

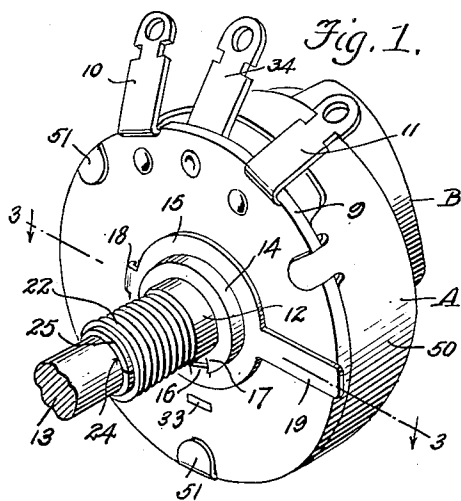
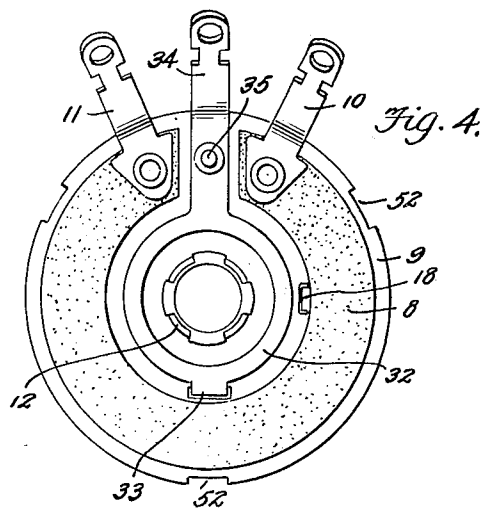
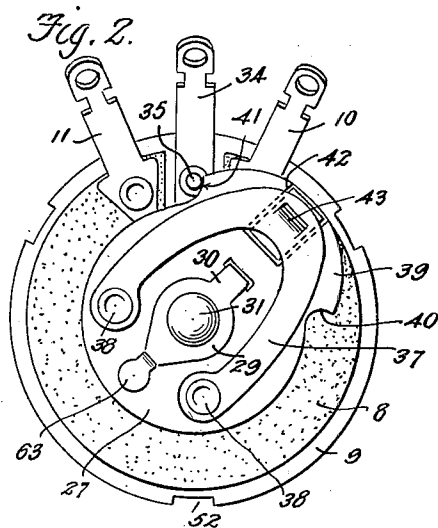
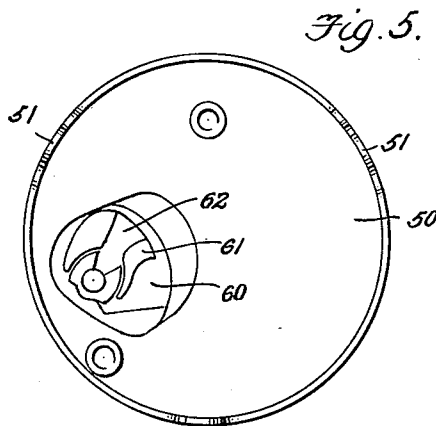
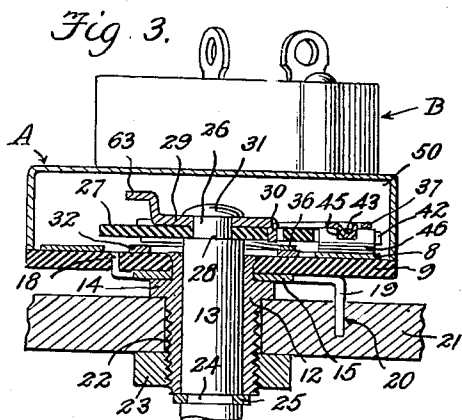
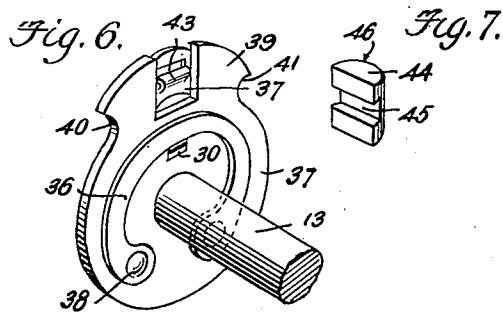
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VARIABLE ELECTRIC RESISTOR

