LINEAR POTENTIOMETER WITH SEGMENTED TERMINAL AND COLLECTOR MEANS

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Filed: May 20, 1971

Appl. No.: 146,738


Int. Cl. ........................................... H01c 5/02


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ABSTRACT

A resistance element disposed on a copper laminated epoxy baseboard is electrically connected by a spring wiper to a collector formed by the copper plate on said baseboard. Resistance terminals integral with the baseboard extend out of the housing enclosing the assembly element. The wiper is actuated by a slider movable along the element to vary resistance. A marker on the slider indicates the wiper position relative to a scale imprinted on the housing.

7 Claims, 9 Drawing Figures
My invention relates to improvements in the design, construction, manufacture and use of electrical linear potentiometers. Although there are other methods of building linear motion potentiometers, my method offers distinct advantages over the existing art, particularly as regards simplicity of construction and convenience in use.

The object of my invention is to provide a linear motion potentiometer, the design of which is based on a novel principle, namely the use of a central structural member in the shape of a copper laminated epoxy baseboard which incorporates the resistance element, the collector for the movable wiper contact and the three resistance terminals all in one piece. Specifically, three soldering lugs integral with the baseboard project out of the potentiometer housing to serve as resistance terminals.

Another object of my invention is to provide a linear motion potentiometer whose method of construction offers structural simplicity and space saving, yet permits efficient operation.

A further object of my invention is to provide a linear motion potentiometer which is manufactured from simple parts and which can be assembled in a few steps requiring no expensive tooling.

Yet another object of my invention is to provide a linear motion potentiometer which offers the convenience of a readout of the wiper position relative to a scale imprinted on the potentiometer housing. This scale, representing resistance or voltage values, can be linear, logarithmic or based on some other function, depending on the properties of the resistance element.

A still further object of my invention is to provide means for locking the potentiometer wiper in any desired position relative scale imprinted on its housing.

My invention is explained with the aid of the following drawings in which:

FIG. 1 is a isometric view of the potentiometer according to one embodiment of my invention.

FIG. 2 is a longitudinal view of the potentiometer assembly of FIG. 1 with part of the rear side cover removed to show the inside of the housing.

FIG. 3 is the cross section of the potentiometer assembly taken along the lines 3-3 of FIG. 2.

FIG. 4 is a front view of the copper laminated epoxy baseboard of FIGS. 2 and 3.

FIG. 5 is a side view of the baseboard according to FIG. 4.

FIG. 6 is a front view of an epoxy spacer plate seen in FIGS. 1 and 2.

FIG. 7 is a perspective view of the slider as seen in FIGS. 1, 2 and 3 according to the invention.

FIG. 8 is a partly broken isometric view of the locking device according to the invention.

FIG. 9 is an electrical schematic of the potentiometer according to the invention.

Referring first to FIGS. 4 and 5 of the drawings, there is shown an epoxy baseboard having a relatively thin copper layer 11, bonded to one of its two large surfaces by a suitable adhesive or deposited on it by a chemical process. Such copper laminated or copper plated plastic boards are well known in the trade and extensively used in printed circuit applications.

The baseboard 10 has: a semicircular groove 12 cut in its unplated surface 27; an oblong recess 29 bordered by baseboard's edge 16 extending parallelly to the groove 12; a pair of edges 31 at the right angle to the edge 16; three lug extensions 17, 18 and 19, electrically insulated from one another by two transversal narrow grooves 20 cut to a depth necessary for the separation of the copper layer 11 into three electrically insulated copper sections 22, 23 and 24, and a thru hole 39 and a narrow slot 25 in each of the sections 22 and 24. The lugs 17 and 19 are located at the ends of the baseboard 10 while the lug 18 is located in the middle position thereof.

Referring to FIGS. 2 and 3 of the drawings, a resistance element 13 consisting of an insulated round core 14 along and around which an electrically resistive wire is wound in a single layer, is glued within and along the length of the groove 12. A portion of the round core 14 protrudes out of the semicircular groove 12. One end (not shown) of the resistive winding 13 is soldered to copper section 22 and thus is electrically connected to the lug 17. The other end (not shown) of the resistive winding 13 is similarly connected to the lug 19 and section 24.

The slots 25 cut into respective copper sections 22 and 24 serve the purpose of transferring the ends of the resistance winding from the insulating side 27 of the baseboard 10 to the copper laminated side 11; of holding the wires securely in place and of facilitating the soldering of the resistance wire to the copper laminated side 11.

In another embodiment of my invention shown, the resistance element consists of an electrically insulated core similar to core 14, on which a layer of electrically resistive carbon is deposited.

Yet in another embodiment not shown, the groove 12 and the core 14 can be replaced by a carbon resistive strip deposited on the insulated side of the baseboard 10 in the area of the groove 12. The connection of the copper element ends to the copper sections 22 and 24 can be accomplished by rivets (not shown) through the base board 10.

In all the foregoing embodiments of my invention, a wiper 15 made of a U-shaped electrically conducting spring material of either round or rectangular cross section straddles the baseboard 10 engaging simultaneously the copper layer 11 and the resistance element 13 to effect an electrical connection between them. This connection is maintained as the wiper 15 is moved along the element 13.

