

- [54] **TRIMMER POTENTIOMETER WITH RESISTIVE OVERLAY**
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- [51] Int. Cl.**H01c 9/02**
- [58] Field of Search.....**338/92, 95, 118, 137, 160, 338/176, 180, 183, 185, 188, 189, 194, 202, 307-309, 323, 328, 332**

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[57] **ABSTRACT**

A trimmer potentiometer includes an elongate resistive element which is screened over a portion of each end terminal pad. Each end terminal pad extends laterally from the overlay and wiper means is disposed for engagement with the lateral extensions of the end terminal pads to short out the resistive overlay portion and prevent the potentiometer from exhibiting a resistance through the thickness of the resistive element at an overlay portion.

4 Claims, 3 Drawing Figures

- [56] **References Cited**
- UNITED STATES PATENTS
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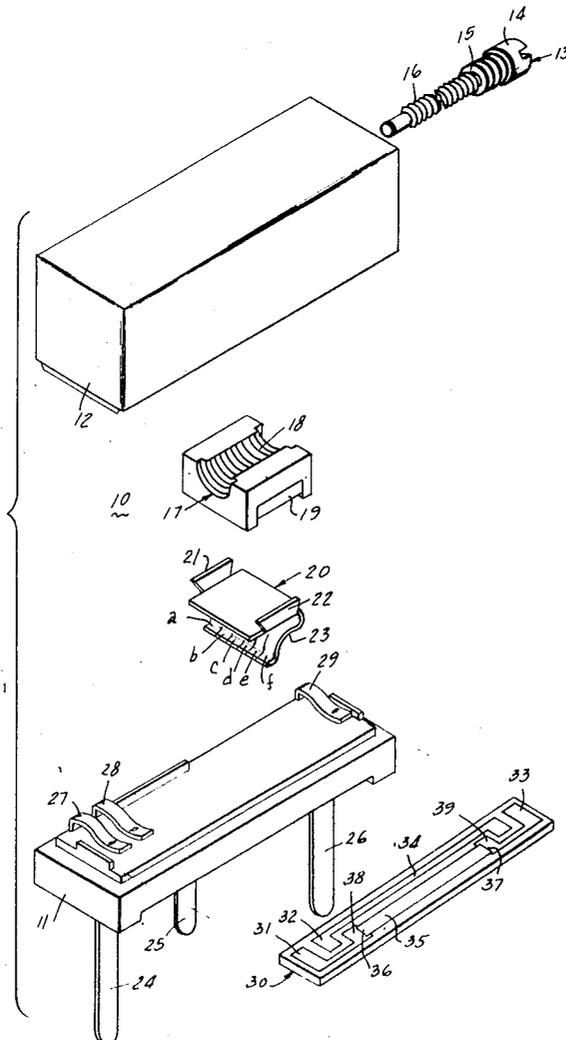


