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VARIABLE RESISTOR

2,925,575

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2 Sheets-Sheet 1

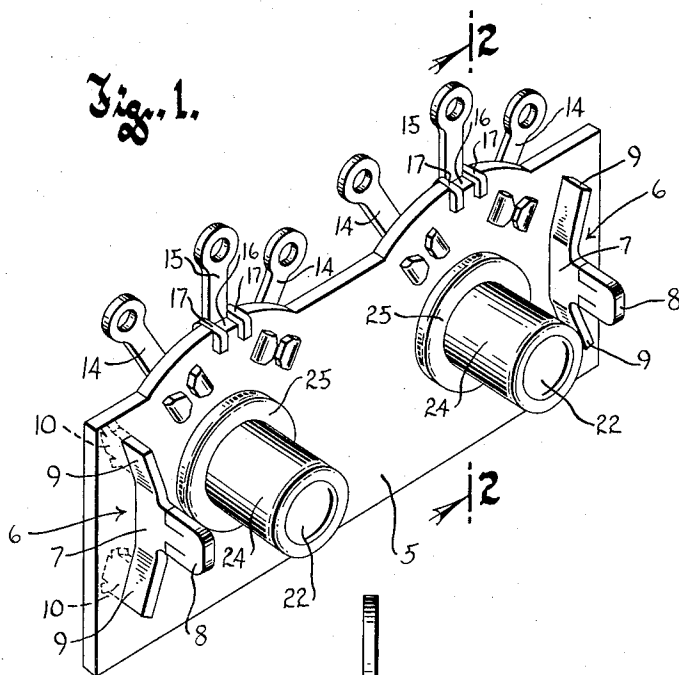
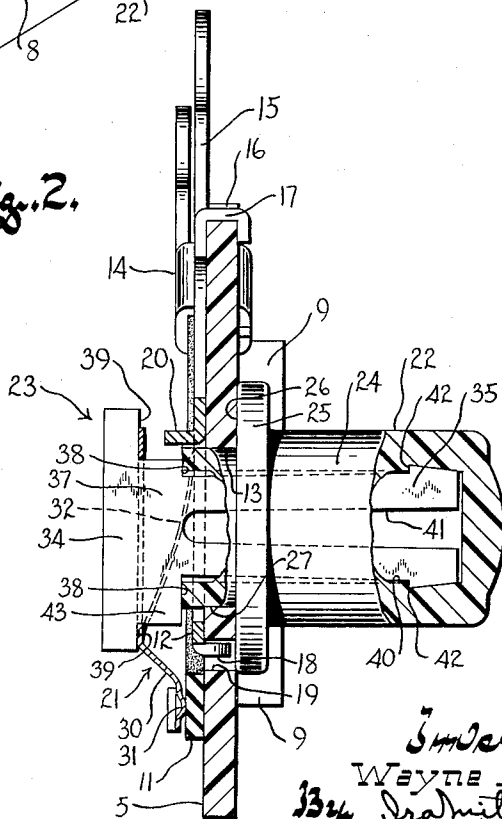


Fig. 2.



