United States Patent

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[54] **DOUBLE PATH LINEAR MOTION POTENTIOMETER**
5 Claims, 4 Drawing Figs.

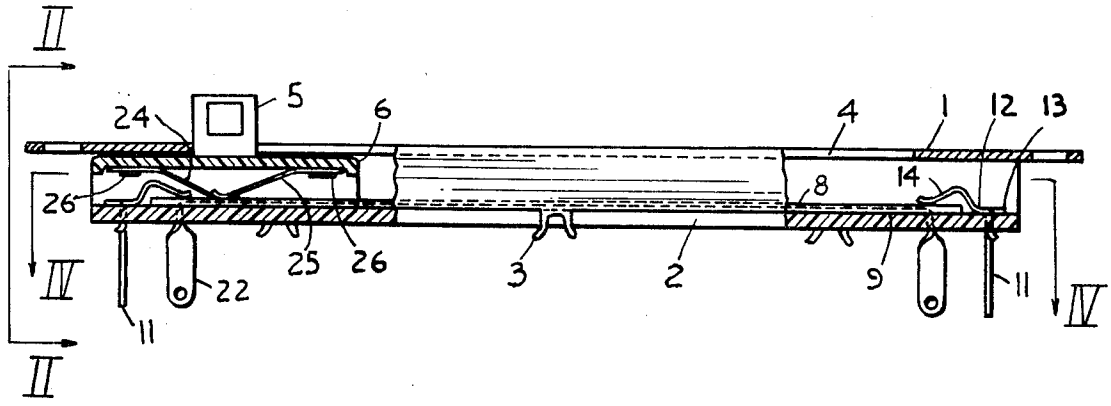
[52] **U.S. Cl.** **338/133,** 338/161, 338/183, 338/332
[51] **Int. Cl.** **H01c 5/02**
[50] **Field of Search** 338/133, 160, 176, 180, 183, 184, 194, 161, 332

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ABSTRACT: Two laterally spaced parallel bands of electrical resistive material are applied to a dielectric surface of a linear motion potentiometer. A slide movable lengthwise of the bands carries a pair of sliding contacts, each of which engages a different one of the bands and a separate collector strip beside it. The ends of the bands are engaged by resilient electric terminals.