Fig. 1

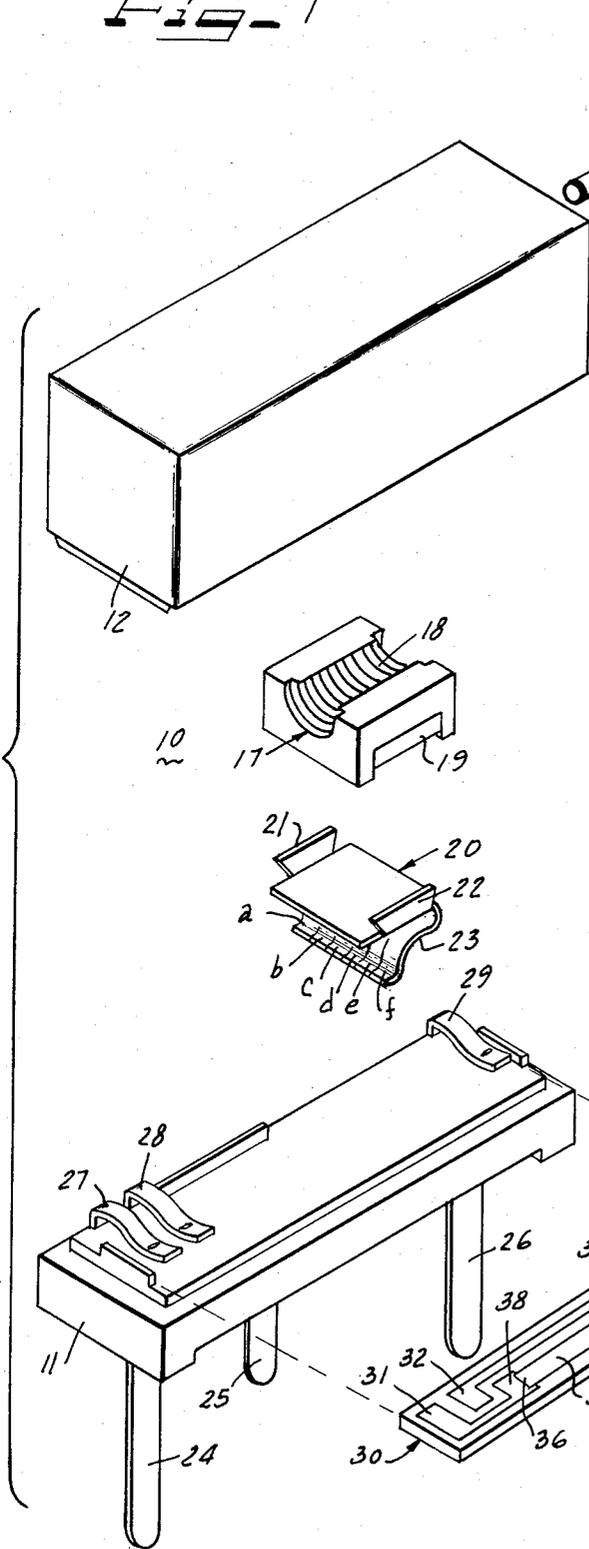


Fig. 2

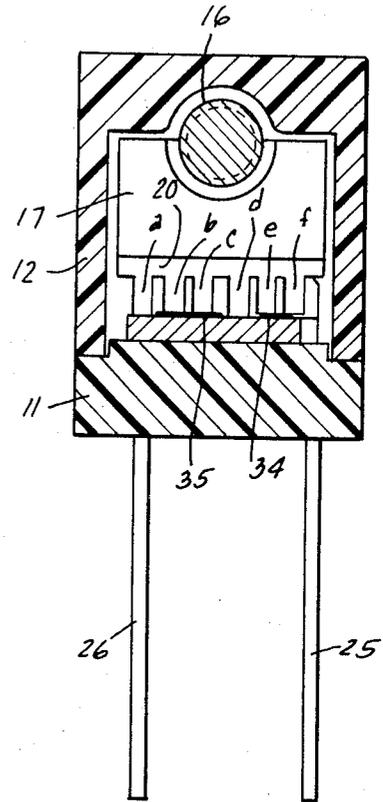
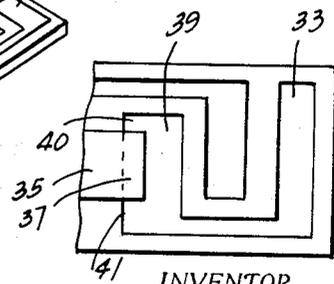


Fig. 3



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TRIMMER POTENTIOMETER WITH RESISTIVE OVERLAY

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to trimmer potentiometers, and more particularly to means for improving the resolution of trimmer potentiometers.