Inventor
Wayne A. Barden
By Ira Miller Jones
Attorney

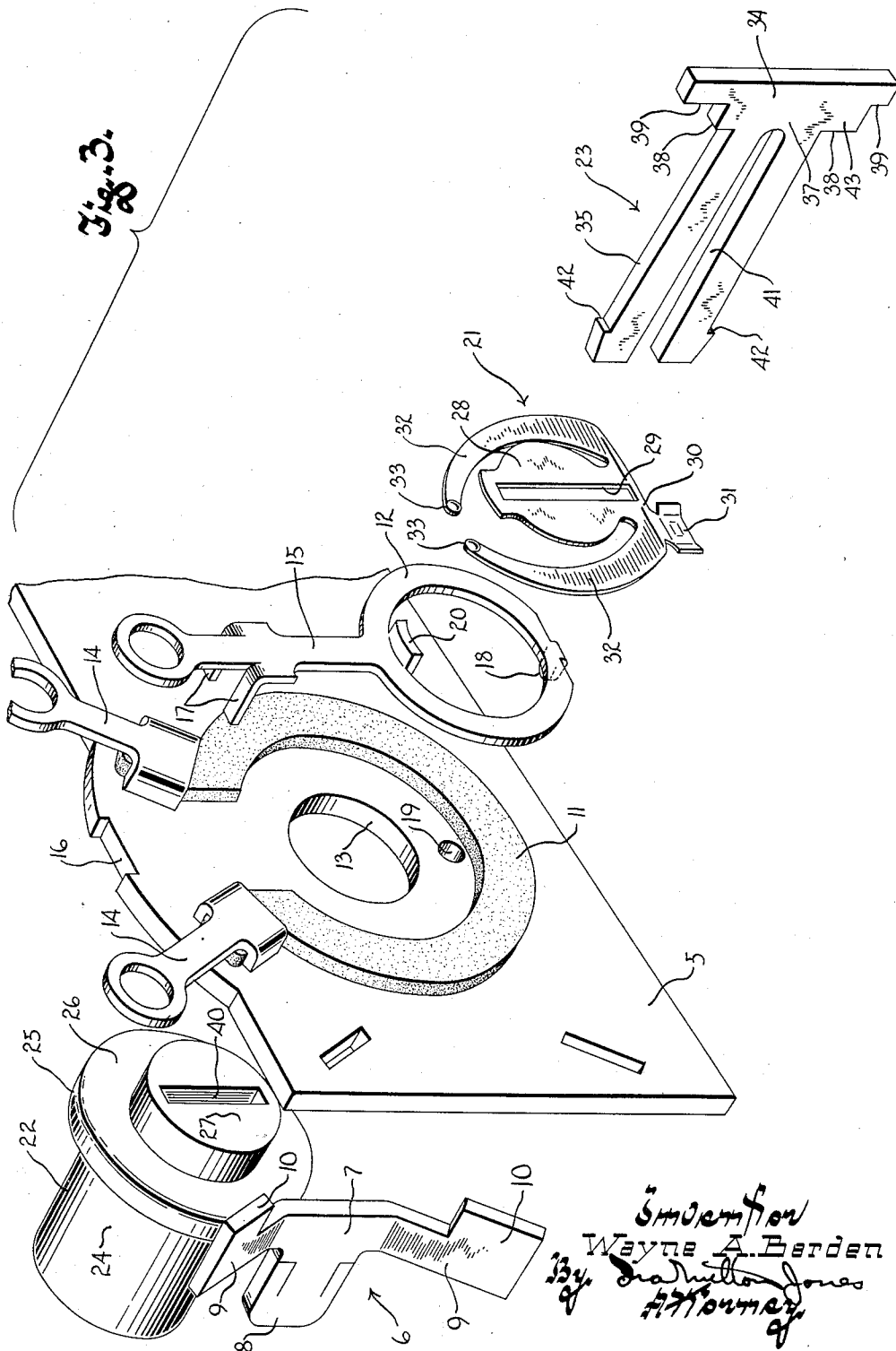
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VARIABLE RESISTOR

Wayne A. Barden, Elkhart, Ind., assignor to Chicago Telephone Supply Corporation, Elkhart, Ind., a corporation of Indiana

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10 Claims. (Cl. 338—166)

This invention relates to variable resistors and has as its purpose to provide a potentiometer of sufficiently simple and inexpensive construction to meet the ever increasing demand for a low cost high quality resistor suitable for use as a pre-set control for television receivers.

These pre-set controls, though of necessity adjustable, are seldom adjusted. In fact, on some sets they are purposely located where only a service man could adjust them. Hence, the name "pre-set controls."

