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 [33] **France**
 [31] **141.458 and 176.382**

[56]

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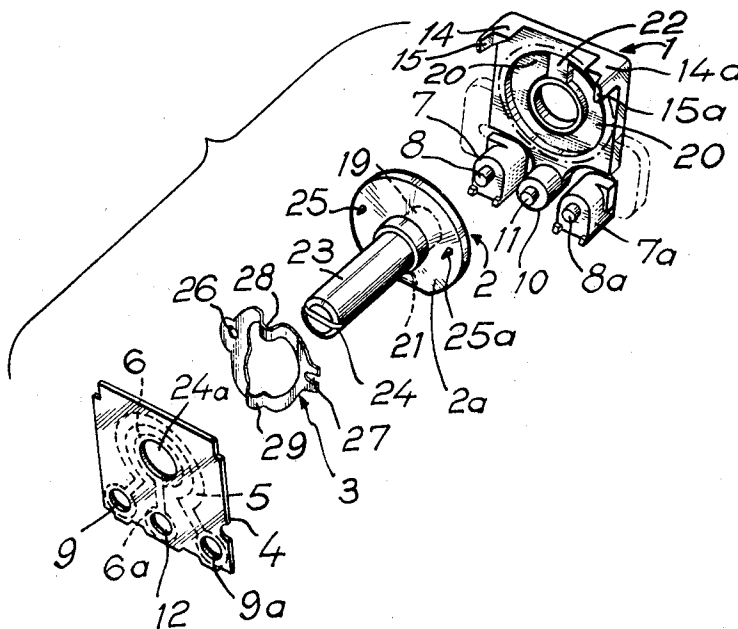
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[54] MINIATURIZED POTENTIOMETERS 13 Claims, 10 Drawing Figs.

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 338/271
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 160, 162, 163, 168, 174, 199, 306, 307, 312, 313,
 325, 332, 271

ABSTRACT: A potentiometer having a cover of conductive material formed by molding in a single piece with a pair of lateral terminals provided to be placed at the ends of a resistance track, a collector, and a base on which the resistance track and the collector are printed. The lateral terminals are separated from the cover during the step of crimping the cover on the base.



