June 14, 1949. D. F. HASTINGS 2,473,247

ELECTRICAL RHEOSTAT DEVICE

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FIG. 2

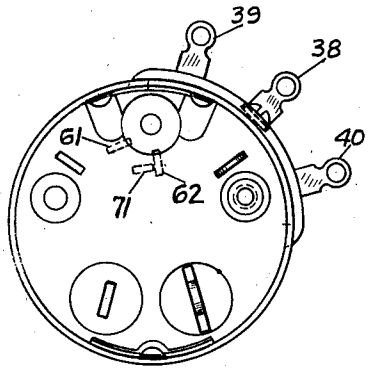


FIG. 1

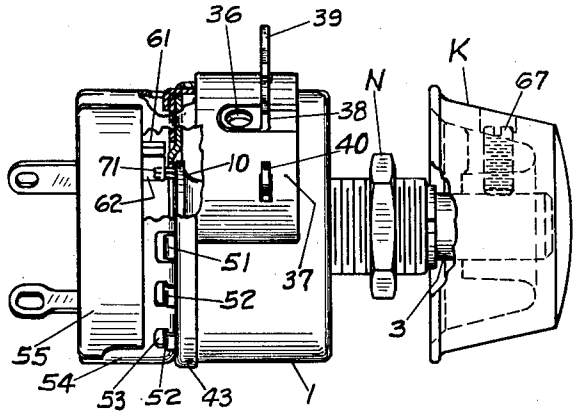


FIG. 7

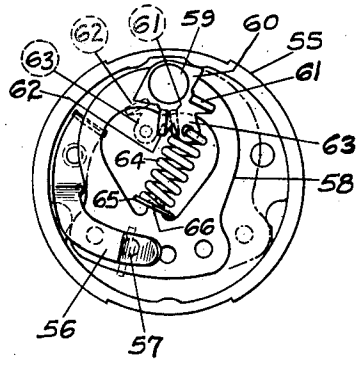


FIG. 8

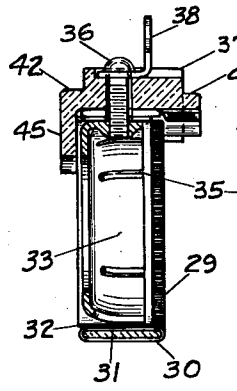
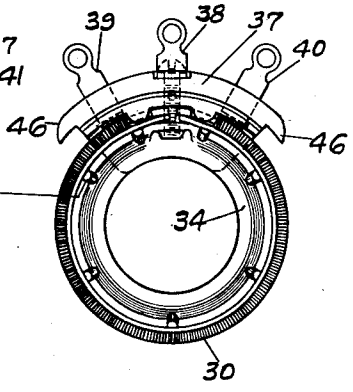


