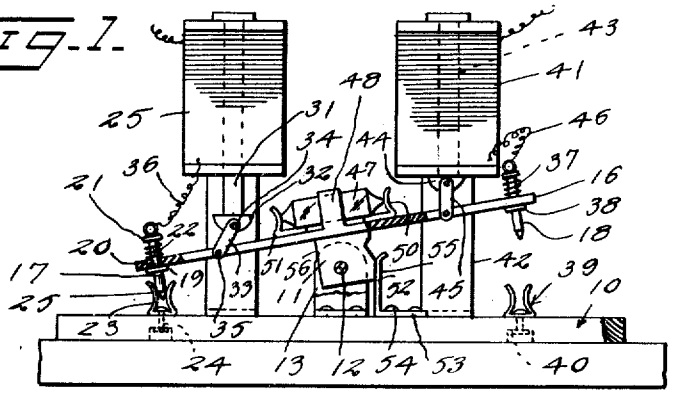


Fig. 2.

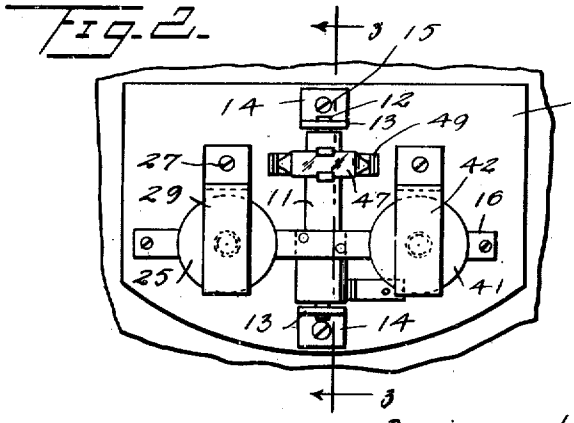


Fig. 3.

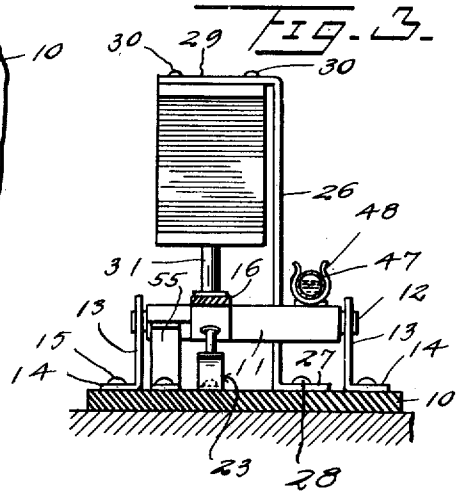
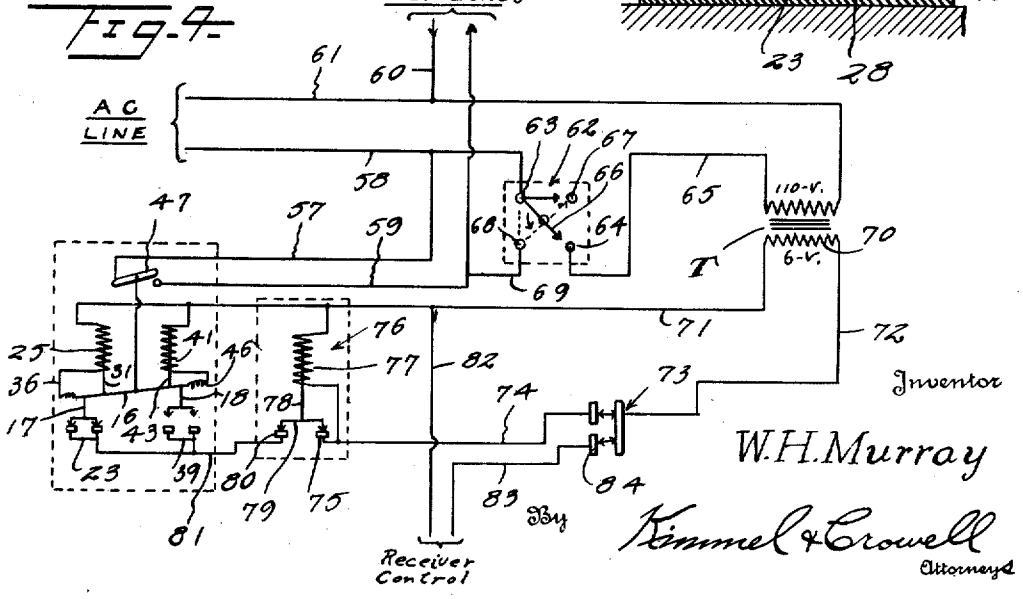


Fig. 4.



