

Sept. 6, 1949.

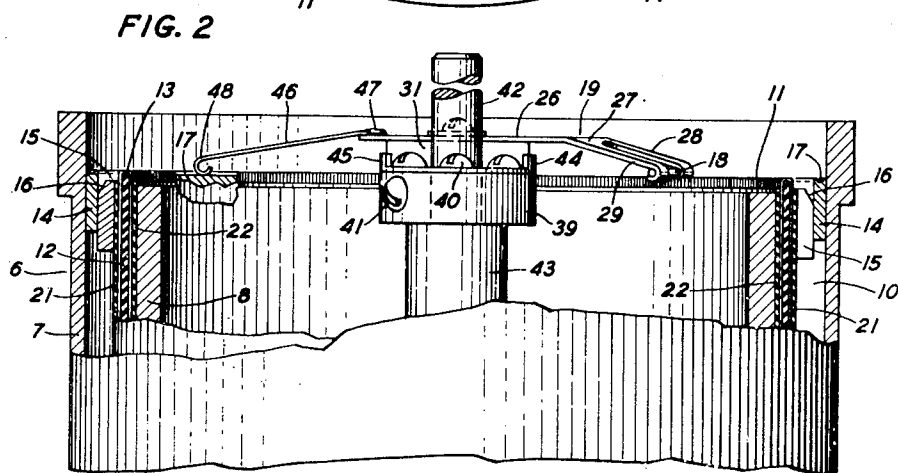
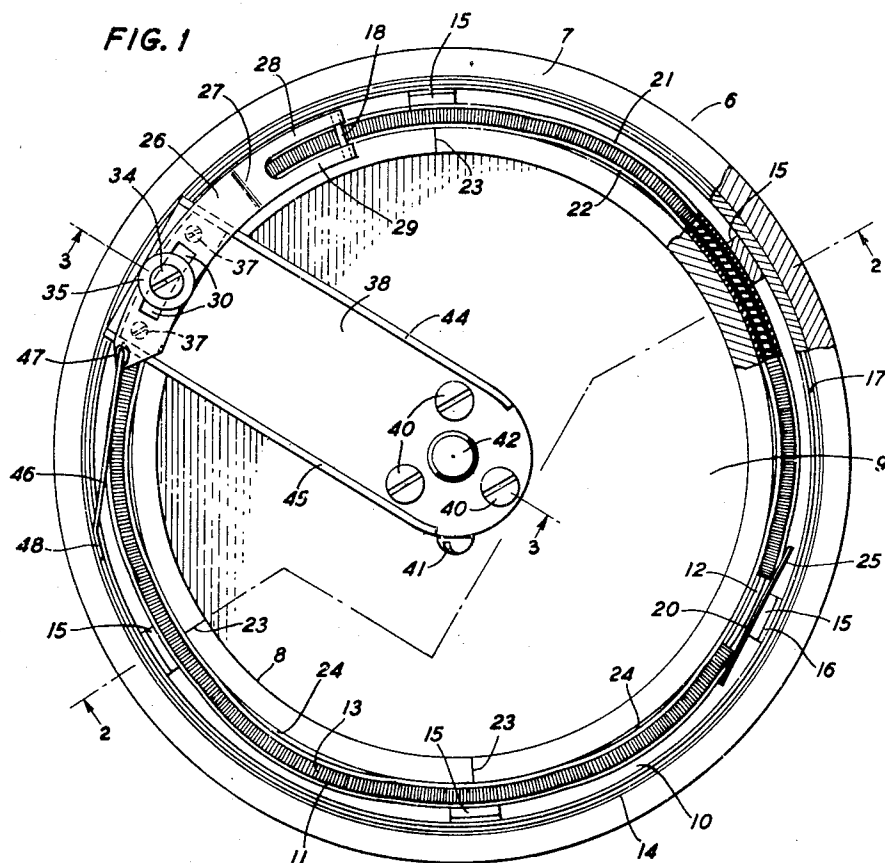
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2,480,995