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VARIABLE ELECTRIC RESISTOR

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4 Claims. (Cl. 201—55)

This invention relates to variable electrical resistors and has particular reference to a resistor of the indicated character which is so constructed and arranged as to reduce to a minimum erratic fluctuations or changes in the resistance so as to provide a resistor which is particularly applicable for use as a volume control in radio receiving apparatus, but which may also be employed in other electrical circuits.

It has been observed in variable electrical resistors that where the contact element itself is of an inherent resilient character, the line of contact with the resistance tends to continuously change in accordance with the variations in the pressure exerted thereupon, and such changes are objectionable particularly in delicate circuits and are very pronounced due to amplification such as in audio-circuits.

The present invention, therefore, contemplates a variable electric resistor of the designated character, which overcomes this objection by employing a movable non-resilient contact element so fashioned as to effect a narrow linear contact with the resistance material, extending laterally thereof and in wiping engagement therewith so that the portion of the resistance material in contact with the said contact element is relatively narrow in the direction of the movement of the element thereover by virtue of which linear engagement and the non-resilient or solid rigid character of the contact element such erratic fluctuations or changes in the resistance are reduced to a minimum.

The invention further provides a variable electrical resistor in which the movable non-resilient contact element is so carried by a resilient contact arm as to permit of relative rocking of the contact element upon the resistance material in order that the contact element may follow any unevenness or irregularity in the surface of the resistance material, while maintaining its linear contact therewith.

The invention further provides in a variable electrical resistor having a high resistance element, such as a thin film of carbonaceous material applied to a non-conductive base, which resistance is sensitive to mechanical abrasion, a non-resilient contact element fashioned and mounted so as to present a relatively narrow linear contacting portion for resilient wiping engagement with the resistance material and which contact element, while free to follow any unevenness or irregularity in the surface of the resistance material, insures positive engagement therewith without the liability of cutting into,

scraping or otherwise injuring the resistance material.

The invention further embodies in a variable electrical resistor unit, which includes a switch member for controlling the power circuit to the radio apparatus with which the unit is connected, an improved metallic actuator finger which is directly connected with the shaft of the resistor so as to relieve any of the other parts of the resistor of strains or stresses incident to the actuation of the switch.

The invention further includes an improved element for locking or anchoring the resistor casing to a panel or mounting therefor.

With the above recited and other objects in view, reference is now made to the following specification and accompanying drawing in which there is illustrated the preferred embodiment of the invention, while the appended claims cover variations and modifications thereof which fall within their scope.

In the drawing:

Fig. 1 is an enlarged perspective view of a combined switch and variable electric resistor constructed in accordance with the invention.

Fig. 2 is an enlarged inner end view with the casing and switch mechanism removed.

Fig. 3 is a longitudinal sectional view taken on a plane indicated by the line 3—3 of Fig. 1 and illustrating the same applied to a mounting panel.

Fig. 4 is a view similar to Fig. 2 with the rotor removed.

Fig. 5 is an inner face view of the switch illustrating the rock head for moving the switch mechanism.

Fig. 6 is a perspective view of the rotor and wiper contact and showing a portion of the resilient contact arm through the recess in the rotor.

Fig. 7 is a perspective view of the semi-cylindrical non-resilient contact element.

In the present disclosure the resistor is shown as a volume control for radio apparatus and is combined with a switch unit for controlling the power circuit leading to the apparatus, although it is to be understood that broadly the resistor is designed and intended for use in any electrical circuit.

