Oct. 17, 1933. H. C. MAIBOHM 1,930,980

VARIABLE ELECTRICAL RESISTOR AND SWITCH

Filed Oct. 30, 1929

FIG. 1

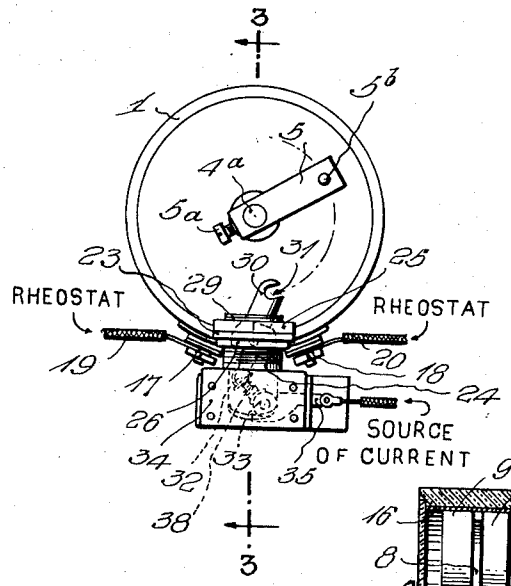


FIG. 2

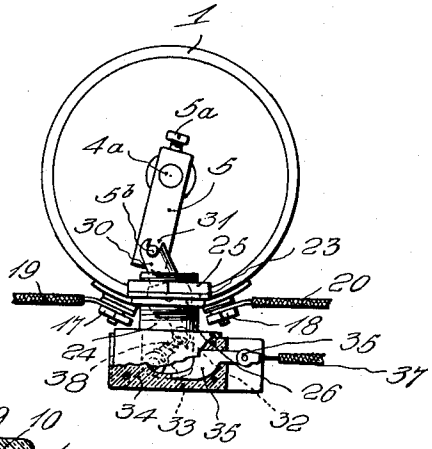


FIG. 3

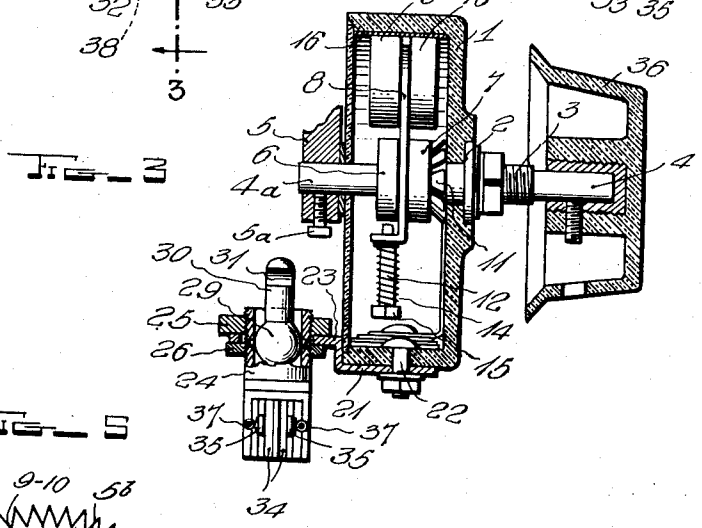


FIG. 5

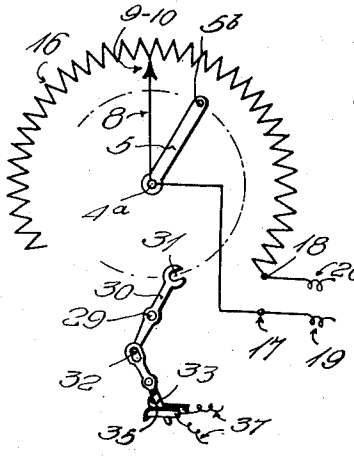
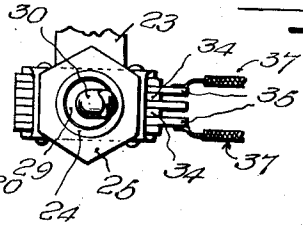


FIG. 4



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1,930,980

UNITED STATES PATENT OFFICE

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VARIABLE ELECTRICAL RESISTOR AND SWITCH

Harry C. Maibohm, Sandusky, Ohio

Application October 30, 1929. Serial No. 403,473

8 Claims. (Cl. 201—55)

My invention relates broadly to electrical control apparatus and more particularly to a combined electric switch and variable resistance device.

One of the objects of my invention is to provide a construction of combined electric switch and variable resistance particularly adapted as a volume control in a radio broadcast receiver in which the electron tube circuits are energized from power derived from an alternating current lighting circuit.

Another object of my invention is to provide a simplified control device for radio receivers for eliminating an additional control which is normally required to cut on or off the radio receiver separate and apart from the volume control resistor which is required for adjusting the broadcast receiver with respect to the received signaling energy.

A further object of my invention is to provide a combined volume control and switch particularly adapted for operation in radio receiving sets by which a switch may be automatically actuated at either limit of the operation of the volume control for cutting on or off the power circuits in a radio receiver.