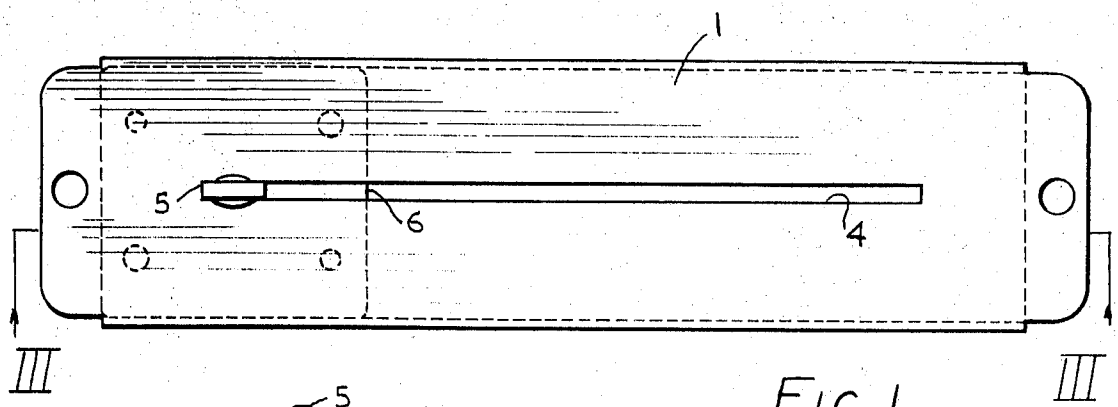


FIG. 1

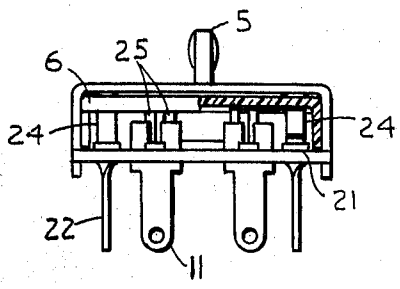


FIG. 2

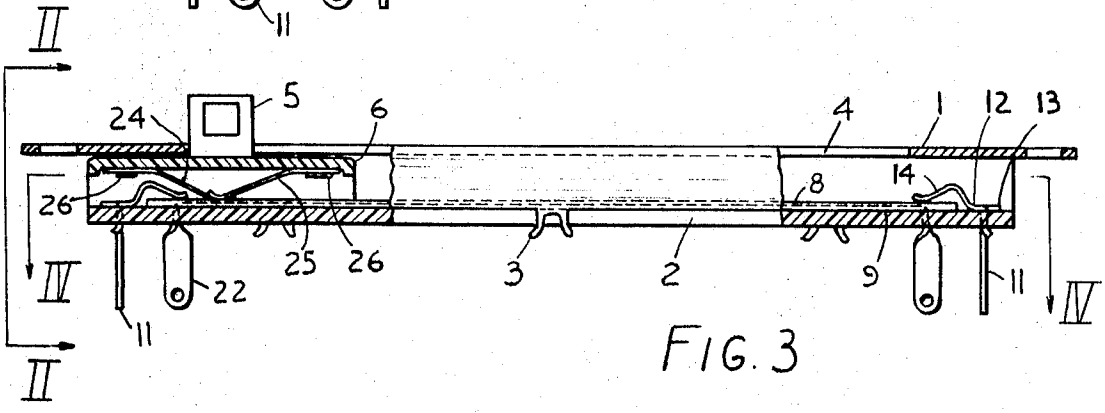


FIG. 3

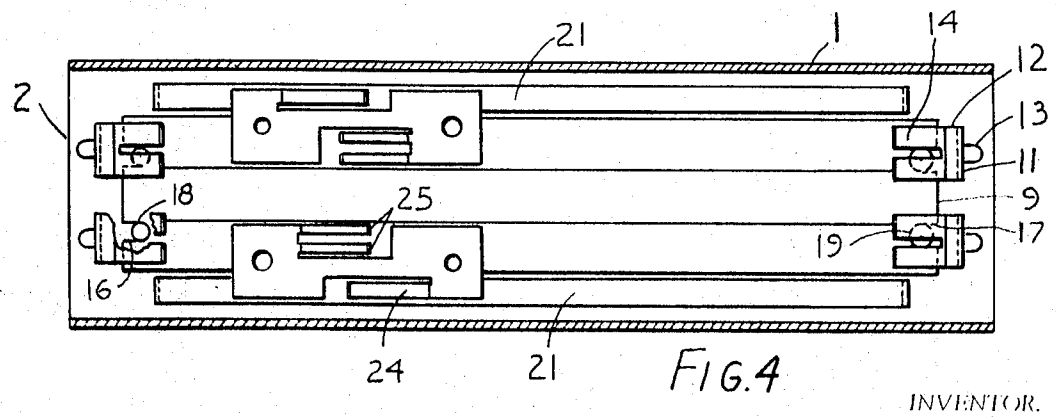


FIG. 4

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DOUBLE PATH LINEAR MOTION POTENTIOMETER

BACKGROUND OF THE INVENTION

In the reproduction of stereophonic sound, each of the two sound tracks is controlled by its own volume control in the form of a potentiometer. The resistance elements of the two potentiometers should be as nearly identical as possible and both resistances should vary substantially exactly the same amount for the same degree of movement of the movable contacts engaging them. These requirements have been difficult to satisfy in the past, because separate volume controls have been used for the two tracks. Thus, a common way of varying the sound has been to mount two rotary motion potentiometers in tandem and to control them by a single rotatable shaft. One difficulty is that the resistance elements of such a tandem control are not made at the same time, but may be made anywhere from minutes to months apart, so it is purely accidental if the two resistance elements are identical. In an attempt to overcome this objection, the practice is to sort the elements to try to match them, but of course that requires time and money and is not very satisfactory anyway. Even though well matched, a second major factor contributing to lack of tracking is mechanical misalignment of the two resistance elements relative to each other. The result of all this is that the volume of one of the stereophonic sound tracks may change at a different rate or in a manner than the other one when the potentiometers are operated.

