LAYER POTENTIOMETER HAVING DIVIDED TRACKS

Field and Background of the Invention

The present invention relates generally to layer-type potentiometers and it relates more particularly, to layer-type potentiometers having a divided track the individual tracks of which represent or form a continuity of each other.Layer potentiometers according to to the present inventions can be used in a large area of the electronic field for regulating and for balancing purposes.

A layer potentiometer according to a well-known construction has a resistance layer applied to a circular or rectangular base and over the surface of which a wiper can be moved over a linear or a circular path.Both ends of the resistance path and the wiper itself are connected to appropriate outputs.Along the path the resistance of the resistance layer can change in a linear fashion or according to a predetermined function (most frequently according to a logarithmic or negative logarithmic function),and ,as a result, a desired resistance characteristic can be set by the movement of the wiper.

In certain control applications output terminals are created also in predetermined intermediate positions of the resistance path.Such output terminals can be used, for example, to exert a certain influence on the shape of the movement-resistance characteristics (for example,

during the regulation of the phisiological voice strength).

There are such application requirements which make it desirable to set up the resistance path in two electrically isolated segments.Such requirement could be solved in principle by providing a potentiometer which has a center tap output, if the center output would be connected to an electrical common point, for example, to earth or to a common electrical ground.The tracks or segments which are to the left or right from the grounded center tap can be considered as individual potentiometers.

The potentiometers which have been above described are still not adaptable for reliably creating potentiometers having individual tracks according to the above principle. This is due to the fact that between the path of the wiper and between the center output there is a certain predetermined distance as measured along the resistance path and, in the intermediate position of the wiper,between the resistance path and between the output ,the resistance has a certain magnitude which is small but not negligible,that is, the center position of the track cannot be connected to an ideal ground in all its cross-section.This is why between two sections of the resistance path there is a so called "cross-talk" present which is an electrical connection in effect and, which in certain applications will not permit independent track use.

Another problem is created from the fact that the wiper is in contact with the resistance path over an area

which has a defined magnitude, and due to the continuous variation of the track resistance over the path, the central grounded state cannot be uniformly set.

Summary of the Invention.

It is, therefore, an object of the present invention to provide a layer potentiometer having divided tracks which reliably provides for the independent state of the individual tracks, that is, provides for the output of a central portion of the track at a very small electrical resistance.

It is another object of the present invention to provide a layer potentiometer having divided tracks in which any position along the divided tracks can be set reliably and uniformly and independently from the region of uncertainty of the setting of the wiper.

According to the present invention an output terminal made from a metallic layer is created which subdivides the track of a layer potentiometer which can be manufactured in a conventional fashion,preferably in a central portion of the resistance track and which, further, is joined with the adjoining edges of the adjacent tracks by overlapping such edges and,at the same time, it has a surface area which is sufficently large to provide a reliable contact of the wiper therewith.For example,it can be advantageous according to the present invention,if the wiper over a few percent of the total path of movement thereof may contact the center output.The invention provides that the resistance path or

track of the layer potentiometer can be subdivided not only into two, but into several segments or tracks, by employing more than one central output made according to the present invention.

The layer potentiometer according to the present invention can be advantageously employed with its reliably separated tracks in many areas of the electronic industry, for example, for regulating, balancing and coupling purposes.

Brief Description of the Drawings

The present invention will become more readily apparent from the following description of preferred embodiments thereof shown and described with reference to the accompanying drawings, in which:

Fig.1 illustrates an embodiment of the layer potentiometer according to the present invention in a cross-section and on somewhat distorted scale;

Fig.2 is a schematic plan view of the potentiometer of Fig.1;

Figs.3 and 4 illustrate possible circuit connections for the layerpotentiometer of the present invention; and

Figs.5-7 illustrate characteristic curves movement-resistance for the resistance segments.

Description of the Preferred Embodiments

With reference to Figs. 1 and 2 which illustrate an an examplary embodiment of the layer potentiometer according to the present invention, it is noted that for sake of illus-

tration the cross-sectional dimmensions are shown on a distorted scale.

The frame of the layer potentiometer is formed from an insulating base 1 which in the exemplary embodiment is shaped as a rectangle,however, it is within the scope of the present invention to form it either as an annular or as a segmented circle.

The application of the resistance path or track 3 is performed in a conventional manufacturing fashion which is well known in the art of manufacturing layer potentiometers. At certain points on the layer-potentiometer,preferably at its extreme end portions and at least at a central region, or at any intermediate point for certain applications,terminals having a predetermined area, are formed by the use of metal-vapor technology, and which are in contact with the divided tracks. The resistance path 3 according to the present invention is subdivided into two halves in the examplary embodiment by the intermediate terminal 5 which is formed from the metallic elemnt 2 as hereinafter described.

The intermediate metallic element 2 is in contact with both of the adjoining resistance tracks 3a and 3b. The reliable contact of the intermediate metallic layer with the adjacent divided tracks is assured by the special manufacturing and forming of the metallic layer 2 according to the present invention.

The metallic layer 2 is applied to base 1 as a first step before the resistance track 3 would have been applied to base 1. The metallic layer 2 under such

conditions is formed in a manner that it overlaps the regions of the subsequently formed resistance layer segments 3a and 3b which will be adjacent to it. By employing an appropriate masking procedure, the center portion of the metallic layer 2 is covered, then the resistance track is applied to the base 1. The resistance track 3 will now be divided by metallic layer 2 into two subtracks 3a and 3b.Due to the overlapping construction as can be seen in Fig.1 tracks 3a and 3b will be joined at their end portions with the metallic layer 2,however, the mask will prevent contact between the individual segments 3a and 3b of the resistance track 3.