2. Description of the Prior Art

Elongate type trimmer potentiometers generally include a resistive element connected between a pair of end terminal pads and a wiper which is movable along the resistive element as a means of varying the resistance. In the manufacturing process for a typical 1¼ inches 2,000 ohm trimmer which has a resistive element measuring 0.500 inch with termination pads of 0.100 inch on each end, silver paladium contact pads are fired onto an alumina substrate and the resistive material is then separately fired onto the substrate. In order to assure adequate electrical contact the resistive material is disposed to overlap a portion of each pad. The resistance through the thickness of an overlay portion adds a fixed resistance to the typical low 0.2 ohm resistance of the pad. Since the termination pad resistance averages 0.2 ohm, the trimmer will never reach 0 ohms. As the wiper of the trimmer moves in the direction of increasing resistance, for example, the trimmer will first exhibit the pad resistance, then a step to the pad overlay thickness resistance and finally a linear resistance linearly variable up to the opposite end of the resistive element where the end effect again repeats the stepped resistance readings.

The stepping of resistance at the ends of the element is objectionable from a noise standpoint, but has been tolerated because of the manufacturing cost reduction gained by ignoring accuracy at the upper and lower ends of a trimmer. With the exception of terminal resistance MIL specifications also ignore a requirement for end setting accuracy.

SUMMARY OF THE INVENTION

It is therefore highly desirable and the primary object of this invention is to eliminate the foregoing end effects in a trimmer potentiometer.

This object is realized by the provision of a wiper assembly and cooperating terminal pad configuration which shorts out the resistive overlay when the wiper is positioned to contact a resistive overlay.

As in prior constructions the resistive element is screened to extend over portions of the end terminal pads; however, the end terminal pads are constructed to extend laterally of the overlay for simultaneous engagement by the wiper. In one form shown, the wiper may include a plurality of electrically connected spring contacts. At least one of these spring contacts is provided for sliding engagement with the resistive element while at least one other of the spring contacts is disposed for movement along a path which is spaced from the resistive element but in an interference relationship with corresponding lateral extensions of the terminal pads. Therefore, as the springs reach the position of the resistive overlay, the resistive effect of the overlay is shunted out and negated.

BRIEF DESCRIPTION OF THE DRAWING

Other objects, features and advantages of the invention, its organization, construction and operation will be best understood from the following detailed description of an exemplary embodiment thereof taken in conjunction with the accompanying drawing, in which:

FIG. 1 is an exploded view of a trimmer potentiometer constructed in accordance with the principles of the present invention;

FIG. 2 is a sectional view taken about midway along the length of the potentiometer illustrated in FIG. 1; and

FIG. 3 is a fragmentary plan view of the screen pattern for the resistive element and terminal pads of the potentiometer illustrated in FIGS. 1 and 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIG. 1, a trimmer potentiometer is generally illustrated and referenced 10. The potentiometer 10 comprises a base 11 and a cover 12. A lead screw 13 is provided for advancing a wiper 20 along a resistor assembly 30. The lead screw 13 includes a slotted head 14 for receiving an adjusting tool, and a plurality of annular ridges 15 for rotatably supporting the lead screw in axially fixed position in the cover 12 in accordance with my copending application, Ser. No. 107,153, filed Jan. 18, 1971. Threaded portion 16 is provided for engaging the threads 18 of a carriage 17.

The carriage 17 includes a pair of recesses 19 (only one shown) for receiving a pair of ears 21, 22 of the wiper 20 for advancing the wiper 20 upon rotation of the lead screw 13.

The base 11 includes a plurality of terminals 24, 25 and 26 which are respectively electrically connected to a plurality of clamps 27, 28 and 29. The resistor assembly 30 is carried by the base 11 and the clamps 27, 28 and 29, respectively, contact a plurality of contact terminal pads 31, 32 and 33 which are carried on the resistor assembly 30. The pad 31 is extended around the pad 32 to a pad 38. A similar terminal pad 33 is connected to a pad 39. A resistive element 35 extends between the pads 38 and 39 and is connected thereto by respective overlay portions 36 and 37.