FIG. 9



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FIG. 4

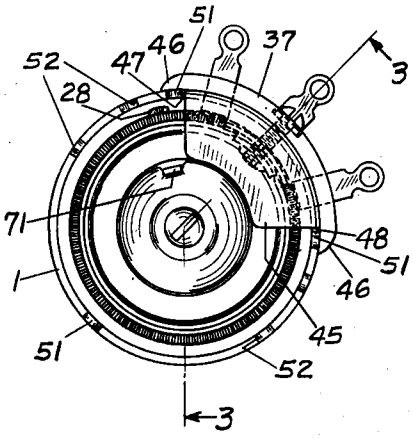


FIG. 3

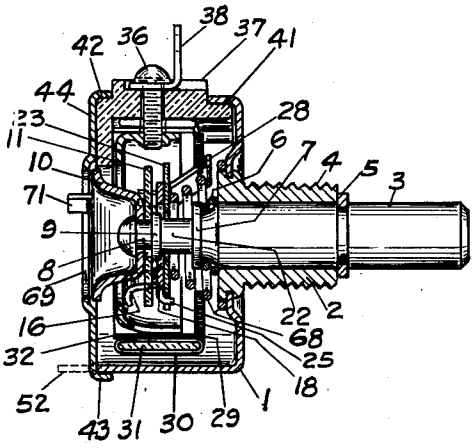


FIG. 5

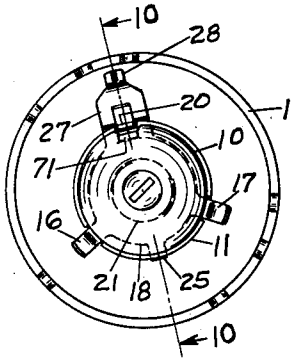


FIG. 10

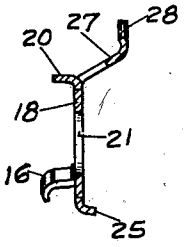


FIG. 11

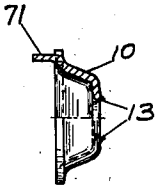


FIG. 6

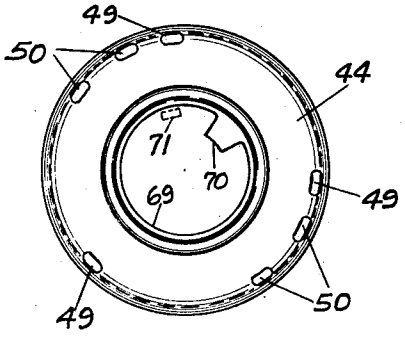


FIG. 12

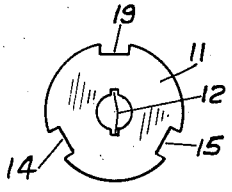
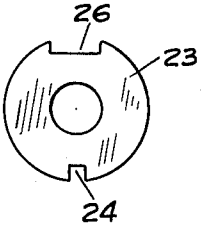


FIG. 13



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2,473,247

ELECTRICAL RHEOSTAT DEVICE

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Application February 23, 1946, Serial No. 649,589

9 Claims. (Cl. 201—48)

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This invention relates to an electrical control structure especially adapted for radio purposes such as in a receiving set. The main part of the structure comprises a volume control rheostat having a casing enclosing a resistance unit and contact mechanism for actuating the resistance element comprising part of said unit. To this principal structure there may be attached an auxiliary unit including a switch controlling the actuation of the radio set.

One of the objects of my present invention is to provide an electrical control structure which is small and compact to fit into a limited space in a radio set, yet one that will give satisfactory operation over a long period of time.

Another object of my invention is to provide a construction in which the resistance element may be readily removed for the purpose of change or renewal, if necessary, without being obliged to remove the entire structure from the set. Since the volume control rheostats are usually of high resistance, they must be constructed of relatively fine wire and consequently the contact pressure on the brush track of the resistance winding must be of such a nature as to produce satisfactory results and maximum life of the resistance unit. Consequently it is one of the objects of my invention to provide a combination of parts which will satisfactorily meet these conditions.

Another object of my invention is to provide a control structure in which the resistance unit has a high electrical resistance to ground and one which has high heat dissipation.

Another object of my invention is to provide a construction in which the control structure is completely shielded within itself as well as being shielded from the auxiliary switch forming a part of the entire structure. These and other objects will be readily observed by one familiar with this type of construction.

My improved design is illustrated in the attached drawings wherein:

Figure 1 is a plan view of the entire construction, a portion being broken away to show one of the combination details.

Figure 2 is a view of Figure 1 looking from left to right.

Figure 3 is a part sectional and part elevational view through the volume control part of the structure, on the line 3—3 of Figure 4.

Figure 4 is a rear end view of the volume control structure with the cover removed.

Figure 5 is a view of Figure 3 with the resistance unit removed looking from left to right.

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Figure 6 is a plan view of the cover shown in section in Figure 3.

Figure 7 is a view of the interior of the switch device shown as the auxiliary unit of Figure 1, the switch parts being in circuit closing position.