After removing the mask, the output terminal 5 is completed by adding a further layer to element 2. Also the layers 4 and 6 are applied, whereupon the two side terminals and the central terminals are completed. The additional layer added subsequently on top of of the base layer 2 is metallically joined with it and overlaps the top of tracks 3a and 3b.The thickness of terminal 5 is negligible and it is shown only distorted in Fig.1 for sake of illustration, however, it assures a smooth sliding of wiper 7 onto it all along its length. Also the area of terminal 5 is large enough to provide a full contact of wiper 7 therewith when the wiper is in its region.

The output contact areas 4 and 6 at the two opposite extreme ends of tracks 3a and 3b serve as the terminals for their associated end regions.

The wiper 7 is constructed in a conventional manner well known in the area of layer-potentiometers, therefore, its detail construction is omitted in order tc avoid unnecessary crowding of the present description.

The layer potentiometer according to the present invention has at least four electrical contact terminals connected thereto, terminals A and B joining contacts 4 and 6 and terminal C joining contact 5 and terminal D joining wiper 7. Resistance track 3 can be subdivided into more than the illustrated two segments by increasing the intermediate contacts 5 in number.

In Figs.3 and 4 the principle of circuit connections for the layer potentiometer of the invention is illustrated. If the wiper 7 during its path of movement describes a linear, logarithmic or negative logarithmic function, that is, the path resistance travelled by it is described by such function, then the characteristics for the layer potentiometer of the invention will be those shown in Figs.5-7. The characteristic curves on the left side represent an U_{out} output voltage measured between terminals C and D, while the right side characteristics represent the U_{out} measured between terminals A and D. Fig.4 illustrates the layer potentiometer of the present invention in the form of a balance potentiometer which can be used in a signal transducing equipment of a stereo audio frequency apparatus. Under such condition terminal A is connected to an appropriate point on the left channel, while terminal B is connected to a point

on the right signal channel,while wiper 7 depending on its position will load either the left or the right side channel of the eqipment.In order to easier adapt the layer potentiometer of the invention for certain uses, wiper 7 can be provided with an arresting device which will assure its accurate positioning over the intermediate contact.

The advantage of the layer potentiometer of the present invention resides in that intermediate contact C provides a reliable electrical separation between segments 3a and 3b of path 3, since there is no chance for a shunt path to form between the two segments when wiper 7 comes into contact with region 5 . Consequently, one may load terminals A and B with signal sources which are independent from each other (like the left and right stereo channels) without getting cross-talk between them.

The layer potentiometer of the invention in certain applications can be used as a twin or gemini-type potentiometer,because its behaviour is similar with respect to circuits connected to terminals A and B due to the fact that the intermediate terminal C is grounded, therefore, the single potentiometer having a single wiper will fulfill the role of two potentiometers.

The large area of possible apllications for the layer potentiometer of the present invention can be easily visualized for an expert in the art and should

not be limited to the disclosed illustrative embodiments. For example,a two or four track tandem potentiometer construction is also within the scope of the present invention,since it would be an obvious modification of the inventive principle disclosed herein.

Having thus described the invention, what I claim as new and desire to be secured by Letters Patent,is as follows:

C l a i m s:

1. A layer potentiometer apparatus comprising:

a base;

a metallic layer formed at a predetermined intermediate region of said base;

a resistance layer formed over said base, said resistance layer overlapping outer portions of said metallic layer;

an additional metallic layer joined to said first-mentioned metallic layer, said additional layer overlapping adjacently lying portions of said resistance layer and forming an intermediate terminal therewith for said potentiometer;

additional terminal means formed at predetrmined other regions of said resistance layer;

wiper contact means adapted for slidable movement over said resistance layer and said intermediate terminal.

2.The layer potentiometer apparatus as claimed in claim 1,whereim said intermediate terminal subdivides said resistance layer into a pair of resistance path regions.

3.The layer potentiometer as claimed in claim 1, wherein said intermediate terminal lies substantially in a common plane with said resistance layer.

4.The layer potentiometer as claimed in claim 1, wherein said intermediate terminal has an I-cross-section.
wherein said intermediate terminal has an I-cross-section

5.The layer potentiometer as claimed in claim 1,or 2, wherein said base is rectangular and said resistance layer is rectangular on both sides of said intermediate terminal.

6.The layer potentiometer as claimed in claim 1, wherein said resistance layer is formed as an annulus.

7.The layer potentiometer as claimed in claim 1, wherein a plurality of intermediate terminals are provided at predetermined regions of said base and forming therebetween a plurality of resistance layer regions.

8.The layer potentiometer as claimed in claim 1, wherein the electrical resistance of said resistance layer varies according to a predetermined function.

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Abstract of the Disclosure

A multi-track potentiometer is provided wherein the adjacent tracks are joined by an intermediate terminal which is formed on a base overlapping with the lower surface of each adjoining resistance layer as well as with the upper surface thereof and substantially having an I-cross-section and wherein the upper overlapping joints are in substantially the same plane as the resistance layer enabling a smooth sliding of the wiper thereover and, at the same time, providing a reliable electrical separation between neighbouring segments of the resistance layer without cross-talk therebetween.