Since quite a few of these pre-set controls are needed in each television receiver, especially those capable of receiving color television, set manufacturers are constantly urging the controls industry to make cheaper potentiometers, but without sacrificing quality. To some extent, this objective has already been achieved, but the variable resistor of this invention, in many respects surpasses the previous efforts to meet the requirements. One of the reasons it does, resides in the fact that its novel construction obviates the need for the customary shaft which forms the main part of the rotor in conventional variable resistors.

Another explanation for the lower cost of the variable resistor of this invention is that the number of its component parts not only has been reduced to the barest minimum, but in addition, these parts are so designed that their assembly is unprecedentedly simpler and quicker.

Still another feature of the variable resistor of this invention is that it lends itself especially well to having a number thereof assembled into a composite gang type control wherein the bases of all of the resistors are simply different areas of a single piece of insulating material so that, by a single mounting operation, the set manufacturer may install several pre-set controls at one time.

With the above and other objects in view which will appear as the description proceeds, this invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the hereindisclosed invention may be made as come within the scope of the claims.

The accompanying drawings illustrate one complete example of the physical embodiment of the invention, constructed according to the best mode so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a perspective view of a multiple or ganged pre-set potentiometer control unit, constructed in accordance with this invention;

Figure 2 is a sectional view taken through Figure 1, essentially upon the plane of the line 2—2, but on an enlarged scale; and

Figure 3 is an exploded perspective view of the components of one of the variable resistors illustrated in

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Figure 1, with the parts thereof arranged essentially in their proper order of assembly.

Referring now more particularly to the accompanying drawings, in which like numerals indicate like parts, the numeral 5 designates the common base for all of the variable resistor units of a composite or ganged pre-set control. The number of variable resistors ordinarily so ganged may be as high as four, hence, Figure 1 which illustrates only two ganged units is merely illustrative of the fact that the variable resistor of this invention lends itself to being ganged in groups capable of being installed in a television receiver as a single composite control.

The base 5 is stamped from a sheet of suitable insulating material, such as Bakelite, and has mounting members secured to the opposite ends thereof. These mounting members comprise sheet metal stampings 6, each of which has a central body portion 7 resting edgewise upon the front face of the insulating base 5 and extended forwardly therefrom to provide tabs 8 of the familiar twist-ear mounting type, to be received in holes in a mounting panel (not shown).

Legs 9 extend from the central body portion 7 of each mounting member, at an obtuse angle to one another, and toward the nearest end of the base. These laterally extending legs lie edgewise against the front side of the base, and their forward edges serve as shoulders to bear against the mounting panel and space the composite control unit therefrom. Tabs 10 which project rearwardly from each of the laterally extending legs 9 through slots in the base, are staked over the rear face of the base to hold the mounting members in place.

All of the variable resistor units mounted on the base 5 (which, in the embodiment of the invention illustrated, are only two) are alike. Each comprises an arcuate resistance element 11 and a metal collector ring 12 overlying the rear face of the base in concentric relation to one another with the collector ring circumscribed by the resistance element, and with both of these parts concentric to a sized round hole 13 through the base.

The resistance element is a separate part secured to the base by conventional clinch-on end terminals 14 which embrace radially projecting tabs on the resistance element and clamp the same to the base. However, if desired, the resistance element 11 can be painted directly on the base or formed in any other suitable manner, the only requirement being that it be arranged in an arcuate path concentric to the hole 13 and electrically insulated from the collector ring 12.

The collector ring 12 has a terminal portion 15 extending radially outwardly therefrom to project beyond the adjacent edge of the base which is notched, as at 16, to receive a pair of tangs 17 bent forwardly from the terminal portion at opposite sides thereof. The reception of these tangs 17 in the notch 16, together with the reception of another lug 18 in an accurately located and sized hole 19 in the base, serves to hold the collector ring 12 in proper position with respect to the resistance element 11 and the hole 13. To secure the collector ring in this position, the ends of the tangs 17 are bent over the front side of the base.