It is among the objects of this invention to provide a potentiometer, in which there are which resistance tracks of substantially identical characteristics, in which both tracks are disposed in the same control, in which error in the location of the tracks relative to each other is substantially eliminated, in which the movable contacts are always moved exactly in unison the same distance, in which error in their relative locations is substantially eliminated, in which expansion and contraction of the resistance tracks will not affect their connection with their terminals, and which is of simple and inexpensive construction.

In accordance with this invention, an elongated potentiometer case has therein a flat dielectric surface, on which there are two laterally spaced parallel tracks or bands of electrical resistive material extending lengthwise of the case. Mounted beside each band and parallel thereto is a separate metal collector member. These members and the two bands are engaged by electric terminals that extend out of the case. A slide movable lengthwise of the case carries a pair of spaced sliding contacts, one of which engages one collector member and band and the other of which engages the other collector member and band. The preferred embodiment of the invention is illustrated in the accompanying drawings, in which

FIG. 1 is a plan view of the potentiometer;

FIG. 2 is an end view;

FIG. 3 is a central longitudinal section, partly in elevation-taken on the line III—III of FIG. 1; and

FIG. 4 is a horizontal section taken on the line IV—IV of FIG. 3. Referring to the drawings, a potentiometer housing or case is formed from a metal channel 1 and a flat insulating base 2. The sidewalls of the channel rest on the edges of the base and are provided with forked lugs 3 that extend through notches in the base, with the outer end of each lug spread apart to lock the channel against the base. The top of the channel is provided with a central longitudinal slot 4, through which extends the actuating knob 5 of a slide 6 inside the case made of insulating material.

Inside the case, as shown in FIG. 4, there are two laterally spaced straight resistance tracks or bands 8 that extend lengthwise of the case in parallel relation. Of course, the case may be made large enough to contain a second pair of resistance bands if desired, so the claims herein are not limited to a single pair of bands. These bands are formed at the same time or in immediate sequence by depositing resistive material onto a dielectric surface. For example, resistive paint may be sprayed onto it through a mask or stencil. The attenuation characteristics of 4two resistance bands are therefore as nearly identical as it is humanly possible to made them. Although the two bands could be applied directly to base 2, it is preferred to deposit them on an insulating strip 9 to form a resistance element that later is mounted on the base inside the case. In order to hold the element in place and to connect the resistance bands into electric circuits, they preferably are engaged by electric terminals designed to clamp the resistance element against the base.

Each of these terminals 11 is made from a strip of spring metal that is rigidly mounted in the base near the ends of the case. The terminals project from the base. To stabilize the terminals, each has a portion 12 inside the case that is bent toward the adjacent end of the resistance element and rests flat against the base. Also, the portion of the terminal extending through the base is provided with a struck-out tongue 13 that likewise rests flat against the base, but extends away from the resistance element. The portion of the terminal close to the outer surface of the base is twisted or staked to pull the tongue and portion 12 of the terminal tightly against the inner surface of the base. The portion of the terminal inside the case beyond portion 12 is provided with a loop 14 that overlies the adjacent end of one of the resistance bands, with the free end of the loop pressing firmly against the band. Consequently, the resistance element is clamped against the base of the case by the four spring terminals. Because of the spring pressure exerted by them, any changes in the thickness of the resistance element or the base, due to changes in temperature and humidity, will not affect the electrical connection between the resistance bands and the spring terminals. If desired, the resistance bands may be provided with taps.

In order to correctly position the resistance element on the base, with its low resistance end at the correct end of the case, each end of the element is provided with at least one recess, most suitably in the form of a notch. One notch 16 is narrower than the other notch 17. The base is provided with inwardly projecting bosses 18 and 19 of two different sizes that fit in the notches and thereby locate the resistance element correctly on the base. Boss 19 will fit only in the large notch 17, so the resistance element will fit only one way on the base.

Between the resistance element and the adjacent sidewall 5 of the case, metal collector members, such as metal strips 21, are located parallel to the resistance bands between them. Each strip has integral terminals 22 at its ends extending through the base and twisted to hold the strip tightly against the inner surface of the base.

