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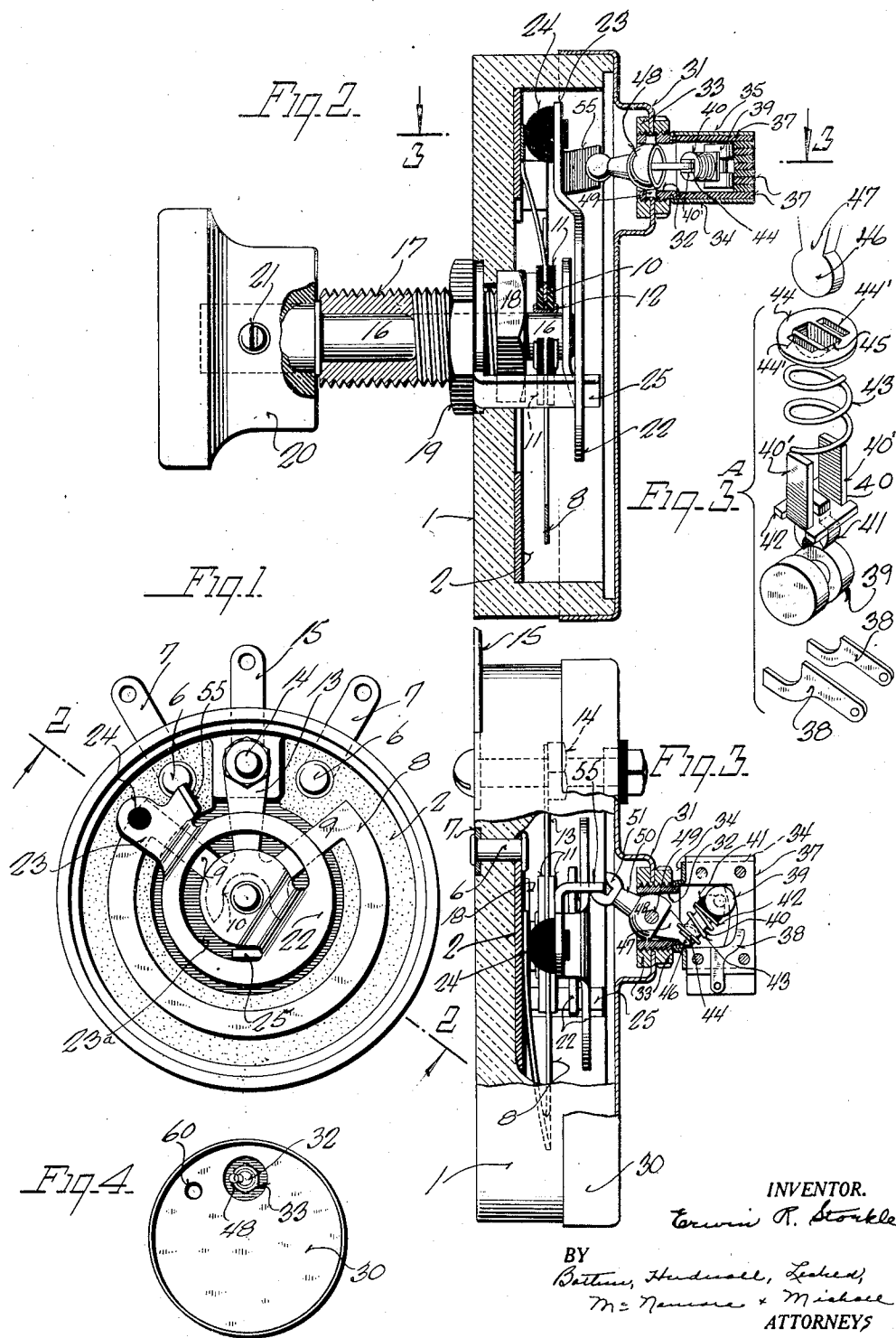
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2,186,154