Other and further objects of my invention reside in the construction of combined electric switch and variable resistor as set forth more fully in the specification hereinafter following by reference to the accompanying drawing, in which:

Figure 1 is a back view of the combined switch and variable resistance control device of my invention showing the switch in position for closing the associated power circuit; Fig. 2 is a rear view of the variable resistance and switch mechanism showing the switch moved to a position for opening the associated power circuit; Fig. 3 is a cross-sectional view taken through the apparatus of my invention on line 3—3 of Fig. 1 showing parts of the device in side elevation; Fig. 4 is a plan view of the switch device employed in association with the volume control arranged according to my invention; and Fig. 5 is a diagrammatic view showing the variable resistance and switch associated therewith.

Referring to the drawing in detail, reference character 1 designates an insulated housing which is provided with a bushing 2 in one wall thereof from which there extends the screw threaded portion 3, which provides means for mounting the insulated casing 1 with respect to a panel structure. A shaft 4 is journaled in bushing 2 and projects beyond the rear of casing 1, as shown at 4*a*, and carries an arm 5 secured thereon in a desired angular position by set screw 5*a*. The shaft is provided with members 6 and 7 which grip opposite sides of the arm 8 which carries at its extremity the contact rollers 9 and 10. A spring washer 11 is provided between member 7 and the interior wall of casing 1 to accurately guide the shaft. Screw member 12 having head 15 under tension by means of spring 14 may be adjusted in strip member 8 for controlling the position of roller members 9 and 10. The resistance is in the form of strip 16 over which roller members 9 and 10 pass. Terminals 17 and 18 secure strip member 16 in position. Terminal 18 connects to one end of resistance 16. Terminal 17 is electrically insulated from resistance 16 and connects to contact arm 8 by which the effective value of the resistance across leads 19 and 20 may be computed. A bracket 21 is secured to the exterior of casing 1 by means of bolt 22. The right angular bend 23 on bracket member 21 extends into a mounting plate which is apertured for the passage of a tubular member 24 which is screw threaded over a portion of its length and engaged on opposite sides of mounting plate 23 by nut members 25 and 28. A tumbler 30 is mounted within the tubular member 24 and includes a spherical portion 29 which is pivoted within the tubular member 24 by means of suitable pins. The tumbler 30 has a depending arm 32 which engages a spring pressed roller member 33, which is arranged for limited movement within the insulated housing 34, from which the tubular member 24 extends. Housing 34 contains a pair of contact members 35 which are bridged by roller member 33 when the member 30 is in the position illustrated in Fig. 1, thus closing the circuit through conductors 37 while the circuit is opened when contact roller 33 is moved to the position shown in Fig. 2 with tumbler 30 in its extreme opposite position. The tumbler 30 is provided with a laterally extending slot disposed at an angle to the axes thereof in a position to receive pin 5*b* in arm 5 when shaft 4*a* is rotated. Tubular member 30 is thus spring pressed by the action of spring device 38 associated with roller member 33 in a direction as shown in Fig. 1 preparatory to receiving pin 5*b* as the movable contact of the variable resistance device is moved to a position adjacent one of its extreme limits for opening the circuit through conductors 37. By moving rotary shaft 4 from a position illustrated in Fig. 2 in a clockwise direction roller

33 may be moved to contacts 35 for closing the circuit through conductors 37, and thereafter the variable resistance controlled by further clockwise movement of shaft 4. A control knob 36 may be provided for controlling the movement of shaft 4 from the front of the control panel of a radio broadcast receiver. The angular displacement between arm 5 and contact arm 8 may be controlled by setting set screw 5a in a desired position to thus control the time at which switching contacts 35 are opened or closed with respect to the value of the resistance cut into the circuit through leads 19 and 20. That is to say, the rotary shaft may be moved from a position in which radially extending arm 5 occupies the position shown in Figure 2 with the control circuit cut off or open. in a counter-clockwise direction to first cut on or close the control circuit and thereafter control the volume by controlling the effective value of the resistance in the circuit between leads 19 and 20. The angular relationship between arms 8 and 5 may be adjusted to meet particular requirements in the electrical circuit which is controlled.

It is not essential that the device of my invention be employed necessarily to a variable resistance as any variable impedance element may be controlled in relation to the cutting on or off of the control circuit employing the principles of my invention.

The combined switch structure and variable resistance has been found to be extremely practical and serves to eliminate the additional circuit control switch heretofore required in radio broadcast receivers. All that is necessary for the operator to do when the improvement of my invention is employed in order to place the radio set in condition for operation is to move control knob 36 which actuates the snap switch and controls the effective value of resistance in the circuit.

