

Sept. 12, 1933.

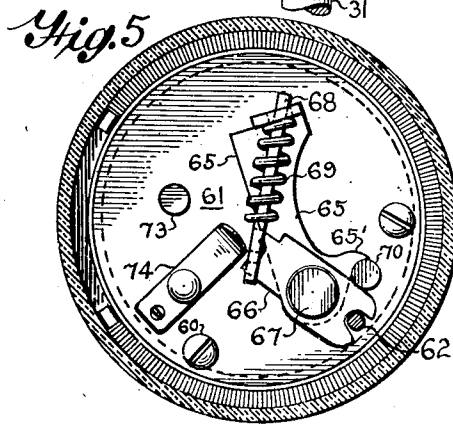
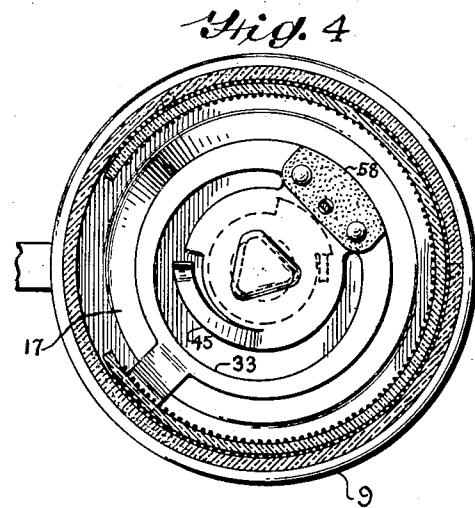
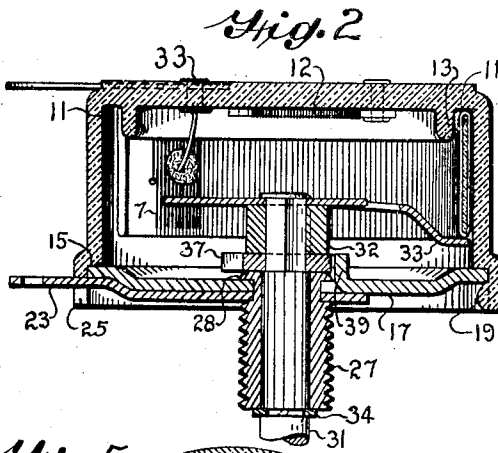
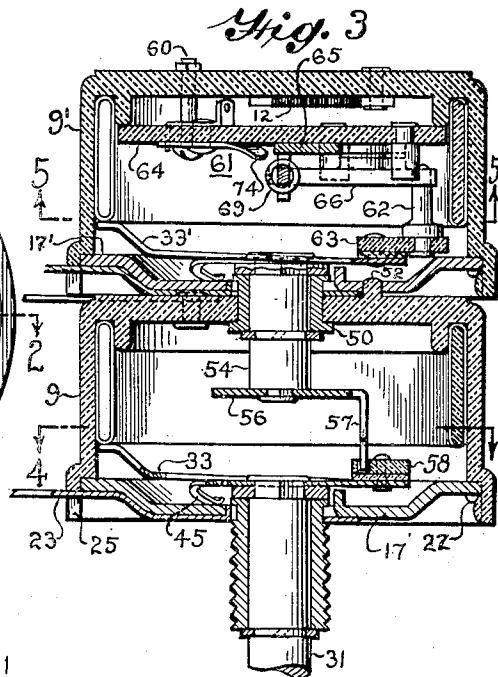
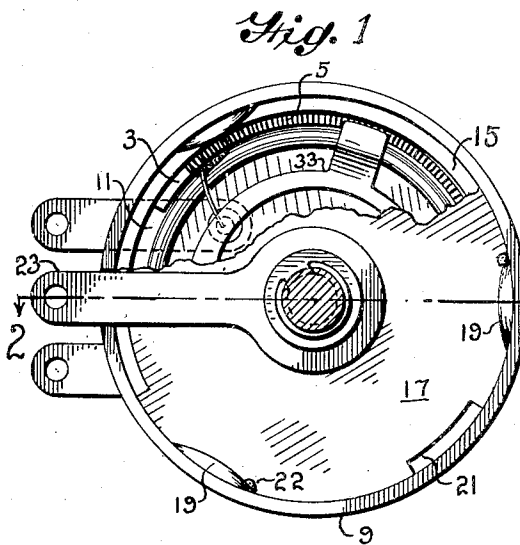
R. C. DA COSTA