COMBINED VARIABLE RESISTANCE AND SWITCH FOR USE WITH RADIO RECEIVERS

Filed April 2, 1932

3 Sheets-Sheet 1



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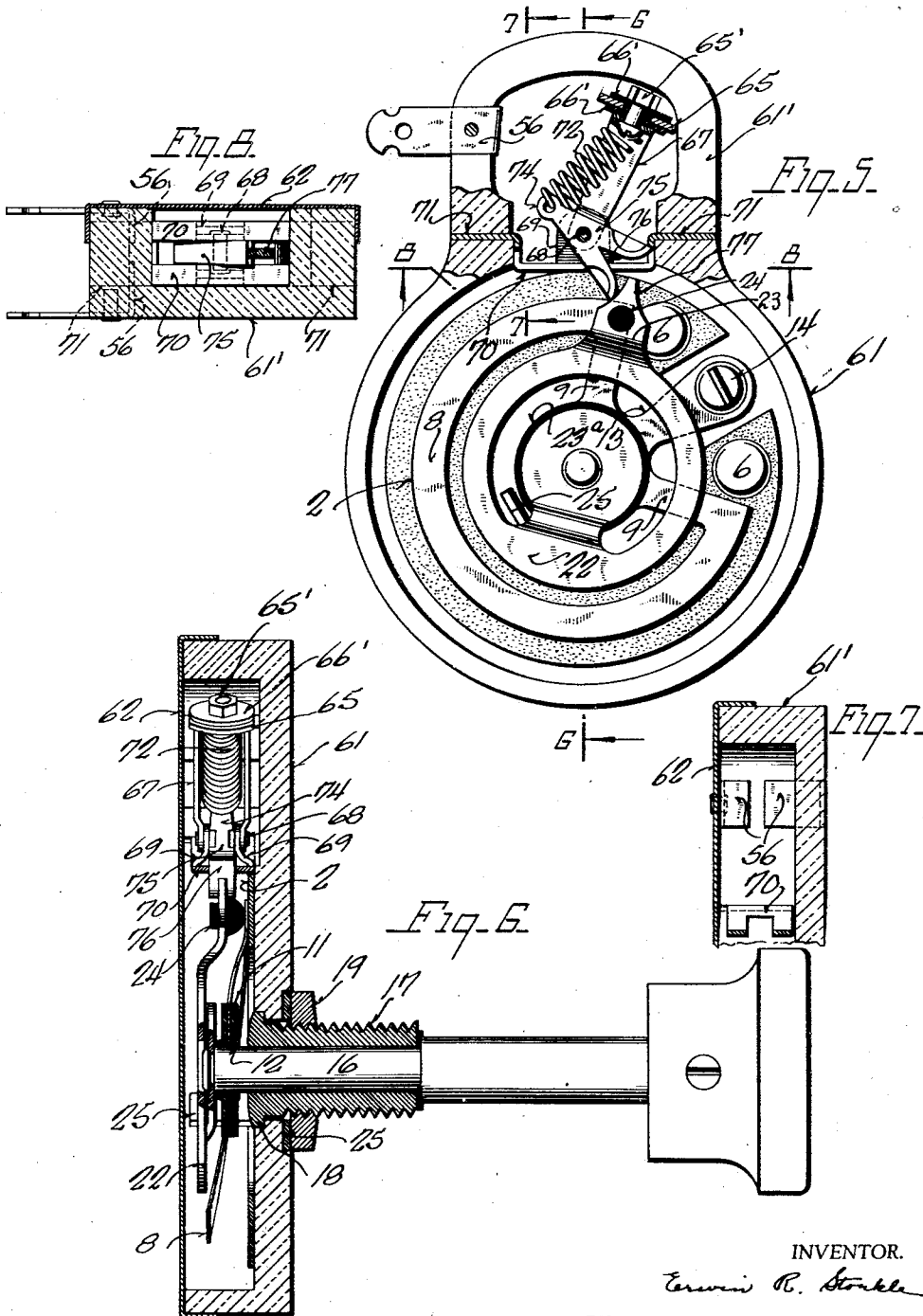