The collector ring 12 also has a lug 20 projecting rearwardly from its inner edge at a point substantially diametrically opposite the locating lug 18. In a manner to be described, this lug 20 cooperates with an abutment on the rotor assembly to define its limits of rotation.

The rotor assembly consists of only three parts—namely, a bridging contactor 21 stamped from resilient sheet metal, an operating member or actuator in the form of knob 22 molded of suitable insulating material,

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and a driver 23 stamped of relatively stiff sheet metal, and by which the contactor is connected with the operating knob to turn in unison therewith.

The operating knob 22, which may have any desired shape, should have its main body portion 24 of a size as to be readily grasped between the fingers, and the base or inner end of this main body portion is preferably enlarged, as by a flange 25, to provide a relatively large, flat shoulder or bearing surface 26 to seat upon the front face of the base and provide a smooth-running end thrust bearing of good stability for the rotor assembly.

Projecting rearwardly from the shoulder 26 is a round pilot boss 27. This boss snugly fits the hole 13 in the base and is journaled therein to provide a side-thrust bearing for the rotor. The boss 27 is longer in the axial direction than the combined thickness of the base and the resistance element, so that its rearmost end lies in a plane well behind the rear face of the collector ring 12.

The bridging contactor 21, as indicated, is stamped from resilient sheet metal and has a flat, generally round disc-like central body portion 28 with a diametrically extending slot 29 therethrough. Joined to the edge of this central body portion 28 adjacent to one end of the slot 29 is a relatively short paddle portion 30. This paddle portion defines an obtuse angle with the body portion 28 and its extremity is formed to provide a smooth surfaced contact 31 to ride upon the rear face of the resistance element. Extending from the opposite sides of the paddle portion 30 are two relatively long arcuate spring contact fingers 32 which embrace the central body portion 28 but lie substantially in a plane which forms an acute angle with the body portion and an obtuse angle with the paddle portion 30. The extremities of these spring fingers are shaped to provide smooth surfaced contacts 33 which, in the assembled condition of the parts, bear upon the rear face of the collector ring 12.

Although for clarity of description the portion of the contactor which carries the contact that rides upon the resistance element has been called a "paddle portion," it is, of course, not incorrect to consider this portion another contact finger.

The contactor is held assembled with the knob with its contact fingers under tension and bearing upon the resistance element and collector ring, by the driver 23; and the manner in which this is accomplished largely explains how the desired simplicity and low cost is achieved by this invention.

The driver is a T-shaped stamping having a head 34 and a stem 35, the width of which is abruptly increased at its junction with the head to provide an intermediate stem portion 37 and a pair of forwardly facing shoulders 38 parallel to but forwardly of the shoulders 39 formed by the underside of the head. The intermediate stem portion 37 has a cross sectional size and shape to snugly fit the slot 29 in the contactor in which it is received with the shoulders 39 bearing squarely against the rear face of the main central body portion 28 of the contactor. The stem of the driver is fixed in a socket 40 formed in the operating knob with its mouth opening to the rear face of its pilot boss 27.

To give the assembly a "snap-on" or "snap-together" characteristic, the stem of the driver is bifurcated, as at 41, and the two legs thus formed are sprung slightly apart so that insertion thereof into the socket places them under tension, and the ends of these legs have rearwardly facing barbs 42 which bite into, or at least firmly grasp, the adjacent sides of the socket to anchor the driver against unintentional withdrawal from the socket.

The correct fully inserted position of the driver is defined by the engagement of its shoulders 38 against the rear face of the pilot boss on the knob, and when the parts are thus correctly assembled, the distance be-

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tween the rearwardly facing shoulder 26 on the knob and the forwardly facing shoulders 39 provided by the underside of the head of the driver, is correctly established for proper contact pressure, it being understood that rearward end thrust imposed upon the rotor by the tensioned contact fingers holds the large flat shoulder 26 on the knob firmly against the front of the base.

The intermediate stem portion 37 extends farther beyond one side edge of the stem than the other, and in so doing provides a stop abutment 43 which travels in an orbit to collide with the lug 20 on the collector ring and thus define the limits of rotation through which the knob and contactor may be turned.