1,926,196

VARIABLE IMPEDANCE

Filed April 23, 1931

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

Fig. 6

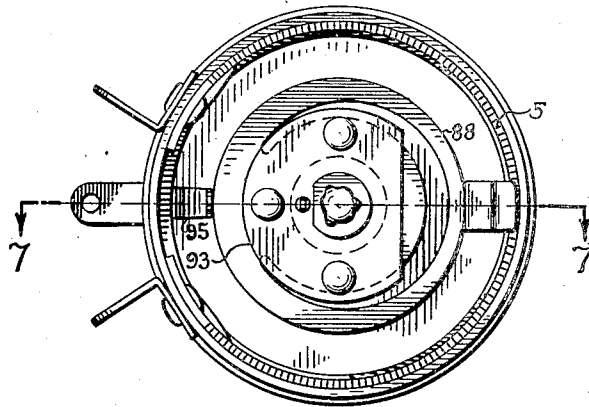
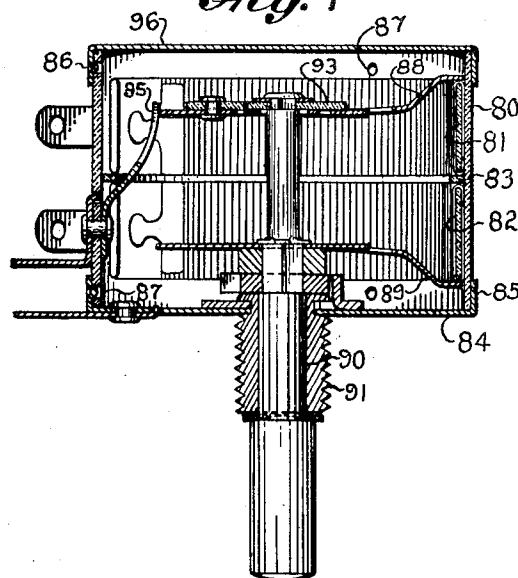


Fig. 7



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UNITED STATES PATENT OFFICE

1,926,196

VARIABLE IMPEDANCE

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Application April 23, 1931. Serial No. 532,244

3 Claims. (Cl. 201—55)

My present invention to variable resistors, switches, or combinations thereof, particularly adapted for the control of radio receiving circuits, and has for its main object to provide a rugged, inexpensive, and simple construction capable of quick assembly and production in large quantities.

A feature of my invention is the combination with a housing carrying therein a resistor and/or a switch, of an end closure member carrying therewith in assembled relation a movable contact structure for the resistor and/or switch, thus providing complementary separable units.

Another feature of my invention is the novel arrangement for securing an end closure member, preferably removable, in a volume control resistor housing.

Still another feature of my invention is the ganging of a plurality of the above units in tandem, utilizing my novel construction for removably securing the units together in operative relation.

Heretofore in previous constructions with which I am familiar it has been common practice to mount the contact arm and shaft directly in the housing or form carrying the resistor element. When such housings have been of molded insulation material it has usually been necessary to employ special constructions and to use great care to prevent injury to the housing in the attempt to obtain a firm and lasting connection of parts.

The end closure member, when used, has had no useful function other than to close the open end of the housing. The assembly of both the resistor and the contact arm structure in the housing as a unit has made assembly as well as the reverse operation difficult and expensive.

Furthermore in prior constructions it has been difficult and expensive to satisfactorily gang several units together. It has been necessary to use special fastenings, and great difficulties have been encountered in ganging more than two units together.

In the drawings, which are shown for illustrative purposes only, I have shown certain preferred forms of my invention, in which:

Fig. 1 is a plan view of an assembled volume control resistor.

Fig. 2 is a side elevation view of the volume control, in section, taken on lines 2—2 of Fig. 1.

Fig. 3 is a side elevation view in section showing a plurality of control devices in ganged tandem relation for simultaneous operation.

Fig. 4 is a plan view, partly in section, of my

device looking toward the end closure member in Fig. 3, taken on line 4—4.

Fig. 5 is an inside bottom view of one of the units of Fig. 3, taken on line 5—5, showing details of the switch in combination.

Fig. 6 shows a plan view with cover removed, of a modified form of my invention.

Fig. 7 shows a side elevation view in section of my modified form in Fig. 6, taken on line 7—7. Similar reference numerals indicate like parts in the several views.

According to my invention an open-ended housing of metal or molded insulation, preferably the latter, has securely mounted therein one or more elements such as resistors, switches, or the like, and is provided at its open end with a removable end closure member such as a cover plate or disc of metal or insulation. This end closure member carries therewith, as a unit, a movable contact structure for the resistor or the like. Utilizing a like form of end closure member secured externally to the bottom or closed end of a housing, as a unit, a second housing is adapted to be removably secured at its open end to said last named end closure member.