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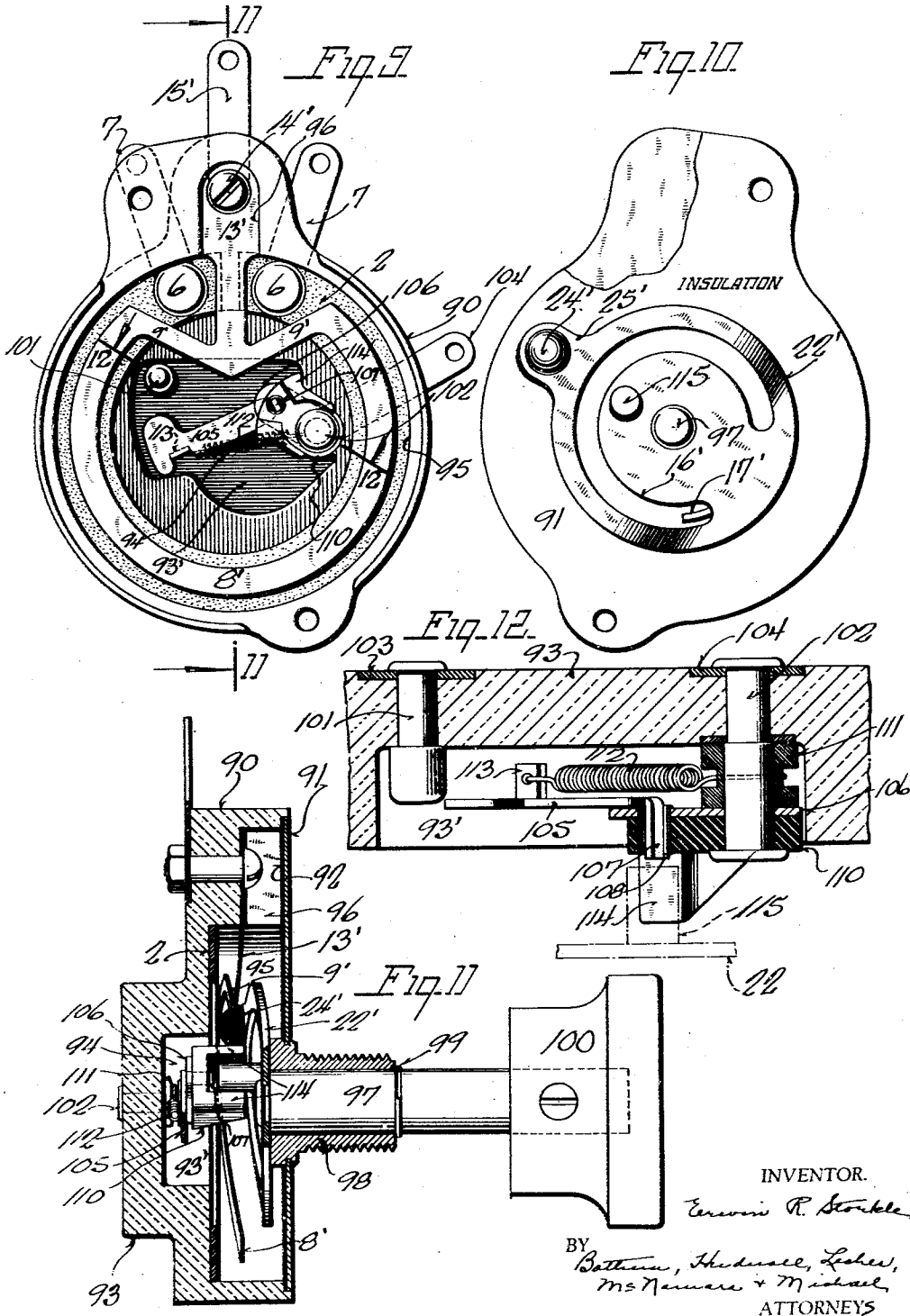
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UNITED STATES PATENT OFFICE