Attention is directed to the fact that the junction of the contact paddle 30 with the spring contact fingers 32 in a sense forms a fulcrum which bears upon the adjacent shoulder 39. Hence, although the short contact paddle 30 is positioned in the assembled unit so as to be substantially non-resilient, it nevertheless obtains an effect of resiliency and follow-up as a result of the translation of force about the fulcrum by the flexure or bowing of the long spring contact fingers 32.

From the foregoing description taken in connection with the accompanying drawings, it will be readily apparent to those skilled in this art that this invention provides a variable resistor especially well adapted for use as a pre-set control for television receivers; and that to a large degree the low cost which is a prerequisite of such controls, is made possible by the simplicity of the rotor construction and the ease of its assembly. To emphasize this point, attention is again invited to the fact that the rotor comprises only three parts, the knob, the contactor and the driver; and that to assemble these parts with one another and with the rest of the control, it is only necessary to place the knob upon the base with its pilot passing through the hole therein and then simply pass the stem of the driver through the slot in the contactor and snap the stem into the socket in the knob. This completes the assembly and, since the knob is formed of insulating material, there are no exposed current carrying parts.

What is claimed as my invention is:

1. A variable resistor of the type wherein rotation of an actuator is imparted to a bridging contactor to carry resilient fingers thereon along arcuate resistance means and a collector ring; characterized by the fact that the resistance means and the collector ring are disposed flatwise on the rear face of a thin but stiff flat base stamped out of insulating material, the base having a round hole therethrough concentrically encircled by the resistance means and the collector ring; by the fact that the actuator comprises a knob having a flat rearwardly facing shoulder bearing flatwise directly against the flat front face of said base, and a pilot which projects axially rearwardly from the shoulder through said hole in the base, said pilot being journaled in the hole and the shoulder being greatly larger in diameter than the pilot so that the knob is rotatably and stably supported by the base; and further characterized by the provision of means connecting the contactor with the knob for rotation in unison therewith, comprising a stem member secured to and projecting rearwardly from the pilot through an opening in the contactor; an abutment member fixed to said stem member and having a forwardly facing surface bearing against the rear of the contactor to hold its spring fingers engaged under tension with the resistance means and the collector ring; and interengaging surfaces on the contactor and on one of said members constraining the contactor to rotate with the knob.

2. The variable resistor of claim 1 wherein said connecting means comprises a T-shaped member, the stem of which passes forwardly through the opening in the contactor and is secured in a socket in the knob opening through the rear end of the pilot boss, the head of the T providing said abutment member.

3. The variable resistor of claim 2 wherein the knob and its pilot are of insulating material and molded as a single unit.

4. The variable resistor of claim 3 further characterized by the fact that the T-shaped member is a metal stamping and that its stem is bifurcated to divide the same into two resilient legs, said legs having rearwardly directed barbs on their extremities which engage the adjacent walls of the socket to anchor the T-shaped member against rearward displacement from the knob.

5. The variable resistor of claim 1 wherein said connecting means comprises a T-shaped member, the stem of which passes forwardly through the opening in the contactor and is secured in a socket in the knob opening through the rear end of the pilot boss, the head of the T providing said abutment member, and further characterized by the provision of rotation stops for the knob comprising cooperating abutments on the collector ring and on the stem of the T-shaped member.

6. A variable resistor comprising a flat base of insulating material having a round hole therethrough; means providing an arcuate resistance element directly on the rear face of the base concentric to said hole; means providing a collector ring overlying and supported on the rear face of the base and concentric to said hole; a rotatable bridging contactor bridging contactor having contact portions bearing on the resistance element and the collector ring; an operating knob for imparting rotation to the bridging contactor, said knob bearing directly against the front face of the base and having a pilot boss projecting rearwardly therefrom and journaled in the hole in the base so that the knob is rotatably supported on the base, said knob having an axial rearwardly opening socket; and a snap-on fastener connecting the contactor with the knob, said fastener comprising a flat T-shaped metal stamping, the stem of which is non-circular in cross section and passes through a correspondingly shaped hole in the contactor, said stem being inserted into the socket of the operating knob with the head of the T bearing against the rear of the contactor to press its contact portions against the resistance element and collector ring; and means operable upon full insertion of the stem into the socket to secure the stem against withdrawal.