ELECTRICAL POTENTIOMETER DEVICE

Filed Aug. 27, 1947

2 Sheets-Sheet 1



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FIG. 3

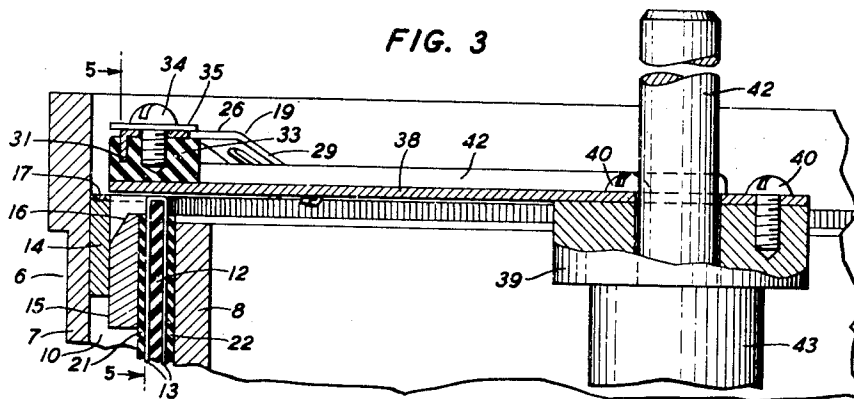


FIG. 4

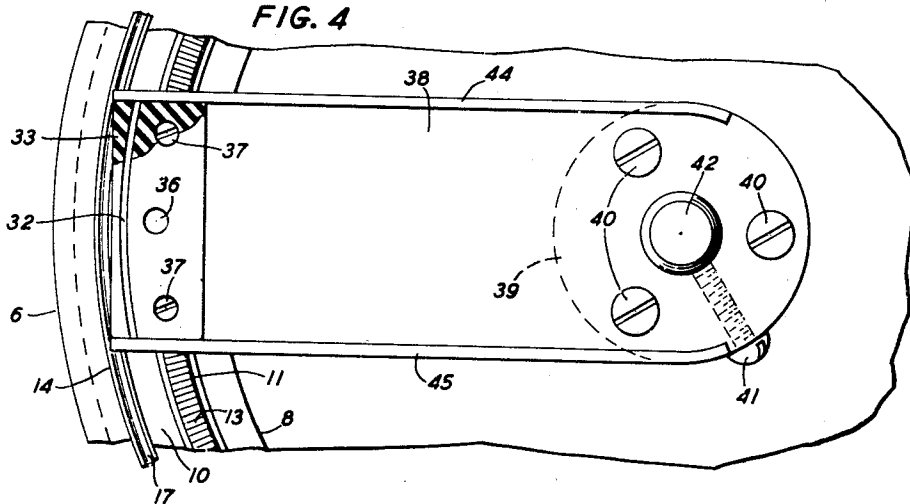
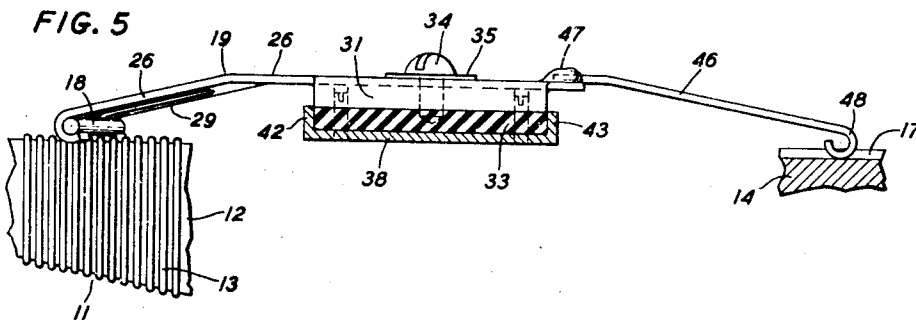


FIG. 5



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ELECTRICAL POTENTIOMETER DEVICE

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Application August 27, 1947, Serial No. 770,868

1 Claim. (Cl. 201-56)

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This invention relates to variable electrical control devices and more particularly to variable electrical control devices of the potentiometer type.

An object of the invention is to provide an improved variable electrical control device of the potentiometer type.

A feature of the invention resides in an improved wiper contact member.

Another feature resides in an improved collector ring.

In the drawings:

Fig. 1 is a top plan view, partly in section, of a potentiometer embodying the invention;

Fig. 2 is a side view, partly in section, of the potentiometer shown in Fig. 1 and sectioned on the line 2-2 in Fig. 1;

Fig. 3 is an enlarged view, partly in section, of a portion of the potentiometer shown in Fig. 2;

Fig. 4 is a top plan view, partly in section, of the portion shown in Fig. 3, but with the wiper contact removed; and

Fig. 5 is a side view, partly in section, of wiper contacts and parts of the wiper contact supporting means and portions of a resistance element and collector ring engaged by the wiper contacts. This side view is taken on the line 5-5 in Fig. 1.

In some precision potentiometers a resistance element is required to be held at predetermined points against an annular wall in a body of the potentiometer in order that a required electrical potential will be obtained when a wiper contact reaches a predetermined point in its travel over the resistance element. The wiper contact is in electrical contact with the resistance element and the electrical potential obtained is conductively carried to a collector ring.

In the present invention, a ring member forming part of the potentiometer serves as a collector ring and also as a part in the means employed in supporting the resistance element.