2,186,154

COMBINED VARIABLE RESISTANCE AND
SWITCH FOR USE WITH RADIO RE-
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mesne assignments, to Globe-Union Inc., Mil-
waukee, Wis., a corporation of Delaware

Application April 2, 1932, Serial No. 602,855

11 Claims. (Cl. 201—55)

This invention relates to a combined variable resistance and switch for use with radio receivers and more particularly to a device of this character designed to simplify the control of such receivers and to blend in with the structure and appearance thereof.

The present application is a continuation in part of my application for combined variable resistance and switch for radio receivers filed April 23, 1931, Serial No. 532,138.

Radio receivers commonly have an "on" and "off" switch operated by a push button or suitable operating element and a volume control usually manipulated by means of a knob or the like.

The present invention proposes to so organize the volume control and "on" and "off" switch that a single operating element may be utilized to exercise control over both the "on" and "off" switch and the volume control.

In carrying out the present invention an interlocking arrangement is provided between the "on" and "off" switch and the volume control which, when the volume is turned to minimum or lowest possible volume position, so functions that the radio set is automatically shut off due to the throwing of the "on" and "off" switch to "off" position, whereas when the volume control is turned up slightly from its lowest or minimum position, then the "on" and "off" switch is automatically thrown to "on" position to energize the radio receiver.

Another important object of the invention is to provide a device of this character in which the switch, the volume control and the interlocking means therebetween are mounted on and located within or substantially within the confines of a common enclosure or of the insulating base and cover sections constituting the enclosure to provide a compact unitary assembly and obtain the inter-relation of the devices which produces the desirable automatic operation of the switch.

Another important advantage of this organization resides in the fact that no special support outside of the cover or base is required for the mounting of the switch. Furthermore, the switch may be applied and removed as a unit without disassembling its parts or the parts of the variable resistance or volume control. Finally, advantages of economy and manufacturing facility are realized.

Other objects and advantages reside in certain novel features of the construction, arrangement and combination of parts which will be hereinafter more fully described and particularly

pointed out in the appended claims, reference being had to the accompanying drawings, forming a part of this specification, and in which:

Figure 1 is a view in elevation showing one embodiment of the invention, the cover section together with the switch being removed to illustrate the volume control or variable resistance;

Figure 2 is a view in section taken on line 2—2 of Figure 1 but showing the cover section and switch assembled with the insulating base section and its volume control device;

Figure 3 is a view partly in elevation and partly in section, the plane of the section being substantially that of line 3—3 of Figure 2;

Figure 3^a is a group view in perspective showing details of the toggle switch mechanism;

Figure 4 is a view in elevation on a reduced scale showing the inside of the cover as viewed;

Figure 5 is a view partly in elevation and partly in section showing another embodiment of the invention, the cover section being removed to illustrate the construction of the volume control or variable resistance and the switch;

Figure 6 is a view in section taken on line 6—6 of Figure 5, parts being shown in elevation for the sake of simplicity in illustration;

Figure 7 is a fragmentary sectional view taken on line 7—7 of Figure 5;

Figure 8 is a sectional view taken on line 8—8 of Figure 5;

Figure 9 is a view in elevation showing another embodiment of the invention, the insulating base section and the parts carried thereby alone being shown for the sake of illustration;

Figure 10 is a view in elevation, with parts broken away for the sake of illustration and illustrating the cover section and the parts carried thereby;

Figure 11 is a view in section taken on line 11—11 of Figure 9; and

Figure 12 is a fragmentary sectional view taken on line 12—12 of Figure 9.

Referring to the drawings, and more particularly to Figures 1 to 4, inclusive, it will be seen that in this embodiment there is provided an enclosure or housing including as its parts or sections a Bakelite or hard rubber molding insulating base-like section 1 and a cover section 30.

The base section 1 contains a graphite resistor 2 of arcuate and flat strip-like formation. The resistor 2 is nearly a complete circle and its ends are connected to binding posts or conducting strips 7 by fastening devices 6. Overlying the resistor 2 is a metallic conductor strip 8 also of arcuate form and integral with radial supporting