Referring to the drawing by characters of reference, A designates generally the resistor unit and B a switch unit. The resistor unit A includes a resistance element 8 having a plane contact surface which may be a carbonaceous material composed of carbon, graphite or a mixture of both, together with a suitable non-conducting

filler and a suitable binder, and which in the present instance is in the form of a substantially annular or semi-circular strip carried by the inner face of the base 9 of an insulating material.

5 The opposite ends of the resistance element 8 are connected by rivets, or any other suitable means of connection, to the base 9 and to the terminals 10 and 11 which project radially from the base. The base 9 has secured thereto a bushing 10 12 extending concentrically therethrough and protruding outwardly from the outer face thereof and within which a shaft 13 is mounted for rotation. The bushing is formed with an enlarged flange 14 between which and the base 9, a washer 15 15 is interposed, the washer being provided with an offset tongue 16 which engages in a notch 17 in the flange 14 to lock the washer against turning movement with reference to the bushing. The washer is further provided with an integral lug 20 18 which is bent inwardly and is anchored in the base 9 to hold the base against turning movement with reference to the washer and bushing 12. The washer is also provided with a radially projecting finger 19, which is designed to be bent at an angle for engagement within a recess 20 in the mounting panel 21 for holding the resistor unit A against turning movement. The bushing is externally threaded as at 22 and protrudes through an opening in the mounting panel 21 for receiving a lock nut 23. The shaft 13, which is mounted in the bushing, is formed with an annular groove 24 at its point of emergence from the bushing 12 and a split lock ring 25 engages in the groove and limits the inward axial movement of the shaft. At its inner end, the shaft is formed with a reduced terminal 26 over which a rotor 27, of insulating material, is positioned and bears against the shoulder 28. The rotor 27 is keyed to the shaft 13 for turning movement therewith by a washer 29 having an offset spur 30 which is anchored in the rotor. The free end of the terminal 26 is headed at 31 to secure the rotor and washer on the terminal 26 between the same and the shoulder 28.

45 An annular contact member 32 is secured in flat engagement with the inner face of the base 11 and is disposed concentric to the axis of the shaft 13. The contact member 32 is provided with an angulated projection 33 on its outer periphery which is anchored in the base 11 and is provided with a radially projecting terminal 34 protruding from the base and riveted or otherwise secured thereto as at 35.

55 The outer face of the rotor 27, which is disposed in confronting relation to the inner surface of the base 9, has attached thereto a substantially U-shaped resilient wiper contact 36 which is so tensioned that the intermediate or bight portion thereof frictionally engages with the annular contact member 32. The opposite inner face of the rotor has secured thereto a substantially U-shaped contact arm 37, and the resilient wiper contact 36 and the contact arm 37 have their terminals secured to each other by means of conductor rivets 38 which pass through the rotor 27. It will be observed that the contact arm 37 is of greater length than the wiper contact 36 so that the medial or bight portion of the arm 37 overlies the resistance element 8. The rotor is of generally circular form having a radially projecting enlargement 39, the opposite sides of which define stop shoulders 40 and 41 adapted to engage with the rivet head 35 to limit the rotational or turning movement of the rotor and shaft 13 in opposite directions. The medial por-