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SOLENOID SWITCH OPERATOR

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Application April 9, 1940, Serial No. 328,785

3 Claims. (Cl. 200—90)

This invention relates to solenoid switches and is a division of my copending application, Serial No. 275,097, filed May 22, 1939.

An object of this invention is to provide an improved switch structure particularly adapted for use in radio tuning devices and controls therefor to turn the electric current on or off to the radio receiver.

Another object of this invention is to provide an improved switch structure and an operating means for the switch structure, the operating means including a pair of solenoids connected to the switch structure for turning the electric current on or off to the radio receiver.

A further object of this invention is to provide an improved solenoid operated switch structure including a liquid switch, the solenoid switch operator being so constructed that one portion thereof will at all times be in an electric circuit so that when the circuit is closed the switch will be moved either from an open position to a closed position or from a closed or circuit making position to an open or circuit breaking position.

A still further object of this invention is to provide in combination with a solenoid operated switch structure for turning the power line of a receiver either on or off, an improved delayed action switch structure which is adapted to prevent oscillation of the main circuit making and breaking switch structure.

To the foregoing objects and to others which may hereinafter appear, the invention consists of the novel construction, combination and arrangement of parts as will be more specifically referred to and illustrated in the accompanying drawing wherein are shown embodiments of the invention, but it is to be understood that changes, variations and modifications may be resorted to which fall within the scope of the invention as claimed.

In the drawing:

Figure 1 is a detail side elevation partly broken away and in section of a solenoid switch structure constructed according to an embodiment of this invention.

Figure 2 is a top plan view of the device.

Figure 3 is a sectional view taken on the line 3—3 of Figure 2.

Figure 4 is a schematic view of the electric circuits embodying this switch structure.

Referring to the drawing, the numeral 10 designates generally a base structure which is adapted to be constructed of insulating material. The base 10 has rockably mounted thereon a rock shaft 11 which at each end thereof is provided with reduced trunnions 12. The trunnions 12 rockably engage in upstanding ears 13 carried by base flanges 14 of angle members which are secured as by fastening devices 15 to the base 10. The rock shaft 11 has secured thereto a transversely disposed bar or lever 16 which adjacent each end is provided with pins or contact members 17 and 18. The contact members 17 and 18 are of identical construction and each pin is provided with a collar or flange 19 which as shown in Figure 1 is adapted to engage the underside of the lever or bar 16. The pin 17 is slidable through an opening 20 formed in the bar 16 adjacent an outer end thereof and the pin or contact member 17 has a second collar or flange 21 adjacent the upper end thereof forming an abutment for one end of a spring 22. The spring 22 engages about the pin 17 on the upper side of the bar or lever 16 and one end of the spring 22 engages against the collar 21 whereas the other end of the spring 22 engages against the upper side of the lever 16. A spring terminal 23 is fixed as by fastening devices 24 to the base plate 10 and this terminal 23 comprises a pair of upwardly extending yieldable arms 25 between which the pin 17 is adapted to engage. The terminal 23 is adapted to be connected to one side of an electric circuit as will be hereinafter described.

A solenoid coil 25 is disposed above the bar 16 and is supported above the bar 16 by means of an upright supporting post or bar 26 provided with a foot 27 secured as by a fastening device 28 to the base 10. The upper end of the supporting member 26 is provided with a right angular and forwardly directed extension [illegible] to which the upper end of the solenoid coil is secured by fastening devices 30. A solenoid core 31 is slidable within the coil 25 and is provided at its lower end with a head 32. The head 32 is connected to the bar or rock lever 16 at one side of the pivotal mounting of the bar 16 by means of a link 33. The link 33 at its upper end is pivotally secured as by a pivot 34 to the head 32 and the lower end of the link 33 is secured by a pivot 35 to the bar 16.

One side of the solenoid coil 25 is electrically connected to the contact 17 by means of a wire or conductor 36 which is connected to the upper end of the pin 17. The opposite end of the coil 25 is adapted to be connected to an electric circuit as will be hereinafter described.