arms 9, the inner ends of which are integral with a notched hub 10 disposed between insulating washers 11, the latter being held engaged with the notched yoke by means of a flanged ring or bushing 12. Integral with this yoke 10 is a third supporting arm 13 which is fastened by a bolt and nut 14 to a conducting strip or binding post 15 and thereby also secured to the housing section or base 1. The flanged bushing 12 is loosely fitted on the inner end of an operating shaft 16 supported for rotation in an externally threaded supporting sleeve 17. The inner end of the sleeve 17 extends through an opening provided in the base 1 and is formed with a head 18 coacting with the marginal wall of the opening within the casing and supplementing the action of a nut 19 threaded on the sleeve and engaging base section 1 for securing the sleeve in position. An operating knob 20 is secured to the outer end of the shaft 16 by means of a set screw 21. A disc-like structure 22 is fastened to the inner end of the shaft 16 and has a radial lug 23 integral therewith and carrying a pressure button 24 which bears against the strip 8 and tends to overcome the inherent resiliency of the strip and place any portion of the strip which the button engages into contact with the resistor 2. The disc-like structure 22 is provided with an arcuate slot 23^a, the ends of which constitute movable stops cooperable with a fixed stop 25 for limiting the movement of the disc-like structure in either direction. The fixed stop 25 may be in the form of an angular bracket, a portion of which is apertured, encircles the sleeve 17 and is confined between the housing or base section 1 and the nut 19.

The volume control device just described is connected in well-known manner in one of the volume control circuits of the radio receiver, the binding posts 7 and 15 being utilized to effect this connection.

As shown, the flange of the cover section 30 telescopes over the open end of the base section 1 and suitable fastening means may be provided for releasably securing these parts of the housing or enclosure assembled. One portion of the cover is pressed outwardly slightly and apertured as indicated at 31 and through the aperture of this portion a connecting sleeve 32 extends. Nuts 33 coact with this sleeve and with the portion 31 to secure the sleeve in position. The outer end of the sleeve is interconnected with a metallic casing member 34 of a toggle switch designated generally at 35. Insulating laminations 37 are confined between and secured to this casing 34 and certain of these laminations are appropriately cut out or recessed to house the operating parts of the switch, as will appear from the drawings:

The switch 35 has fixed contact members 38 confined between or in recesses provided therefor in certain of the insulating laminations and a cooperable roller contact 39. The roller contact 39 is supported at one end of one of the toggle links 40 and its support consists of a mounting piece 41 of hard rubber or molded insulating material. The link 40 consists of two spaced strips 40' interconnected with each other and with the mounting piece 41 at one end and having adjacent the mounting piece integral abutment lugs 42 for the spring 43 of the switch. On the other end of the strips a sliding spring abutment 44 is mounted, slots 44' in the abutment permitting it to slide along the strips 40'. The sliding spring abutment 44 is socketed as at 45 and receives the rounded end 46 of the other toggle member 47.

The toggle member 47 may be one arm of the switch operating lever 48 fulcrumed on the sleeve 32 as indicated at 49 and provided with a second arm 50 formed with a yoked or notched end 51.

Integral with the lug 23 of the volume control device is a projection or lug 55 which is designed for coaction with the notched or yoked end 51 of the switch operating lever 48. In the assembly the parts are so arranged that as the volume control is moved up from its extreme low position its lug or projection 55 engages and coacts with the notched or yoked end 51 of the switch operating lever 48 to swing the switch lever in a counter-clockwise direction as viewed in Figure 3. This causes the spring abutment and connector 45 to slide down the link members 40 and also change the angular relation between the toggle member 47 and the link members 40 at the same time. Finally, the parts pass what may be called dead-center position, that is, the position in which the spring acts not to hold the roller 39 in the position shown in Figure 3 but to throw it with a snap action downwardly in said figure and until this roller contact engages and is in electrical bridging relation to the fixed contact members 38. The switch is then on and this condition obtains without further interaction between the volume control device and the switch throughout the entire range of the volume control. However, when the volume control is shifted back to its extreme low position, the lug 55 again coacts with the notched end 51 of the lever 48 to reversely operate the switch and throw it to its "off" position. To insure easy assembly of the cover with the switch thereon and the insulating base with the volume control therein and this with the notched end 51 in proper relation to the lug 55, a centering aperture 60 is provided in the cover section and is designed to receive a centering projection properly positioned on and extending from the insulating base section.

In the form of the invention shown in Figures 5 to 8, an insulating housing section is designated at 61 and has an integral peripheral extension 61'. The main portion of the base houses the volume control and the extension 61' houses the snap action toggle switch, the enclosure or housing of the control and switch being completed by the coaction of a cover section 62 with the housing section 61. The volume control is identical with that previously described in that it consists of a carbonaceous or graphite resistor 2, conducting strip 8, disc-like arrangement 22, pressure button 24, and the other elements of the variable resistance or volume control previously described. The snap action toggle switch is, however, slightly different in its structure and in its relation to the variable resistance, and hence the form of the interlocking means is slightly varied.