Figure 8 is a section through the resistance unit forming part of the volume control structure.

Figure 9 is an end view of the resistance unit removed from the casing.

Figure 10 is a part elevational and part sectional view through the volume control contact arm.

Figure 11 is a part sectional and part elevational view of the cup fastened to the end of the driving shaft for operating the auxiliary switch carried by the volume control structure.

Figures 12 and 13 are plan views of the insulators used for insulating the contact member shown in Figure 10. All of the figures just described are approximately twice the size of a working structure.

In the various views wherein like numbers refer to corresponding parts 1 is a casing which carries a bearing 2 supporting an operating shaft 3. The bearing 2 is threaded at 4 to receive a nut N and lock washer for mounting the unit on a suitable support. The shaft 3 has a groove to receive a snap ring 5 which is held against the outer end of the bearing 2 by means of a thrust spring 6, positioned in a conically shaped recess in the shaft between an annular collar 7 and the inner end of the bearing 4. This construction insures that the shaft 3 will be held in proper longitudinal position in its bearing 2. The inner extremity of the shaft 3 has a reduced end 8 and an annular collar 9. Positioned on this reduced end 8 is a cup shaped member 10 and an insulator 11. Preferably cup 10 and the insulator 11 are keyed to the shaft end 8 as indicated by the recesses 12 on the member 11 and the spurs 13 on the member 10. The insulator 11 has two notches 14 and 15 which are adapted to receive respectively contact lugs 16 and 17 on a contact member 18. The insulator 11 has an additional notch 19 to receive a lug 20 on the contact arm 18. The contact arm 18 has a clearance hole 21 therein so that it is spaced some distance from the shaft portion 22. From the above description it will be seen that the contact member 18 is drivingly carried by the insulator 11 yet it is free to move longitudinally of the shaft by reason of the fact that the lugs 16, 17 and 20 are narrower than their respective notches 14, 15 and 19 in the insulator 11. Positioned against the side of the contact member 18 toward the bearing 2 is another insulator 23 having a

notch 24 therein to receive a lug 25 on the contact member 18. The insulator 23 has a wider notch 26 to receive the arm 27 of the contact member 18. The arm 27 terminates in a contact portion 28 which is adapted to engage a brush track 29 on the edge of a resistance winding. The resistance winding 30 is wound on a band-type insulating strip 31 of suitable insulating material. Positioned interiorly of the winding 30 is an insulating band-type strip 32 and fitting snugly within the insulating band 32 is a band-type collector ring 33 having an interiorly projecting flange forming an electrical contact track 34 on which the contact lugs 16 and 17 run. The collector ring band is preferably subdivided by slots 35 into a plurality of sections so that when this contact member is formed the band portion thereof will be formed into a plurality of resilient sectors which will engage the insulator 32 and through it, apply pressure to the strip 31 to hold it in full expanded position especially at its ends. Fastened to the contact member 33 as by a screw 36 is an insulator 37 of suitable strong material. A terminal 38 is held by the screw 36 in position on the insulator 37. The insulator 37 also carries additional terminals 39 and 40 which are electrically connected to the opposite ends of the winding 30. The insulator 37 is arcuately formed as shown in Figure 9 to fit the curvature of the winding 30. The insulator 37 is also provided with an arcuately shaped flange 41 fitting under the edge of the casing 1 as shown in Figure 3. It also has an arcuate shoulder 42 at the inner edge to receive the flange 43 of a cover 44. The insulator 37 also has a depending relatively wide flange 45. The opposite ends of the insulator 37 also have projecting edges or flanges 46 for lapping over the casing it being understood that the wall of the casing is cut away as indicated by the narrow spaces 47 and 48 so as to allow the complete resistance unit as shown in Figures 8 and 9 to be slipped into position within the casing. The cover 44 is provided with a plurality of openings, three of which are indicated by the numeral 49 and the other four by the numeral 50. These openings 49 and 50 are adapted to receive cooperative fingers 51, three of which pass through the openings 49 in the cover and are bent so as to hold the cover 44 in position on the casing 1. When the cover 44 is secured in position it presses against the depending flange 45 of the insulator 37 and thereby pushes the resistance unit forwardly against contact arm 18, thus depressing a coil spring 68 positioned between the insulator 23 and the inside of the front of the casing 1 so the contact lugs 16 and 17 and the contact 28 of the contact member 18 are resiliently held in engagement with their respective cooperating parts as has been described. The other four fingers 52 which pass through the openings 50 in the cover are adapted to be bent over into recesses 53 in the switch member casing generally referred to by the numeral 54. This auxiliary switch member comprises an insulating member 55 within which is mounted a spring contact member 56 and a contact stud 57 which is carried on an insulator 58 pivoted on a stud 59. Stud 59 also carries a shifting member 60 having upwardly extending arms 61 and 62 and lug 63 to which one end of a spring 64 is attached while the other end of the spring is positioned on a washer 65 carried by a projection 66 on the insulator 58. For cooperation between the arms 61 and 62 there is a lug 71 on the periphery of the cup 10 which is adapted to be positioned between the arms 61 and 62 indicated by the dotted lines in Figure 2. No further description of the auxiliary switch shown in Figure 7 will be given as this per se forms no part of my present invention, and may not be used.