The pin 18 is constructed similar to the pin 17 being urged upwardly by means of a spring 37

so as to maintain the collar 38 in engagement with the underside of the lever 16 on the side of the pivotal mounting of this lever opposite from the pin 17. A contact clip 39 similar to the clip 23 is secured as by a fastening device 40 to the base 10 and is adapted to be electrically connected to an electric circuit as will be hereinafter described. A solenoid coil 41 is disposed in laterally spaced relation to the coil 25 and is supported above the opposite end portion of the lever 16 from the coil 25 by a supporting member 42 similar to the supporting member 26. The coil 41 has slidable therein a core member 43 which at its lower end is provided with a head 44. The head 44 is connected to the rock lever or bar 16 by means of a link 45 which is pivoted at one end to the head 44 and at the other end to the bar 16. The coil 41 has one end thereof connected as by a conductor 46 to the contact pin 18 and the other end of the coil 41 is adapted to be connected to an electric circuit as will be hereinafter described.

A liquid switch member 47 is mounted on the rock shaft 11 at one side of the rock lever or bar 16. The switch member 47 is removably mounted on the shaft 11 by means of a pair of yieldable clip members 48 which are secured to an insulated supporting bar 49. The bar 49 is fixed to the shaft 11 and extends at right angles thereto as shown in Figure 2. The supporting bar 49 has secured thereto a pair of spring terminals 50 and 51 which are fixed to the bar 47 and which engage the opposite end of the liquid switch member 47. The switch member 47 is so constructed that when the bar 16 is in one position which is the position shown in Figure 1, an electric circuit in which the switch member 47 is interposed will be broken. In the opposite position of the rock lever or bar 16, the switch member 47 will close an electric circuit to the power lines of a radio receiver as clearly set forth in my copending application.

In order to provide a means whereby the shaft 11 may be yieldably held in either a circuit making or a circuit breaking position, I have provided an upwardly extending shaft holding member 52 which is carried by a base 53 fixed as by fastening devices 54 to the base member 10. The holding member 52 is preferably of yieldable construction and engages against a flat face 55 provided on the shaft 11. When the lever 16 is in the position with the terminal pin 18 engaging the terminal clip 39 the holding member 52 is adapted to engage a second flat face 56 formed on the shaft 11. The face is disposed at an obtuse angle to the face 55 as shown in Figure 1.

The holding member 52 will also assist in the shifting of the bar 16 from one position to another as the apex of the angle formed by the flat portions 55 and 56 form a cam coacting with the spring holding member 52 in rocking the shaft 11.

In Figure 4 there are shown the electric circuits within which the solenoid switch structure is interposed. The switch member 47 has one side thereof connected as by a conductor 57 to one side 58 of a source of power supply. The other side of the switch member 47 is connected as by a conductor 59 to one side of the power line of a radio receiver. The other side 60 of the power lines to the radio receiver is connected to a conductor 61 which is connected to the supply source. A switch member generally designated as 62 has one terminal 63 thereof connected to the power line 58 and has a second terminal 64 connected by a conductor 65 to one side of a transformer T. The other side of the transformer T is connected to the conductor 61.

The switch member 62 includes a substantially V-shaped blade structure 66 and a pair of terminals 67 and 68. The terminal 67 is a dead terminal and the terminal 68 is connected by means of a conductor 69 to the conductor 59. The switch structure 62 is provided for the purpose of either cutting out the transformer T from the power lines 58 and 61 or connecting the transformer T to these power lines. When the switch structure 62 has the blade member 66 thereof disposed in the dotted line position, the transformer T will be cut out and the blade member 66 will connect the two terminals 63 and 69 together and thus cut out the liquid switch 47.

The secondary 70 of the transformer T has one side thereof connected as by conductor 71 to the opposite side or end of the two coils 25 and 41. The opposite side of the secondary 70 is connected as by a conductor 72 to a switch structure 73, the details of which are more fully set forth in my copending application hereinbefore mentioned

A conductor 74 is connected to the switch structure 73 and the conductor 74 is also connected to a terminal 75 of a delayed action switch structure 76. The switch structure 76 includes a solenoid coil 77, a core 78 slidable therein and a bridging contact 79 which is adapted to bridge the terminal 75 and a second terminal 80. The details of the construction of the solenoid switch structure 76 are more fully set forth in my copending application.

The terminal or contact 80 is connected as by conductor 81 to the contact clips 39 and 23. A conductor 82 is connected at one end to the conductor 71 and the opposite end of the conductor 82 is adapted to be connected to a receiver controlling or tuning means as set forth in my copending application. A second conductor 83 is connected at one end to the receiver controlling or tuning device embodied in my copending application and also to a terminal 84 which forms a part of the switch structure 73.