The slide 6 is channel shape and straddles the resistance element and the collector strips. It carries two independent sliding contacts, each of which is formed from a very small strip of spring metal that is punched to provide it with a spring finger 24 engaging a collector strip, and preferably two parallel spring fingers 25 engaging the adjacent resistance band. The contact also is provided with holes at its opposite end for receiving bosses 26 projecting inwardly from the slide in order to rigidly correct the slide and contact together. The two contacts therefore are positioned rigidly relative to each other and the slide and will be moved in unison when the slide is moved. Consequently, the two contacts will move exactly the same distance along the straight resistance element for any given movement of the slide.

It will be seen that this potentiometer contains one double track resistance element instead of two separate elements. This eliminates the need for sorting resistance elements because both elements are produced on a common substrate at, or nearly at, the same instant. It also avoids error in the location of the two resistance tracks relative to each other, as well as of the two sliding contacts that are joined to a common slide.

According to the provisions of the patent statutes. I have explained the principle of my invention and have illustrated and described what I now consider to represent the best embodiment. However, I desire to have it understood that, within the

scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. A linear motion potentiometer comprising an elongated case having therein a flat dielectric surface extending lengthwise of the case, two laterally spaced parallel flat bands of electrical resistive material deposited on said surface and extending lengthwise thereof, the case having an insulating base supporting said bands, a pair of elongated metal collector member disposed in the case beside the bands and parallel thereto, electric terminals engaging said bands and collector members and extending out of the case, each of the band terminals being a strip of spring metal rigidly mounted in said base and having a portion inside the case looped away from the base and provided with a free end resiliently pressing against the adjoining band, a slide in the case movable lengthwise thereof, and a pair of spaced sliding contacts secured to the slide for movement therewith, one of the contacts engaging one collector member and band, and the other contact engaging the other collector member and band.

2. A potentiometer according to claim 1, in which each of said band terminals has a struck-out tongue inside the case extending away from the adjoining band and engaging said base.

3. A potentiometer according to claim 1, in which each of said band terminals has a portion inside the case connecting said looped portion with the rest of the terminal and resting on the base close to the end of the adjoining band, and a struck-out tongue extending along the base away from the band.

4. A linear motion potentiometer comprising an elongated case having an insulating base provided near one end with an onwardly projecting boss and neat its opposite end with a larger inwardly projecting boss, an insulating strip inside the case engaging said base and extending lengthwise thereof, said strip having a small notch at one end receiving the smaller boss and having a larger notch at its opposite end receiving the larger boss to correctly position the strip on the base, two laterally spaced bands of electrical resistive material on the inner surface of said strip and extending lengthwise thereof, spring metal terminals mounted in said base at the opposite ends of said strip and each having a portion inside the case looped away from the base and provided with a free end resiliently pressing against the adjoining end of one of said bands and holding the strip against the base, each of said terminals also having a struck-out tongue inside the case extending away from said strip and engaging said base, a metal collector strip mounted on said base at each side of said insulating strip and extending lengthwise thereof, electric terminals rigidly mounted in said base and connected to said collector strips, a slide in the case movable lengthwise thereof, and a pair of spaced spring metal contacts secured to the slide for movement therewith, one of the contacts engaging one collector strip and band, and the other of the contacts engaging one collector strip and band.

5. A linear motion potentiometer comprising an elongated case having an insulating base, an insulating strip mounted on the base and having a flat exposure surface extending lengthwise of the case, said base being provided with inwardly projecting bosses of different sizes at opposite ends of said strip, the ends of the strip being provided with recesses receiving said bosses with a large boss fitting in only a large recess, two laterally spaced parallel flat bands of electrical resistive material deposited on said surface and extending lengthwise thereof, a pair of elongated metal collector member disposed in the case beside the bands and parallel thereto, electrical terminals engaging said bands and collector members and extending out of the case, said band terminals being mounted in said base and holding said strip against it, a slide in the case movable lengthwise thereof, and a pair of spaced sliding contacts secured to the slide for movement therewith, one of the contacts engaging one collector member and band, and the other contact engaging the other collector member and band.

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