For operating the shaft 3, a knob K is fastened thereto by a set screw 67. Assuming that the auxiliary switch is in closed position as shown in Figure 7, then the arms 61 and 62 will be in the position shown by the full lines. When the knob K is turned so as to open this switch the lug 71 will engage the arm 62 and move it to its dotted line position and the arm 61 will follow to its dotted line position. This action will cause the toggle spring 64 to move the switch into open circuit position, when the switch is to be closed the lug 71 will act on the arm 61 in its dotted position and move it to the position shown in full lines Figure 7. Also as it will be readily understood the turning of the shaft 3 will cause the contact 28 of the contact member 18 to move around on the brush track 29 of the winding 30 as well as the contacts 16 and 17 to move on their track surface 34 so that a circuit may be completed from the terminal 39 through to the terminal 38 as well as from the terminal 40 depending on the position of the contact 28.

From the construction as described it will be seen that the resistance unit when in operative position is held by the cover and casing so there is a yielding engagement between the spring 68 and the contact member 18, since this member is pushed a short distance away from the insulator 11. By using a coiled spring 68 a longer range of spring reaction is obtained which will take up for dimensional changes or inaccuracies of manufacture and will give better contact engagement between the co-acting parts. Also the construction is such that the resistance unit may be readily removed from the casing without having to remove the casing from its mounting.

The cup 10 has its walls flared outwardly so as to substantially close the hole 69 in the cover 44 to practically close the casing 1 for electrically shielding the parts within the casing 1 from other devices especially the auxiliary switch fastened to the rear end of the casing 1. The cover 44 is also provided with a projection 70 to act as a stop for the lug 71 on the cup 10. While the inner end of the shaft 3 is shown as spun over the bottom of the cup 10 to hold it in position, it may be held in place by a lock washer and screw. Other minor changes may be made in the details without departing from the spirit of my invention and the scope of the appended claims. Having thus described my invention, what I claim is:

1. An electrical control structure including, a cup shaped casing with a section portion removed from the wall of the cup, a ring-shaped unit having a resistance winding fitting within the cup and having an insulating block carrying terminals fastened to the unit and connected to opposite ends of the winding and forming part thereof, the block spanning over opposite exterior edges of said sector portion, a cover for holding said unit in the casing with means for holding the cover to the casing, a bearing carried by the cup, an operating shaft carried by the bearing, an electrical contact member insulatingly carried by the shaft and having parts co-operative with parts of the resistance unit including a contact track thereon for completing a circuit to said terminals, said resistance unit having an interiorly positioned band-type collector ring with an inwardly projecting flange forming an electrical contact track for parts on said contact member carried

by the shaft, a strip of insulating material formed as a band has a resistance winding thereon with a band of insulating material preferably wider than the width of the winding and located between the winding and the collector ring.