While I have described preferred embodiments of my invention, I desire that it be understood that modifications may be made and that I intend no limitations upon my invention other than are imposed by the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States is as follows:

1. A mono-control variable electrical resistor and switch unit comprising: a casing, a resistance disposed within said casing, a rotary shaft journaled in said casing and projecting beyond the limits thereof, a contacting arm carried by said shaft and arranged to sweep over said resistance within said casing, an arm adjustably mounted on the projecting end of said rotary shaft which projects beyond the limits of said casing and angularly shiftable to a selected position with respect to the position of said contacting arm within said casing, a supporting bracket extending laterally from one side of said casing, a spring actuated toggle switch carried by said supporting bracket, an actuating member extending from said toggle switch, said actuating member being shiftable to either of two limiting positions, the arm on said shaft extending in the path of the actuating member for engagement therewith for effecting movement of said toggle switch to either of its limiting positions corresponding to the position of said contacting arm on said resistance.

2. A mono-control variable electrical resistor and switch unit comprising: a casing, a resistance element disposed in said casing, a rotatable shaft journaled in said casing and projecting beyond the limits thereof, a contact arm carried by said shaft within said casing for establishing a variable connection with said resistance element, a radially extending member adjustably carried by the end of said rotatable shaft exteriorly of said casing, a switch mounted upon the exterior of said casing and including a toggle member movable to either of two limiting positions, a member connected with said toggle member and projecting in the path of said radially extending member and shiftable by the engagement of said radially extending member therewith for correspondingly shifting said toggle member at a selected time depending upon the effective electrical resistance determined by the angular movement of said rotatable shaft.

3. A mono-control variable electrical resistor and switch unit comprising: a resistance unit of substantially circular shape, a rotatable shaft, a frame for maintaining said resistance unit in a predetermined shape and for supporting said shaft centrally of said resistance unit, a contacting arm carried by said shaft for making electrical contact with said resistance unit, a supporting bracket attached to said frame and extending laterally therefrom, said bracket having an aperture formed therein, a toggle switch, a casing for said toggle switch having a portion thereof fitting into the said aperture of said bracket for supporting said toggle switch in a predetermined position with respect to said shaft and means on said arm for imparting motion to said toggle switch for rapidly making or breaking the circuit of said switch irrespective of the rapidity of rotation of said shaft.

4. A mono-control variable electrical resistor and switch unit comprising: a resistance unit of substantially circular shape, a rotatable shaft, a frame for maintaining said resistance unit in a predetermined shape and for supporting said shaft centrally of said resistance unit, a contacting arm carried by said shaft for making electrical contact with said resistance unit, a supporting bracket attached to said frame, a toggle switch attached to said supporting bracket in a predetermined position with respect to said frame, an arm carried by said shaft for actuating said toggle switch in such a manner that the circuit of said switch is instantaneously either established or interrupted irrespective of the rapidity of rotation of said shaft.

5. A mono-control variable electrical resistor and switch unit comprising: an electrical resistance element, a frame including means for mounting the unit and for supporting said resistance element, a rotatable shaft journaled in said frame, an arm associated with said resistance element and rotatable by said shaft to adjustably vary the electrical resistance of said unit, an instantaneously acting snap switch carried by said frame, and a trip finger carried by said rotatable shaft, eccentrically disposed with respect to the axis thereof and engageable with said snap switch to non-restrainingly trip said snap switch to open-circuit or closed-circuit positions irrespective of the rate at which said shaft be rotated.

6. A mono-control variable electrical resistor and switch unit comprising: an electrical resistance element, a frame including means for mounting the unit and for supporting said resistance element, a rotatable shaft journaled in said frame, an arm associated with said resistance element and rotatable by said shaft to adjustably vary

the electrical resistance of said unit, an instantaneously acting snap switch carried by said frame and having an actuating arm eccentrically disposed with respect to the axis of said shaft and terminating in an open fork, and a trip finger carried by said shaft and freely engageable and disengageable with said fork by rotation of said shaft to non-restrainingly trip said switch to open-circuit or closed-circuit positions irrespective of the rate at which said shaft be rotated.

7. A mono-control variable electrical resistance and switch unit comprising: an electrical resistance element, a frame including means for mounting the unit and for supporting said resistance element, a rotatable shaft journaled in said frame, an arm associated with said resistance element and rotatable by said shaft to adjustably vary the electrical resistance of said unit, an instantaneously acting snap switch carried by said frame, and a trip finger carried by said rotatable shaft, eccentrically disposed with respect to the axis thereof, and engageable with said snap switch to non-restrainingly trip said switch to open-circuit or closed-circuit positions irrespective of the rate at which said shaft be rotated, said finger being so arranged with respect to said resistance-element-associated arm as to be engageable with said switch when and only when said unit is adjusted to a position of substantially greatest resistance.

8. A mono-control variable electrical resistor and switch unit comprising: an electrical resistance element, a member associated with said resistance element to vary the effective resistance of the unit, a frame including means for mounting said unit and means for supporting one of said afore-mentioned elements, a rotatable shaft journaled in said frame and rotatively carrying the other of said first- two-mentioned elements to adjustably vary the resistance of the unit, an instantaneously acting snap switch carried by said frame, and a trip finger carried by said rotatable shaft, eccentrically disposed with respect to the axis thereof, and engageable with said snap switch to non-restrainingly trip said switch to open-circuit or closed-circuit positions irrespective of the rate at which said shaft be rotated.

HARRY C. MAIBOHM.