In the use and operation of this solenoid switch structure, when the switch 73 is in a circuit closing position, the circuit from the transformer T will be closed from one side thereof through the conductor 71 to one side of each of the solenoid coils 77, 41 and 25. The other side of the circuit will be closed from the conductor 72 through the switch structure 73, conductor 74, contact 75, bridging member 79, contact 80, conductor 81 and either one of the switch contact clips 23 or 39 depending upon the position of the rock lever or bar 16. Assuming that as shown in the drawing, the pin 17 is in engagement with the contact clip 23, the circuit will be completed from the conductor 81 to the clip 23, contact pin 17, conductor 36 and from the coil 25 to the conductor 71. When this circuit is completed, the core 31 will be drawn upwardly by the energization of the coil 25 so as to thereby break the circuit to the contact clip 23. Before this circuit is broken, the rock lever 16 will be permitted a slight movement so as to provide a delayed action in the breaking of the electric circuit to the coil 25. This delayed action is effected by the slidable mounting of the pin 17 in the bar 16 and the cushioning of the pin 17 by means of the spring 22. When the coil 25 is energized so as to raise the pin 17 and break the electric circuit to the coil 25, the switch member 47 will be rocked to a circuit closing position thereby closing the

circuit from the supply line 56, conductor 57 and conductor 59 to one side of the radio receiver.

The other side of the radio receiver is connected by the conductors 60 and 61 to the other side of the supply line. In order to provide a means whereby the solenoid switch structure embodying the two solenoids 25 and 41 may be prevented from continually rocking the bar 16 as the coils 25 and 41 are alternately energized, the circuit breaking structure 76 is provided with a delayed action switch structure and which is adapted to operate slower in its circuit breaking action than the switch structure embodying the solenoids 25 and 41. In this manner, when the coil 25 is energized, the adjacent end of the rock lever 16 will be drawn upwardly so as to close the switch 47 and at the time the contact pin 18 engages the spring clip 39, the solenoid core 78 in the switch structure 76 will move the bridging member 79 out of contact with the contacts 75 and 80.

In this manner the circuit to the coil 41 is broken which is prior to the time that the pin 18 engages the clip 39. However, as the lever 16 is moving downwardly on the side thereof carrying the pin 18, the lever 16 will continue to move downwardly on this side until the pin 18 engages the clip 39. The switch structure 73 regulates the operation of the switch structure embodying the coils 25 and 41 and this switch structure 73 is adapted to be opened or closed at desired intervals as more specifically described in my copending application.

In the event is desired to cut out the switch structure embodying the switch 73 and the coils 25 and 41, the switch structure 62 may be operated to bridge the two terminals 63 and 68. When this is done the transformer T is cut off from the supply source and the electric current from the conductor 58 will go through the terminal 63, switch blade 66, terminal 68 and conductor 69 to the conductor 59. The conductor 59 is connected to one side of the power line of the radio receiver and the other side of the receiver is connected by conductor 61 to the supply conductor 63.

What I claim is:

1. A circuit making and breaking device comprising a rock shaft, a transversely disposed lever carried by said shaft, a liquid switch carried by said shaft, a pair of electro-magnetic members disposed one on each side of said shaft and above said lever, means operatively connecting said members to said shaft to thereby effect rocking of said shaft and lever, a pair of stationary yieldable contacts disposed beneath said lever adjacent the ends thereof, a pair of movable spring-pressed contact members carried by said lever for alternate engagement with said stationary contacts, and means connecting said movable contact members to said electro-magnetic members.

2. A circuit making and breaking device comprising a rock shaft, a transversely disposed lever carried by said shaft, a liquid switch carried by said shaft, a pair of electro-magnetic members disposed one on each side of said shaft and above said lever, means operatively connecting said members to said shaft to thereby effect rocking of said shaft and lever, a pair of stationary contacts disposed beneath said lever adjacent the ends thereof, a pair of movable contact members carried by said lever for alternate engagement with said stationary contacts, means mounting said movable contact members on said lever to thereby effect a delay in the breaking of the circuit to an associated electro-magnetic member, cam means carried by said lever, and a resilient holding means engageable with said cam means for yieldably rocking said lever after a movable contact has been disconnected from its stationary contact.

3. A circuit making and breaking device comprising a rock shaft, a transversely disposed lever carried by said shaft, a liquid switch carried by said shaft, a pair of electro-magnetic members disposed one on each side of said shaft and above said lever, means operatively connecting said members to said shaft to thereby effect rocking of said shaft and lever, a pair of stationary contacts disposed beneath said lever adjacent the ends thereof, a pair of movable contact members carried by said lever for alternate engagement with said stationary contacts, said movable contact members being slidable relative to said lever, a collar carried by each movable contact member engaging one side of said lever, and a spring for each contact member engaging the opposite side of said lever and a movable contact member yieldably holding said collar against said lever.

WILLIAM H. MURRAY.