2. An electrical control structure including, a cup shaped casing with a section portion removed from the wall of the cup, a ring-shaped unit having a resistance winding fitting within the cup and having an insulating block carrying terminals fastened to the unit and connected to opposite ends of the winding and forming part thereof, the block spanning over opposite exterior edges of said sector portion, a cover for holding said unit in the casing with means for holding the cover to the casing, a bearing carried by the cup, an operating shaft carried by the bearing, an electrical contact member insulatingly carried by the shaft and having parts co-operative with parts of the resistance unit including a contact track thereon for completing a circuit to said terminals, and said insulating block being arcuately formed with the same curvature as the wall of the cup and having extended flanges on its opposite ends and inner edge to position the block on the cup, with a relatively wide flange at the cover end of the structure, this wide flange extending radially inwardly over a considerable arcuate portion of the outer surface of the resistance unit so when the cover is on it engages this wide flange and holds the resistance unit in a resiliently operative position.

3. An electrical control structure including, a cup shaped casing with a section portion removed from the wall of the cup, a ring-shaped unit having a resistance winding fitting within the cup and having an insulating block carrying terminals fastened to the unit and connected to opposite ends of the winding and forming part thereof, the block spanning over opposite exterior edges of said sector portion, a cover for holding said unit in the casing with means for holding the cover to the casing, a bearing carried by the cup, an operating shaft carried by the bearing, an electrical contact member insulatingly carried by the shaft and having parts co-operative with parts of the resistance unit including a contact track thereon for completing a circuit to said terminals, said resistance unit having an interiorly positioned band-type collector ring with an inwardly projecting flange forming an electrical contact track for parts on said contact member carried by the shaft, the band portion of the ring being separated into a plurality of sections as for the purposes described.

4. An electrical control structure including, a cup shaped casing with a section portion removed from the wall of the cup, a ring-shaped unit having a resistance winding fitting within the cup and having an insulating block carrying terminals fastened to the unit and connected to opposite ends of the winding and forming part thereof, the block spanning over opposite exterior edges of said sector portion, a cover for holding said unit in the casing with means for holding the cover to the casing, a bearing carried by the cup, an operating shaft carried by the bearing, an electrical contact member insulatingly carried by the shaft and having parts co-operative with parts of the resistance unit including a contact track thereon for completing a circuit to said terminals, said shaft being positioned in its bearing at the operative end by a recess in the shaft and a snap ring within the recess with the snap ring adapted to engage the end of the bearing and means for

holding the snap ring in such engagement, said means including a collar spaced a short distance rearwardly from the inner end of the bearing, a thrust spring positioned between the collar and the end of the bearing to hold the snap ring on the outer shaft end against the shaft bearing.

5. An electrical control structure including, a cup shaped casing with a section portion removed from the wall of the cup, a ring-shaped unit having a resistance winding fitting within the cup and having an insulating block carrying terminals fastened to the unit and connected to opposite ends of the winding and forming part thereof, the block spanning over opposite exterior edges of said sector portion, a cover for holding said unit in the casing with means for holding the cover to the casing, a bearing carried by the cup, an operating shaft carried by the bearing, an electrical contact member insulatingly carried by the shaft and having parts co-operative with parts of the resistance unit including a contact track thereon for completing a circuit to said terminals, said shaft being positioned in its bearing at the operative end by a recess in the shaft and a snap ring within the recess with the snap ring adapted to engage the end of the bearing and means for holding the snap ring in such engagement, said means including a collar spaced a short distance rearwardly from the inner end of the bearing, a thrust spring positioned between the collar and the end of the bearing to hold the snap ring on the outer shaft end against the shaft bearing, said cup shaped metallic member is fastened to the inner reduced end of the shaft, a circular insulator fixed on the shaft adjacent the bottom of said cup, a contact member positioned by said circular insulator out of contact with the shaft, a washer type insulator around the shaft adjacent the inner surface of said contact member and a spiral type spring positioned between said washer type insulator and the bottom of said casing for the purpose described, said contact member having an arm for contacting with the track surface on the resistance unit and also having contact fingers for engaging another member of the resistance unit.