As shown in Fig. 1, the potentiometer comprises a body 6 having an outer wall 7 and an inner annular wall 8 extending from an apertured base wall 9, the walls 7 and 8 being concentrically arranged and cooperatively defining an annular space 10 in which the resistance element 11 of the potentiometer is disposed. The resistance element 11 comprises a card-like member 12 of insulating material serving as a support for a winding 13 of resistance wire, turns of which extend over edge portions of the card-like member 12 as shown in Fig. 5.

The resistance element 11 is set edgewise in

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the space 10 and so that it follows the contour of the annular wall 8 in the body 6 and is pressed toward the outer surface of the annular wall 8.

A ring 14 of conducting material is concentrically arranged relative to the annular wall 8. At predetermined spaced points wedge block members 15 are provided between the ring 14 and the resistance element 11, the wedge block members 15 having bevelled upper edges 16 as clearly shown in Fig. 3. The ring 14 and the wedge block members 15 cooperate to press the resistance element 11 toward the annular wall 8 to hold the resistance element 11 in required place in the body 6. The ring 14 is strong but slightly flexible and may be made from sheet steel or other suitably strong conducting material. The diameter of the ring 14 should be such that the ring 14 will fit tightly against the wedge block members 15 when the wedge block members 15 are fully disposed between the ring 14 and the resistance element 11. It is preferable to make the inside diameter of the ring 14 slightly less than the distance between the outer surfaces of two diametrically disposed wedge block members 15 and such that the ring 14 must be force fitted in place. The bevelled upper edges 16 of the wedge block members 15 facilitate placement of the ring 14 in final position. An annular groove 17 is formed in the upper edge of the ring 14 for a purpose to be later explained.

In mounting the resistance element 11, the wedge block members 15 and the ring 14 in the body 6, the resistance element 11 is disposed edgewise in the space 10 and so that an upper edge of the resistance element 11 is slightly above the upper end of the wall 8 and in a position to be frictionally engaged by a contact piece 18 of a wiper contact 19. Ends of the resistance element 11 are brought into end-to-end relation as shown at 20 in Fig. 1. The wedge block members 15 are placed in the space 10 at predetermined required spaced points and between the outer side of the resistance element 11 and the inner surface of the wall 7. The ring 14 is placed edgewise in the space 10 and between the wedge block members 15 and the wall 7 and on the bevelled upper edges 16 of the wedge block members 15. When the ring 14 is in this position the ring 14 may be forced downwardly in the space 10, portions of the ring 14 being, in effect, outwardly cammed by the bevelled upper edges of the wedge block members 15 until the ring 14 tightly bears against the outer flat surfaces of the wedge block members 15. In forcing the ring 14 into final position some spring tension is

developed in the ring 14 to constantly urge the wedge block members 15 and the resistance element 11 toward the wall 8. Before the ring 14 is forced down into final position insulating strips 21 and 22 may be applied to opposite faces of the resistance element 11, the insulating strip 21 being disposed between the resistance element 11 and the wedge block members 15 and the insulating strip 22 being disposed between the resistance element 11 and the wall 8.

In some precision potentiometers now made it is required that at some predetermined points in the travel of the wiper contact over the resistance element certain predetermined turns of the resistance wire will be engaged by the wiper contact when the wiper contact reaches these points. The structure shown and described in this specification may well be used in satisfying such requirement. Before the ring 14 is forced down to its final position the resistance element 11 may be adjusted to bring certain predetermined turns of the resistance wire to required reference points such, for instance, as scratch marks 23 on the wall 8. A wedge block member 15 may be placed in register with each of these points to hold the resistance element 11 against movement relative to these points when the ring 14 is in final position and the potentiometer is in operation. If the distance between two points of such holding is less than the length of a corresponding portion of the resistance element 11 extending from one point to the other a portion of the resistance element 11 may be bulged away from the wall 8 as shown at 24 to let a required turn of wire on the resistance element 11 be in register with a required scratch mark 23.

A bridge piece 25 may be provided in an even plane with the upper edge of the resistance element 11 to form, in effect, a supporting rail for the contact piece 18 when the wiper contact 19 is passing over the end-to-end positioned points of the resistance element 11.

The wiper contact 19, as shown in Figs. 1, 2 and 5 may be readily formed from sheet metal and comprises a body portion 26 terminating at one end in a downwardly slanting and bifurcated arm portion 27 across the ends of the tine portions 28 and 29 of which is secured the contact piece 18. In the body portion 26 an elongated aperture 30 is formed extending lengthwise of the body portion 26. Extending downwardly from and integral with the body portion 26 is a curved flange 31 arranged to extend into a curved groove 32 formed in a block 33 of insulating material on which the body portion 26 is adjustably mounted by means of a screw 34 and washer 35, the shank of the screw 34 being extended through the elongated aperture 30 in the body portion 26 and into a tapped hole 36 formed in the block 33. The curvatures of the flange 31 and the groove 32 are alike and correspond to the curvature of the annular space 10 in the body 6. The block 33 of insulating material is apertured and secured by means of screws 37—37 to the free end of a pivotally supported apertured arm 38 mounted on and extending from a collar 39. The arm 38 is secured by means of screws 40 to the collar 39 which is secured by means of a set screw 41 to a rotatable shaft 42 extending through a tubular post 43 mounted in the body 6 and extending from the base wall 9. Spaced side flanges 44 and 45 are provided on the arm 38 to strengthen the arm structure.