The snap action toggle switch includes a movable contact 65 adapted in the closed position of the switch to bridge fixed contacts 56. Screw and nut 65' secures contact 65 to the bottom portion of a U-shaped toggle link 67 and washers 66' electrically insulate the contact 65 from the link 67. The ends of the legs of the link 67 are pivoted as at 68 to the ears 69 of a slotted mounting strip 70. The strip 70 is received in slots 71 provided therefor in opposed portions of the casing or insulating base. A spring 72 is located between the legs of the U-shaped toggle link 67 and has one end bearing against the head of the screw of screw and nut 65'. The other end of the spring is connected to the other link 74 of the toggle, which link 74 may be constituted by one

arm of a lever designated generally at 75 and also fulcrumed on the pivot pin 68. The other arm of this lever 75 is notched as at 76 so as to be adapted to be engaged and operated by a correspondingly formed projection 77 provided on the lug 23 of the volume control device.

With this construction as with the other embodiment, when the volume control device is turned up from its extreme low position the projection or lug 77 wipes against one of the side walls of the notch of the switch operating lever and swings this lever in a clockwise direction as viewed in Figure 5. As this action progresses the spring 74 is compressed and its angular relation to link 67 is eventually reversed so that it moves the link 67 with a quick snap action from the position shown in Figure 5 to a position wherein the contact 65 bridges the contacts 56 and thus energizes the receiver. This condition obtains throughout the entire range of resistance values, that is, throughout various adjustments of the volume control device. When, however, the volume control device is turned down to its extreme low position the projection 77 again coacts with the notched end of the lever to return the lever to the position shown in Figure 5 wherein the switch is in "off" position.

In the embodiment of the invention shown in Figures 9 to 12, inclusive, the enclosure for the volume control device and "on" and "off" switch consists of a molded housing section 90 rabbeted around its open end to receive a cover section 91 having a sheet of insulating material 92 on its inner face. The housing 90 has an integral enlargement 93 in its main portion, the enlargement 93 extending axially therefrom instead of peripherally therefrom as in the embodiment shown in Figures 5 to 8 and defining a cavity or recess 93'. In the cavity or recess 93' provided by this enlargement the "on" and "off" switch designated generally at 94 is accommodated whereas the volume control device is accommodated in the main compartment 95 of the enclosure.

The volume control device is identical with that incorporated in the other embodiments of the invention except for the mounting of the operating shaft and the specific form and manner of supporting the conductor strip. As in the previous embodiments this volume control includes the graphite resistor 2 secured to a surface of the housing by means of the fasteners 6 which connect the ends of the resistor with the binding posts 7. The conducting strip is of slightly different design and is designated at 8'. It is of the same arcuate form and has two integral supporting arms 9' which merge into a main supporting arm 13'. This main supporting arm 13' has a substantial portion thereof snugly fitted in a seat or recess 96 and it is held in said recess and against movement by means of a bolt and nut 14' which not only exerts this securing action but which electrically connects the conductor strip with the binding post 15'. The conductor strip 8' is, as before, biased by virtue of its inherent resiliency away from and out of contact with the resistor but any portion thereof may be brought into contact with this resistor and consequently more or less of the resistor cut into or out of the circuit by shifting along the strip the pressure member or button 24', which is carried by a lug 25' of a disc 22'. The disc is slotted as at 16' and the ends of the slot coact with a fixed stop 17' to limit the movement or adjustment of the disc 22' in either direction. The disc 22'

is supported and adjusted by means of an operating shaft 97 which has its inner end riveted or otherwise suitably secured to the center of the disc and which is supported for rotation in a supporting sleeve 98 suitably secured to an aperture in the cover section 91. The shaft 97 is held against axial movement by the engagement of the disc 22' with one end of the sleeve and by the engagement of a ring-like retaining wire 99 with the other end of the sleeve, the wire 99 being partially received in annular groove in the periphery of the shaft. An operating knob 100 is connected to the outer end of the shaft.