7. The variable resistor of claim 6 further characterized by the provision of rotation limiting stops for the knob comprising cooperating abutments on the collector ring and the stem of said T-shaped stamping.

8. A variable resistor of the type wherein rotation of an actuator is imparted to a bridging contactor to carry resilient fingers thereon along arcuate resistance means and a collector ring, both of which are on the rear face of a flat base of insulating material, characterized by the fact that the actuator includes a driver having a non-circular stem and a transverse part on the rear end of the stem providing a forwardly facing contactor supporting surface; and further characterized by the fact that the bridging contactor comprises a stamping of resilient sheet metal interposed between the rear face of the base and said forwardly supporting surface, said contactor having a flat central body portion with a non-circular hole therethrough snugly receiving the non-circular stem of the driver, and lying flat against the forwardly facing supporting surface on the driver, and said contactor further having a short paddle portion and long resilient fingers, the anchored ends of the paddle portion and of the resilient fingers being connected to the flat central body portion at a point thereon which is supported by said forwardly fac-

ing supporting surface, the paddle portion and the fingers projecting in the same axial direction from the central body portion and forming an obtuse angle to one another with the fingers embracing the central body portion, and the extremities of said paddle portion and of said fingers being formed to provide smooth contact surfaces which bear respectively against the resistance means and the collector ring at points remote from one another and at opposite sides of the axis of rotation of the contactor.

9. As an article of manufacture, a contactor for the rotor of a variable resistor comprising: a resilient sheet metal stamping having a flat disc-like central body portion with a diametrically extending slot therethrough, said stamping further having a short paddle portion and long resilient fingers, the anchored ends of the paddle portion and of the resilient fingers being connected to the flat central body portion at a point thereon near one end of its slot, the paddle portion and the fingers projecting in the same axial direction from the central body portion and forming an obtuse angle to one another with the fingers embracing the central body portion, and the extremities of said fingers and paddle portion being formed to provide smooth contact surfaces.

10. A variable resistor comprising: a base consisting of a thin but stiff sheet of insulating material, the front and rear faces of which are flat throughout their entire area, said base having a round hole therethrough; means providing an arcuate resistance path on the rear face of the base concentric to the hole therein; means providing a collector ring of good conductivity on the rear face of the base and also concentric with the hole; terminals for the ends of the resistance path and for the collector ring secured to the base and electrically connected to the ends of the resistance path and to the collector ring, respectively; a bridging contactor having resilient contact portions engaging the resistance path and the collector ring to traverse the same as the bridging contactor is rotated about the axis of the hole; an actuator for the bridging contactor having a round pilot boss journaled in the hole in the base and having a rearwardly facing flat shoulder from which the pilot boss projects rearwardly, said shoulder having an area considerably greater than the cross sectional area of the pilot boss and bearing flatwise directly upon the front face of the base to provide a smooth running end thrust bearing of good stability for the actuator; and retaining means connecting the bridging contactor with the actuator for rotation therewith, said retaining means having a spring finger portion engaging a portion of the actuator, one of said portions surrounding the other and the spring finger portion having sharp edges thereon disposed to permit insertion of the latter one of said portions into the other during assembly, but which edges bit into the actuator portion engaged thereby after assembly and thus strongly resist separation of the retaining means from the actuator, and said retaining means carrying the bridging contactor and holding the latter with its resilient contact portions engaged under tension with the resistance path and the collector ring to thus maintain good contact therebetween and hold the shoulder tightly against the front face of the base.

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