Secured to and extending from the body portion 26 of the wiper contact 19 is a conductor rod

46 which serves as a conducting means between the wiper contact 19 and the ring 14. One end of the conductor rod 46 is in electrical connection with the wiper contact 19 and may be connected for instance, by means of solder 47 to the body portion 26 of the wiper contact 19.

The free end of the conductor rod 46 terminates in a hook-like portion 48 arranged to extend into the annular groove 17 formed in the ring 14. The conductor rod 46 is in frictional connection with the ring 14 through the hook-like portion 48 and the annular groove 17 forms, in effect, a track in which the hook-like portion 48 of the conductor rod 46 may run. The conductor rod 46 may be made of spring wire and have sufficient spring tension developed therein to maintain the hook-like portion 48 in good electrical contact with the ring 14.

When the shaft 42 is rotated the contact piece 18 of the wiper contact 19 travels along an edge of the resistance element 11 and makes successive contact with turns of wire in the resistance element 11. The hook-like portion 48 of the conductor rod 46 is moved in the same measure as the contact piece 18 and keeps in frictional contact with the ring 14.

Since the wiper contact 19 is held on the block 33 by a single screw 34 and the washer 35 and an elongated aperture 30 is provided in the body portion 26 of the wiper contact 19 to accommodate the shank of the screw 34, the wiper contact 19 may be readily adjusted to make the contact piece 18 rest on a predetermined turn of the resistance wire in the resistance element 11 when the arm 38 has been moved a predetermined extent and the contact piece 18 is in the vicinity of the predetermined turn of the resistance wire. To adjust the wiper contact 19 to meet the required turn of resistance wire it is only necessary to loosen the screw 34 and move the wiper contact 19 lengthwise until the contact piece 18 rests on the predetermined turn of resistance wire. During this movement the curved flange 31 on the body portion 26 of the wiper contact 19 slides in the curved groove 32 and makes the wiper contact 19 move in a curved path following the curvature of the annular space 10. In this movement the conductor rod 46 is moved and the path of movement corresponds with the curvature of the annular space 10. The curved flange 31 on the body portion 26 of the wiper contact 19 and the curved groove 32 in the block 33 cooperate to make the wiper contact 19 and the conductor rod 46 move in curved paths following the curvature of the annular space 10 and concentric with the wall 8 to prevent such lateral movements of the wiper contact 19 with respect to the resistance element 11 and corresponding lateral movements of the hook-like portion 48 of the conductor rod 46 with respect to the ring 14 as would cause the contact piece 18 to run off the resistance element 11 and the hook-like portion 48 to run off the ring 14. The curved flange 31 on the body portion 26 of the wiper contact 19 and the curved groove 32 in the block 33 also cooperate to prevent undue pivotal movement of the wiper contact 19 when the screw 34 is tightened to hold the wiper contact 19 in required adjusted position on the block 33.

It will be seen from the above description and with reference to the drawings that the ring 14 forms part of the holding means for supporting the resistance element 11 in required place and that the ring 14 also serves as an electrical collector ring in the potentiometer. The ring 14 is

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therefore a unitary holding and collector ring member. It will be understood that conducting means, not shown, may be provided for electrically connecting the resistance element 11 to a required part of an electrical system and that other conducting means, not shown, may be provided for electrically connecting the ring 14 to another required part of the electrical system.

The conductor rod 46 forms, in effect, a spring tensioned tail piece on the wiper contact structure to provide electrical connection between the wiper contact 19 and the collector ring 14 of the potentiometer.

What is claimed is:

A variable electrical control device comprising a curved electrical resistance element and a collector ring supported in concentric spaced relation, a support for said resistance element and said collector ring, a shaft rotatably supported in said support, an arm secured to said shaft, a block of insulating material supported on said arm, a curved groove formed in said block and following the curvature of said resistance element and said collector ring, a wiper contact

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adjustably mounted on said block by means of a single screw and having an apertured body portion on said wiper contact, an end portion in frictional contact with said resistance element, a conductor rod extending from said wiper contact into frictional engagement with said collector ring and a curved flange on the body portion of said wiper contact extending into the curved groove in said block to hold said wiper contact against rotation relative to said block.

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