The "on" and "off" switch which is disposed in the recess 93' of the enlargement 93 includes a pair of fixed contacts 101 and 102 (see Fig. 12) which are electrically connected with binding posts 103 and 104. These fixed contacts are electrically insulated from each other but may be bridged and electrically connected by the movable contact assembly of the switch. The movable contact assembly consists of toggle links 105 and 106. The toggle member 106 is pivotally mounted on and directly electrically connected with contact 102. The toggle member 105 has an outturned lug 107 which extends through a bushing 108 carried by the toggle member 106 and serving to aid in the mechanical pivoting of the parts 105 and 106, and in establishing an electrical connection between them. This bushing 108 has the further function of securing in position an interlocking member 110 which is also pivotally mounted on the contact 102. In between the base of the cavity 93' and the toggle member 106 is a spacing collar 111. This spacing collar properly positions the toggle members in the cavity and also provides means for anchoring one end of a retractile coil spring 112. The other end of this spring 112 is connected to a lug 113 integral with the toggle member 105. The interlocking member 110 is provided with spaced projections 114 designed to coact with a pin or projection 115 on the disc 22'. The parts are so organized and related that when the volume control device is turned down as far as it may be or is in the position shown in Figure 9, then the pin 115 is disposed in between the projections 114. When the volume control is turned up from its extreme low position, the pin 115 moves and wipes against one of the projections 114 to swing the interlocking member 110 and consequently also the toggle link 106 in a counterclockwise direction, as viewed in Figure 9. Such movement of the link 106 shifts the pivotal connection between this link and the link 105 until the pivotal connection crosses the line along which the spring 112 is exerting its pull. This reverses the action of the spring and causes it to swing the link 105 forcibly with a snap action in a clockwise direction as viewed in Figure 9 and into engagement with the fixed contact 101. The switch is then "on" and the receiver energized. This condition obtains without further inter-action of the interlocking members between the volume and the switch throughout the entire range of adjustments of the volume control and until the volume control is returned to its extreme low position. Returning of the volume control to extreme low position causes the pin 115 and interlocking member 110 to reversely coact and swing the switch with a snap action to "off" position.

In all embodiments of the invention the radio volume control device is connected in well known manner in one or more of the volume control circuits of the radio receiver and the switch is

connected in well known manner in the power input circuit of the receiver and in all forms, there is had the advantage of controlling the "on" and "off" switch and the variable resistance of the volume control device from a single operating knob and not only this but the switch and resistance are compactly mounted and organized. A part of the housing for the resistor affords a mounting for the switch and either directly or through slight extensions provides the enclosure for the switch.

While I have shown and described several embodiments of the invention, it is to be understood that the constructions illustrated have been taken for the sake of illustration or example and that various changes in the size, shape and arrangement of the parts may be made without departing from the spirit of the invention or the scope of the subjoined claims.

The invention claimed is:

1. A unitary self-contained switch and variable resistance assembly comprising a housing made up of releasably connected sections defining a main chamber, a wall of one of said sections having a recess, a switch mounted in said recess, a variable resistance mounted in said chamber and having an adjustable element, means operable from the exterior and extending into the housing and connected to said adjustable element for adjusting the same, said switch being of the spring toggle snap action type and having an operating element formed with spaced projections, and a cooperable projection moved with the adjustable element of the resistance and cooperable with the spaced projections of the operating element to close the switch when the adjustable element is moved from its initial position and to open the switch when the adjustable element is moved back to its initial position.

2. A device of the character described comprising a housing including releasably connected sections defining a main chamber within the housing, one of said sections having an extension defining a cavity adjacent the main chamber, a variable resistance mounted in said main chamber, means operable from the exterior of the housing and extending through one of the sections thereof and connected to the variable resistance for adjusting the same, a switching device mounted in the cavity and interengaging elements between the switching device and the variable resistance whereby adjustment of the resistance in a predetermined manner will effect operation of the switch.

3. A device of the character described comprising a base section, a variable resistance mounted on the base section and having a movable element, a cover section coacting with the base section to enclose the resistance and having an opening therethrough, and a switch mounted on the cover section and overlying said opening and having an operating member extending through said opening and cooperable with the movable element of the resistance whereby actuation of the variable resistance to one position closes the switch and to another position opens the switch.