Referring to FIG. 3, it can be seen that the pad 39 includes a pair of portions 40 and 41 which extend laterally of the overlay portion 37. The pad 38 has a similar construction. The wiper 20 includes a spring portion 23 having a plurality of spring contacts *a-f* which resiliently and slidingly engage the resistor assembly 30. As can be seen in FIG. 2, the spring contact *b* and *c* engage the resistive element 35 and the spring contacts *e* and *f* engage an elongate extension 34 of the pad 32 which lies substantially parallel to the resistive element 35. The spring contacts *a* and *d* are disposed so as to travel paths parallel to and slightly spaced from the resistive element 35. The spring contacts *a* and *d* therefore engage the end terminal pad lateral portions 40 and 41 at or before the time that spring contacts *b* and *c* engage the overlay portion 37. Thus, with similar constructions at the overlay portions 36 and 37 the resistance steps at the lower and upper ends of the resistive element 35, which provide undesirably non-linear resistive effects with further adjustment of screw

13, are eliminated and only the negligible terminal end resistance is effective below or above the set resistance at these respective points.

Although pairs of contacts, i.e., *a* and *d*, *b* and *c*, and *e* and *f*, have been illustrated and although it is known that more contacts increase reliability, it is clearly evident that only a single contact per function is necessary to practice the invention. Further, it may be observed that the pad may, if preferred, be elevated, or thickened around the overlay to raise its surface to the level of the overlay surface. Such an arrangement would permit a single bridging contact to accomplish the shunt function.

It will be seen, accordingly, that the terminal problems formerly encountered in trimmer potentiometers have been eliminated. These were particularly disadvantageous at the lower end of resistance adjustment, where the thickness resistance of the overly comprised a substantial percentage of the initial resistance. Roll on or roll off variations occurring at the low resistance terminal were also clearly noticeable. These variations, caused by the roll of the wiper onto or off of raised overlay, caused undesirable non-linearity of resistance change with degrees of lead screw turn. Undesirable circuit noise caused by such wiper movements adjacent the terminals has been eliminated and this has been accomplished simultaneously with loosened overlay tolerance in manufacture.

While I have described my invention by reference to a specific illustrative example, many changes and modifications thereof may become apparent to those skilled in the art without departing from the spirit and scope of the invention, and it is to be understood that I intend to include within the patent warranted hereon all such changes and modifications which may reasonably and properly be included within the scope of my contribution to the art.

What is claimed is:

1. In a trimmer potentiometer having a resistive element which extends between and overlies portions of a pair of spaced terminal pads and a wiper contact which slidably engages the resistive element, the improvement therein comprising the provision of means con-

nected to the wiper contact and disposed to travel a path parallel to the resistive element, and the provision of a portion of each of the terminal pads which extend laterally from the overlay portions and in interference relationship with said means for engagement therewith as soon as the wiper contact engages the respective overlay portion of the resistive element, thereby shunting out said overlay portions.

2. The structure set forth in claim 1 wherein said means comprises a second wiper contact resiliently movable relative to said wiper contact to contact said terminal pads independently of the level of said overlay.

3. A trimmer potentiometer comprising: a base, a resistor assembly carried on the base including a substrate, first, second and third spaced terminal pads carried on said substrate, a resistive element carried on said substrate and including portions overlying and extending above portions of said first and second terminal pads, and an elongate conductive strip extending from said third terminal pad and carried on said substrate substantially parallel to said resistive element, said first and second terminal pads each including a second portion thereof which extends laterally from the portions covered by said resistive element; and a wiper mounted for movement along said resistive element, said wiper comprising a plurality of electrically connected spring contacts including a first spring contact for slidably engaging said conductive strip, a second spring contact for slidably engaging said resistive element and a third spring contact for slidably engaging one of said second portions of said terminal pads as said second spring contact engages the corresponding raised overlay portion of said resistive element.

4. The trimmer potentiometer according to claim 3, wherein said second portions of first and second terminal pads extend on both sides of said overlay portions and said wiper includes a third spring contact, said second and third spring contacts spaced apart a distance greater than the width of said resistive element and move along respective paths which are in interference relationship to said second portions of said terminal pads.

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