Referring now more in detail to my novel variable resistor device in Figs. 1 and 2, I show a resistor of the type consisting of an insulation core 3 carrying thereon resistance wire 5 having a portion 7 comprising an electrolytic deposit of low resistance metal such as copper on selected portions of the wire, in accordance with the disclosure of Lodge and Da Costa application No. 438,496 filed March 24, 1930. This resistor element is mounted in the housing 9 fitting snugly therein within the recess 11 formed by an annular ridge 13 and the inside cylindrical surface of the wall of said housing.

It has been found convenient to mount a fixed resistor 12, which is ordinarily connected in series with the variable resistor 5, within the confines of said ridge and secured against the end wall of the housing as by rivets.

The housing 9 is made preferably of molded insulation, although it may be of metal, and is formed with an inside shoulder 15 at the open end thereof to receive the edge of an end closure member or cover plate 17, preferably of sheet metal and slightly dished. A plurality of inwardly projecting lugs 19 are formed adjacent this shoulder for the purpose of retaining the end closure member in the end of the housing against said shoulder. Spaced peripheral notches 21 are formed in the closure member, the spacing of the notches corresponding with that of the lugs.

During assembly the plate 17 is inserted in such manner that said notches slide past said lugs. The cover plate 17 is then rotated upon the shoulder 15 through an angle sufficient to lock said plate securely in said casing. For practical purposes I have found it desirable to form slightly raised portions 22 on said plate in spaced relation around the periphery thereof whereby said portions come into contact relation with said lugs in wedging relation to effect a firm binding action. In some cases I have found it desirable to make the cover plate and the cooperating inside wall surface of the housing each slightly eccentric in cooperative relation, in the manner disclosed in Da Costa application No. 517,210 filed February 20, 1931. Such a construction gives a tight binding action when the parts are assembled and relatively turned.

To insure that the housing and closure member will remain in the desired assembled relation, I have provided a resilient locking member 23 which preferably likewise functions as a terminal for external electrical connections. This locking member cooperates with complementary means on the housing, e. g., it snaps into place in a depression 25 in the rim of the housing when said plate 17 has been rotated the desired amount during assembly. The central portion of this plate 17 carries a bushing 27 which is secured thereto through a central opening therein. The bushing is secured in place by upsetting the end thereof at 28, and carries a shaft 31 on the end of which is mounted a spacing sleeve 32 and sliding contact arm 33 for making the electrical connection with the resistor element 5. The contact end of the sliding arm 33 may be plated with chromium to reduce wear and give better electrical connection, as disclosed in Lodge application No. 524,849 filed Mar. 24, 1931. However, in some cases it has been found that a bronze sliding contact functions best in combination with "nichrome" resistance wire for some reason, not entirely understood. It appears that less disturbances result in certain circuits using this combination, possibly due to a smaller contact difference of potential between bronze and "nichrome", contrary to expectations. This however is no part of my invention, being shown and described in Lodge application 524,849 filed March 24, 1931.

A stop element with a projection 37 is secured on said shaft in fixed relation with said arm for cooperating with a lug 39 on said cover-plate to limit the rotation of said contact arm. I have shown the shaft as being of the same diameter throughout so as to permit removal from the closure member and bushing 27. With this construction it is expedient for manufacturing reasons to secure the contact arm on the end of the shaft as a unit and then to insert the shaft into place in the bushing, holding it therein by means of a split washer 34. However, a feature of my present construction is that it is unnecessary, unless desirable, to provide for such removal of the shaft and contact arm from the end closure member as above set forth. Reference is had to Fig. 7 showing shaft 90 with a shoulder thereon. The main feature of my invention is that the closure member shall carry therewith as a unit the movable electrical elements for cooperating with the elements secured to the housing.

In some cases in electrical circuits, particularly in radio volume control design, it is customary to provide a plurality of volume controls ganged together for simultaneous operation and

in compact relation. In Fig. 3 I have illustrated the manner and means for combining in tandem relation a plurality of the above control units. In this arrangement the cover plate 17' for the housing 9' is firmly secured to the back of housing 9 by means of a bushing 50 which extends through a central opening in the bottom of the housing and in the plate 17', and which is upset at either end. A lug 52 on the back of housing 50 cooperates with an aperture in plate 17' to prevent rotational displacement. In this bushing 50 is mounted a shaft 54 on one end of which is secured the sliding contact arm 33' and on the other end of which is a metallic coupling link 56 having an angular projection 57 adapted to engage the driving contact arm 33. Between the link 56 and contact arm 33 is mounted an insulating connector member 58 which is fastened to a portion of the contact arm 33. This is shown in plan view in Fig. 4. Any other form of detachable coupling means may be employed, e. g., that disclosed in Lodge application 451,326 filed May 10, 1930.