tion of the enlargement 39 is provided with a notch 42 which registers with the medial or bight portion of the contact arm 37 and receives an offset tongue 43 which is out struck from the bight portion of the arm. The contact shoe or element 44 is non-resilient and non-deformable and is of substantially semi-cylindrical solid formation with its plane upper surface provided with a groove 45 which receives the tongue 43 so that the contact element 44 lies partially within the confines of the notch 42, while the protruding convex surface 46 thereof is urged by the inherent resiliency of the arm 37 into engagement with the carbonaceous surface of the resistance element 8, the arrangement being such that the carbonaceous surface of the resistance has a restricted tangential engagement with the convex surface of the contact element on a line disposed transversely thereof in the direction of its width or substantially perpendicular to the path of movement of the element 44 over the resistance element 8. It will be observed that the tongue 43 presents a rounded convex face engaging in the grooved portion 45 of the contact shoe or element 44 which permits of a rocking action of said contact element in one direction to compensate for irregularities in the carbonaceous surface of the resistance element 8, while preventing rocking motion at right angles thereto. It will further be observed that due to the convex face 46 of the contact element, damage or injury to the carbonaceous surface is avoided and wear on the same is reduced to a minimum. Due also to the convex formation of the shoe or contact element 44, the tangential engagement of the surface of the resistance element therewith forming a narrow or line contact and the non-resiliency or solid rigid character of the contact element, erratic fluctuations or changes in the resistance are practically obviated.

40 The resistance unit A further includes a housing 50 which may be associated with the base 9 in any desired manner, but which housing, as shown, is provided with integral fingers 51 fitted in peripheral notches 52 in the base 9 and crimped around the forward face thereof.

Where a switch member for controlling the power circuit is employed in connection with the resistance unit A, the switch unit shown at B is carried by the housing 50 and includes a switch 50 60 of any approved type including a rock head 61 of insulation material having a recession 62. In order to provide means for actuating the switch 60 in timed relation with the resistance unit, the washer 29 is provided with an offset actuator finger 63 which moves into and out of engagement with the recession 62 and shifts the cam of the switch mechanism past dead center in the usual manner. By making the actuator 63 as an integral part of the washer 29, strains and stresses are directly transmitted through the washer to the shaft 13 without subjecting the rotor thereto.

What is claimed is:

1. In a variable electrical resistor, a rotatable shaft, a resistance fixed against movement with the shaft, a movable non-resilient contact element having a longitudinally extending curved face providing a narrow linear contact portion extending laterally of and in wiping engagement with the resistance, a resilient contact arm engaging said contact element transversely thereof to permit of the rocking of the contact element laterally of the resistance, and retaining the element against rocking movement longitudinally of the resistance, and means mounting said contact

arm and contact element for rotational movement with said shaft.

2. In a variable electrical resistor, a rotatable shaft, a resistance fixed against movement with the shaft, a movable contact element having a transversely extending medially arranged groove in one face thereof and a longitudinally extending curved opposite face providing a narrow linear surface extending laterally of and in wiping contact with the resistance, a resilient contact arm engaging said contact element transversely thereof and in said groove to permit of the rocking of the contact element laterally of the resistance, and retaining the element against rocking movement longitudinally of the resistance, and means mounting said contact arm for rotational movement with said shaft.

3. In a variable electrical resistor, a rotatable shaft, a resistance fixed against movement with the shaft, a movable contact element having a longitudinally extending convex face providing a narrow linear surface extending laterally of and in wiping contact with the resistance, a resilient contact arm engaging said contact element transversely thereof to permit the rocking of the contact element laterally of the resistance and retaining the same against rocking longitudinally of the resistance, an insulation base member mounted

ed on said shaft to move therewith, said base having an inwardly directed, radially arranged recess and forming a support for the contact arm with the contact element loosely positioned in said recess to move therewith when in engagement with the contact arm.

4. In a variable electrical resistor, a rotatable shaft, a resistance and a non-resilient contact element mounted for relative movement with respect to each other, said contact element having a transversely extending groove in one face thereof and a longitudinally extending convex opposite face, providing a narrow linear contact portion extending laterally of and in wiping engagement with said resistance, a resilient contact arm engaging said contact element transversely thereof and in said groove to permit the rocking of the contact element laterally of the resistance and retaining the same against rocking longitudinally of the resistance, an insulation base member mounted on said shaft to move therewith, said base having an inwardly directed radially arranged recess and forming a support for the contact arm with the contact element positioned in said recess to move therewith when in engagement with the contact arm.

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