Holes or slots 17a, 18a and 19a in respective lugs 17, 18 and 19 facilitate the connection of external wires thereto. Alternatively, the potentiometer, according to my invention, can be mounted on a perforated circuit board by inserting the three terminal lugs through matching holes in the circuit board in which:

A distinct feature of my invention is the utilization of terminals integral with the baseboard instead of conventional extrinsic metal terminals which would have to be mechanically attached to the assembly and electrically connected to the resistance element. The absence of such extrinsic terminals eliminates terminal contact problems and simplifies the assembly procedures.

Referring now to FIG. 1, in addition to FIGS. 2 and 3 of the drawings, there is shown the assembly of parts constituting the complete potentiometer according to my invention. The potentiometer is enclosed in a housing 45 comprised of the following component parts: one baseplate 40, two epoxy spacer plates 30 shown individually in FIG. 6; two rectangle-shaped epoxy side covers 32 and 33 and one rectangle-shaped epoxy plate 36 having a cutout 41. A narrow groove 34 is cut the full length of each of the side covers 32 and 33 parallel to their long edges. The baseboard 10 and the spacer plates 30 adjacent to it are sandwiched between the covers 32 and 33 with the edges of the plate 36 projecting into the grooves 34, the entire assembly being clamped together by means of two eyelets 37 which pass through respective holes 39 in the baseboard 10. The housing 45 protects the resistive element 13 and its contact surfaces from physical damage and dust.

Inside the housing 45, there is shown a T shaped slider 28 depicted in more detail in isometric view of FIG. 7, made of electrically insulating material, comprised of three projections 28a, 28b and 28c. The slider projections 28b and 28c have respective grooves 21b and 21c milled in them into which the wiper 15 fits snugly. As the slider 28 moves lengthwise the edge 16 between the edges 31, the wiper 15 moves likewise along the element 13.

In the illustrated embodiment of my invention, the eyelets 37 act as stops to limit the travel of the slider 28.

Referring back to FIG. 1, it is seen that the upper portion 28a of the slider 28 is formed into a knob 40 projecting out of the housing 45 through the cutout 41 in the plate 36. The knob 40 has a pointer 42 to indicate the position of the wiper 15 in relation of the element 13. For this purpose, a 0-to-10
scale 43 equal in length to the length of path of travel of the wiper 15 along the resistance element 13 is imprinted on the plate 36 along the cutout 41. By sliding the plate 36 along the grooves 34, a position can be found for the plate 36 in which the pointer 42 is at zero reading of the scale 43 and the resistance between the terminals 18 and 19 is zero. The position of plate 36 is made permanent by application of epoxy cement in the grooves 34. It will be recognized by anyone skilled in the art that the divisions of the scale 43 can represent either resistance or voltage values.

Referring now to FIG. 8, there is shown a partly broken view of a potentiometer housing 45a similar to potentiometer housing 45 seen in FIG. 1, except that the potentiometer incorporates a locking device 50 comprised of a screw 52 and of an internally threaded bushing 51 in which the screw 52 can be turned. The bushing 51 is mounted fixedly in the knob 40a which is similar to the knob 40 except that knob's portion protruding above the side panel 32a is slightly wider, but does not project laterally past the panel 32a. The screw 52 has a knurled head 53 of a relatively large diameter. The side panel 3a against which the knob 40a is positioned is slightly wider than the panel 33, so that the head 53 when tightened against the knob 40a will engage the panel 32a, thus producing a locking effect.

The schematic diagram of FIG. 9 comprised of resistance element 13, wiping contact 15 and terminals 17, 18 and 19 depicts the electrical circuit of my invention.

Although in the foregoing embodiments of my invention copper and epoxy have been specified as component parts of the baseboard 10, it is obvious to any person skilled in the art that other electrically conducting and insulating materials can be employed in their stead.

While I have explained the principle of my invention and described specific embodiments thereof, it is to be understood that the presented embodiments have been given here merely by way of illustration and by no means limit the scope of my invention which may be practiced otherwise than illustrated and explained in this specification.

I claim:

1. A potentiometer comprising in combination a shaped baseboard having two large parallel surfaces; one surface being an electrical insulator, the other an electrical conductor, insulating means for dividing the conductive surface into first, second and third sections electrically insulated from one another; a resistance element mounted on the baseboard having its respective ends connected electrically to the first and to the second conductor sections; a spring wiper made of electrically conducting material movable in simultaneous electrical engagement with the resistance element and which the third conductor section; a housing having walls enclosing the element and the conductor sections except for three lugs integral with respective conductor sections and protruding out of the housing; a slit in one of the walls of the housing disposed parallel to the resistance element; a slider member made of electrically insulating material coupled rigidly to the spring wiper protruding out of the slit in the housing; and means for displacing the slider member along the length of the slit.

2. A potentiometer according to claim 1, including locking means for locking the slider in place at any point of the slot.

3. A potentiometer according to claim 2 where the locking means comprises screw-nut members in threaded engagement with one another, one of the members being part of the slider, the other one adapted to be manually tightened against one of the walls of the stationary potentiometer housing.

4. A potentiometer according to claim 1, including scale means marked on one of the walls of the housing; indicating means associated with the slider for indicating slider position in relation to the scale, and means for adjustment of the location of the wall with the scale markings thereon in relation to the other walls of the housing.

5. A potentiometer according to claim 1, where the resistance element is mounted on the insulating side of the baseboard.

6. A potentiometer according to claim 1, where the wiper is a U shaped spring straddling the baseboard.

7. A potentiometer according to claim 1, where the resistance element is single layer wire wound element.