To assemble the above units the plate 17', on the back of housing 9, is inserted into the open end of housing 9' and rotated and locked in the same manner as in the case of Fig. 2. I have here in Figs. 3 and 4 shown a means for obtaining more positive electrical contact between the rotating contact arm 33 and the metallic closure member 17 and electrical terminal 23. This means consists in a brush 45 carried by and preferably integral with the central portion of the rotating contact arm. This brush 45 is biased to bear down upon the plate 17 in firm contacting relation.

Within the housing 9', secured to the closed end thereof as by bolts 60, I have shown, in improved form, a snap switch 61 mounted in operative relation with the volume control device, for the purpose of making or breaking a circuit, as for example the input power supply of a radio receiving set. This construction permits the operator to employ the same control knob to independently control volume and to operate said switch. The means for actuating this switch comprises a pin 62, secured angularly to the rotating contact arm 33' by the interposition of a piece of insulation 63, for engaging a notch in the end of the arm 66.

This switch device, which is the subject matter of Draving et al application 518,836 filed Feb. 27, 1931, and shown more clearly in plan view in Fig. 5, comprises a plate 64 of insulation material having mounted thereon a toggle switch including a circuit closing blade 65 and arm 66, both pivoted on stud 67. The link member 68 and coil spring 69 are connected in operative relation between the ends of said blade 65 and arm 66. The extension 65' on the side of the blade 65 strikes against the post 70 to limit the throw in one direction, and another portion of the blade strikes a post 73, while engaging electrical contact 74, to limit the throw in the other direction. The arm 66 is limited both ways in its movement by means of post 70.

Although in Fig. 3, I have shown the plate 17' as secured to the closed end of housing 9 for engaging the other housing 9', it is sometimes desirable to dispense with this plate and insert the closed end of housing 9 directly into the enlarged open end of housing 9', employing means or formations molded in the end of housing 9 for securing it directly to the other housing in a similar manner.

The above construction provides a compact, tight enclosure permitting the use of a small quantity of oil within the casing for improving electrical and mechanical contact action. For the purpose of making a better seal between the end closure member and the housing I have used lacquer for sealing the connections.

In Figs. 6 and 7, I have shown a slightly modified form of multiple unit volume control in a simplified inexpensive form. In this construction a common housing 80 is employed, being cut from standard "bakelite" tubing, or other form of insulating material, and carries therein two wire-wound resistors, 81 and 82 separated by ledge member 83. A metallic cover plate 84 having a cylindrical flange 85 is secured to the end of the housing 80 by means of spaced raised points 86 on the cylindrical portion, which points cooperate with corresponding spaced apertures 87. This plate carries two rotatable contact arms 88 and 89 on the shaft 90 revolving in bushing 91. In this case it is desirable that contact arm 88 be at a different potential than that of arm 89, and it is therefore insulated from shaft 90 by means of an insulating plate 93, which is secured directly to the end of the shaft. Electrical connection from contact arm 88 is made with external circuits by means of resilient brush contact member 95 which bears against an edge portion of arm 88. The opposite end of the housing 80 is closed by cover 96, secured to the housing in a manner similar to that in case of cover 84.

While I have described the principles of my invention, together with the apparatus which I now consider to represent the best embodiment thereof, I desire to have it understood that the apparatus shown is only illustrative, and that the invention may be carried out by other means.

I claim as my invention:

1. In a variable resistor, a housing having an

open end and containing a resistor, a closure member for said end of said housing, movable contact structure carried by said closure member, a lug on the closure member providing a stop limiting the movement of the contact structure, means for securing and angularly registering said member to said housing, said means including a resilient terminal fastened to said closure member and angularly locking the closure member from moving out of its registry position.

2. In an electrical device of the character described, a hollow housing for enclosing a resistor element, a removable plate for closing an open end of said housing, means for preventing axial displacement of said housing and said plate when assembled, a resilient tongue secured to said plate in a radial direction, and means on said housing cooperating with said tongue for locking said plate against relative rotation.

3. In a multiple unit combination of the character described, a cylindrical housing of molded insulating material having an open and a closed end and carrying therein a resistor, a metallic plate for closing said open end, means for removably securing said plate to said open end, a shaft, and rotatable contact arm carried by said removable plate for cooperating with said resistor when said plate is in place in said housing, a second metallic plate similar to said first mentioned plate carried by said closed end of the housing on exterior thereof, means for securing said plate to said housing comprising a bushing centrally disposed through said plate and said closed end, a second housing, carrying an electrical device, removably secured to said second named plate, and a rotatable shaft and arm carried by said bushing in cooperative relation with said electrical device, and means for mechanically coupling said shafts.

ROBERT C. DA COSTA.