6. An electrical control structure including, a cup shaped casing with a section portion removed from the wall of the cup, a ring-shaped unit having a resistance winding fitting within the cup and having an insulating block carrying terminals fastened to the unit and connected to opposite ends of the winding and forming part thereof, the block spanning over opposite exterior edges of said sector portion, a cover for holding said unit in the casing with means for holding the cover to the casing, a bearing carried by the cup, an operating shaft carried by the bearing, an electrical contact member insulatingly carried by the shaft and having parts co-operative with parts of the resistance unit including a contact track thereon for completing a circuit to said terminals, said shaft being positioned in its bearing at the operative end by a recess in the shaft and a snap ring within the recess with the snap ring adapted to engage the end of the bearing and means for holding the snap ring in such engagement, said means including a collar spaced a short distance rearwardly from the inner end of the bearing, a thrust spring positioned between the collar and the end of the bearing to hold the snap ring on the outer shaft end against the shaft bearing, said shaft insulatingly carrying a contact member having an arm for contacting with the track surface on the resistance unit and also having contact fingers for engaging another member of the resistance

unit, and spring means for holding said contact member so its contacts are resiliently made, said cup shaped member being fastened to the inner end of the shaft, with a finger projecting rearwardly from the rim of the cup for the purpose described.

7. An electrical control structure including, a cup shaped casing with a section portion removed from the wall of the cup, a ring-shaped unit having a resistance winding fitting within the cup and having an insulating block carrying terminals fastened to the unit and connected to opposite ends of the winding and forming part thereof, the block spanning over opposite exterior edges of said sector portion, a cover for holding said unit in the casing with means for holding the cover to the casing, a bearing carried by the cup, an operating shaft carried by the bearing, an electrical contact member insulatingly carried by the shaft and having parts co-operative with parts of the resistance unit including a contact track thereon for completing a circuit to said terminals, said cover has a centrally located hole therein while the inner end of the shaft has a cup-shaped member fastened thereto, the rim of the cup being slightly larger in diameter than said hole in cover and being positioned to approximately close the hole, the rim of the cup having a rearwardly projecting finger for engaging switch operating parts of a switch that is adapted to be mounted on the control structure as described.

8. An electrical control structure adapted to receive a switch for closing and opening a different circuit, said control structure having a casing carrying a shaft on which is insulatingly mounted a control contact member, a conically shaped coil spring between the face of the casing and the control member but out of electrical contact therewith, a resistance unit removably held in the casing by a cover so said contact member is resiliently held by said spring in contact with parts of said resistance unit, the cover having a centrally located hole therein, a metallic cup fastened to the end of said shaft, the rim of the cup being but somewhat larger in diameter than the diameter of said hole and a projection on the rim of the cup adapted to engage arms on a movable switch member which has a casing adapted to be fastened to the casing of the rheostat.

9. An electrical control structure including a casing having a bearing located in one end and carrying a shaft having a contact member insulatingly and slidably mounted thereon, a resistance unit positioned within the casing, said unit having a resistance winding with a brush track thereon and a current conducting ring with terminals for the winding and ring, said contact member having arcuately spaced parts for engaging the brush track and the ring, said contact member being slidably moved toward the front of the casing by the unit when it is moved into operative position within the casing and a coiled spring having one end located at the junction of said bearing and casing and reacting against the contact member to hold it in axially movable engagement with its cooperative parts of the unit.

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