4. A device of the character described for use in radio receivers and comprising a base section, a volume control device mounted on the base section, a cover section interengageable with the base section and coacting with the base section to enclose the volume control device, an "on" and "off" switch mounted on and enclosed by the cover section, said cover section and switch being attachable as a unit to the base section, and

cooperating parts mounted on the control device and switch which are brought into operative relation to each other by the mere assembly of the cover section with the base section, said cooperating parts being engageable to automatically throw the switch to "on" position when the volume control device is moved up from its low position and being engageable to automatically throw the switch to "off" position when the volume control device is moved back to low position.

5. In combination, a volume control comprising a circular resistance, a contact arm for varying said resistance, a rotatable actuator shaft on which said contact arm is mounted, a projecting pin eccentrically mounted on said shaft, a casing enclosing said volume control, an aperture in said casing, an auxiliary recessed casing closing said aperture, a snap-switch contained in said auxiliary casing, and an actuating arm for said snap switch operable by said projecting pin at one extreme of its cycle.

6. In combination, a volume control comprising an electrical resistance, a member arcuately movable throughout a relatively wide range for varying said resistance, an eccentrically mounted projecting element upon said member, an insulating base, a snap switch mechanism carried thereby, a metal cover member for said resistance varying device to which said insulating base is secured, said cover member having an opening formed therein to provide clearance for said switch mechanism, said projecting element having a transient lost motion connection with said switch mechanism to provide for actuation of the latter to open—and/or closed—circuit position during movement of said movable member in reverse directions, respectively, through a relatively small portion of its range.

7. In combination, a volume control comprising a circular resistance, a contact arm disposed on one side of the plane of said resistance for varying the same, a rotatable actuator shaft on which said contact arm is mounted, a pin eccentrically mounted on said shaft, a casing enclosing said volume control, said casing being provided with a recessed extension on the other side of the plane of said resistance, a switch contained in said extension, and an actuating member for said switch operable by said pin.

8. In combination, a volume control comprising a circular resistance, a contact arm for varying said resistance, a rotatable actuator shaft on which said contact arm is mounted, a projection eccentrically mounted on said shaft, a casing enclosing said volume control, said casing having a communicating peripheral recessed extension, a switch contained in said extension, and an actuating arm for said switch operable by said projection.

9. In a volume control and switch assembly, in combination, a sub-assembly comprising a resistor, wiring terminals therefor, an adjustable control element for said resistor and a supporting base for said resistor, terminals and control element, a sub-assembly comprising a switch, wiring terminals therefor and a supporting base for said switch and terminals, an actuating member having operative connections with both said control element and said switch, the connection between the actuating member and switch being of a transient character, and a built-up housing including the bases of said sub-assemblies to support and fully enclose said resistor, its said control element, said switch and said operative connections, said actuating member and said wiring

terminals extending outside of said housing, the parts constituting said built-up housing being secured together by means independent of the mounting means for said assembly.

- 5 10. The combination with an electrical resistance varying device having a member rotatable to opposite extreme positions, of a projecting element mounted eccentrically upon said member, a metallic cover member for said resistance varying device, said cover member having an opening formed therein, a recessed insulating base member adapted to overlie said opening and rigidly secured to said cover member, and a snap switch mechanism carried within said base member and
10 enclosed thereby, said switch mechanism including an actuating element with which said projecting element has transient driving engagement in different positions of said rotatable member whereby operation of said switch mechanism is
15 20 effected.

11. The combination with an electrical resistance varying device having a member arcuately movable throughout a relatively wide range, of an eccentrically mounted projecting element upon said member, a recessed insulating base, a snap switch mechanism carried within said base, a metal cover member for said resistance varying device to which said insulating base is secured at a plurality of spaced points on the former, said cover member having an opening formed therein to provide clearance for said switch mechanism, said projecting element having a transient lost motion connection with said switch mechanism to provide for actuation of the latter to open—and/or closed—circuit position during movement of said movable member in reverse directions, respectively, through a relatively small portion of its range.

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