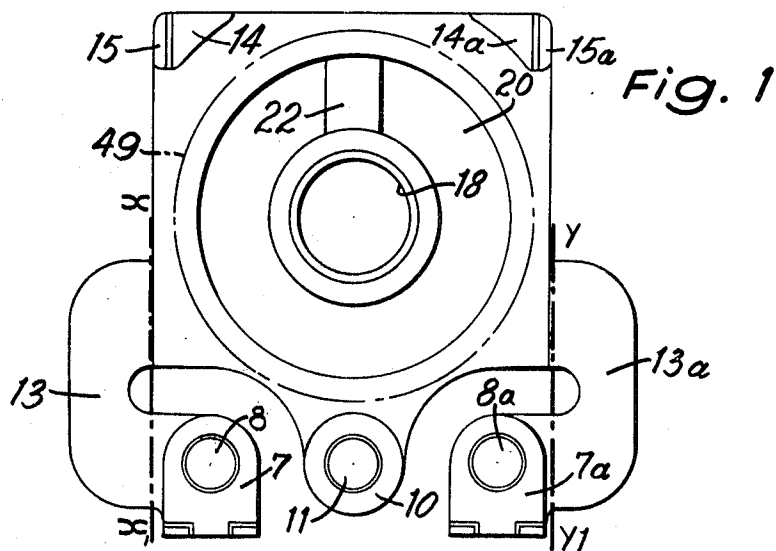


Fig. 1

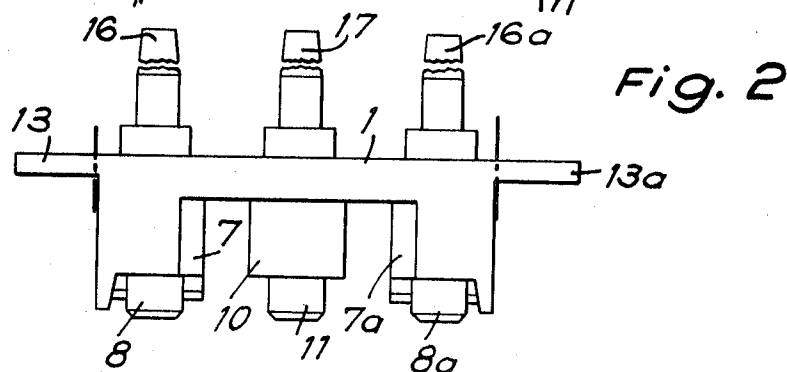


Fig. 2

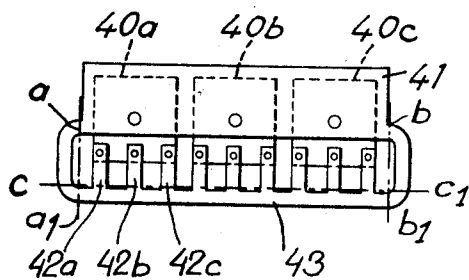


Fig. 6

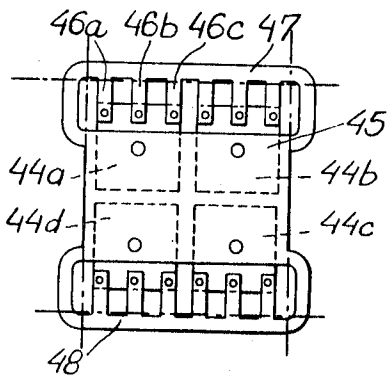
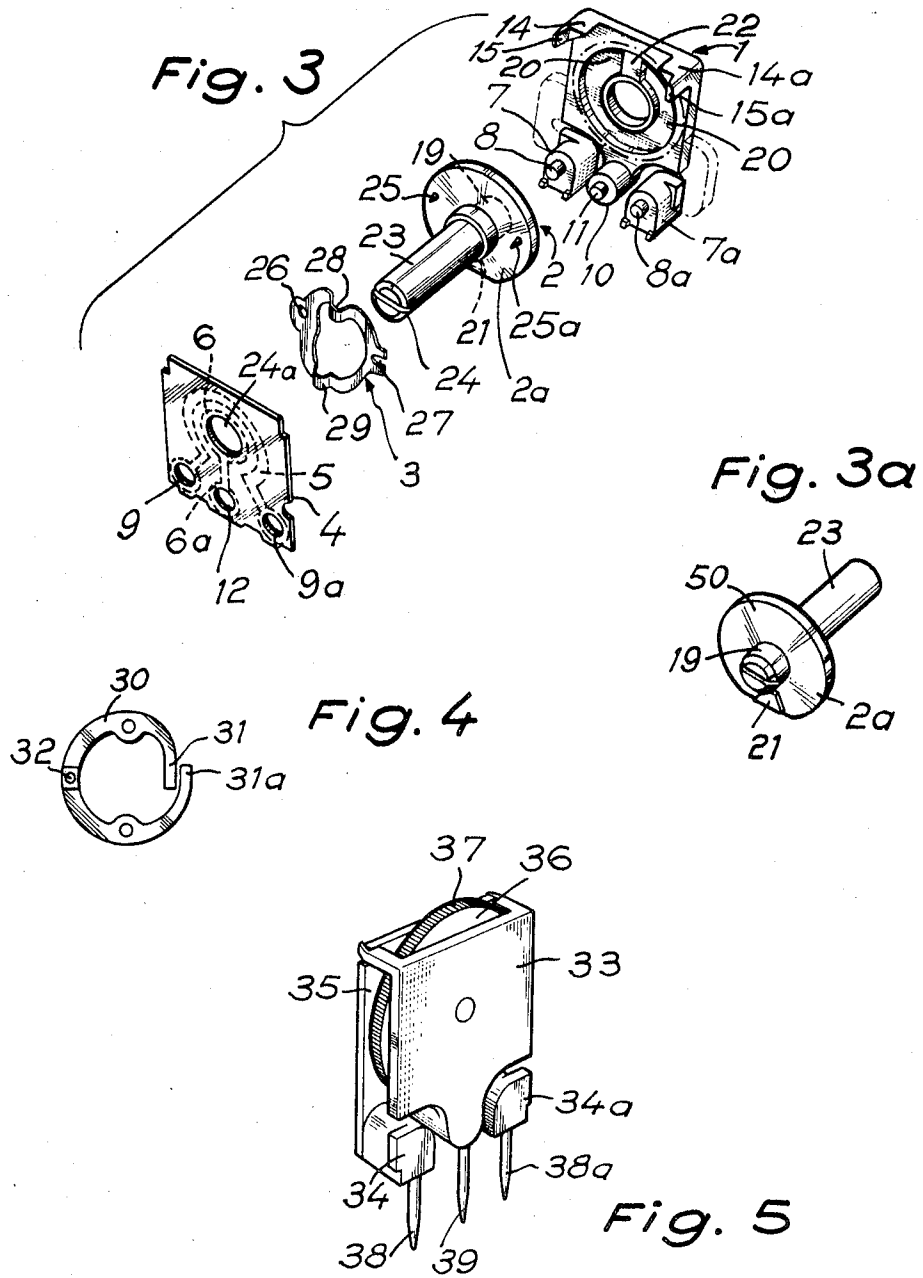


Fig. 7

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Fig. 8

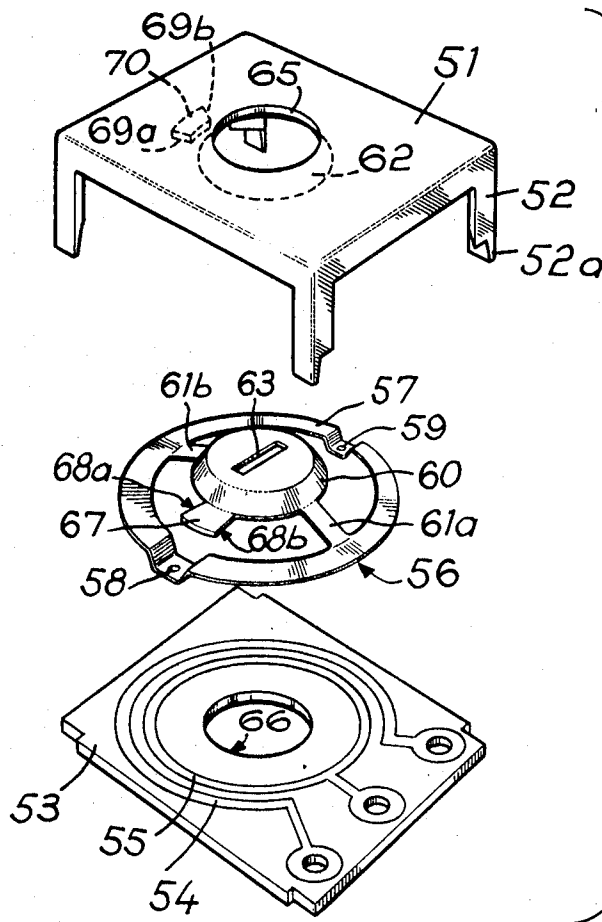
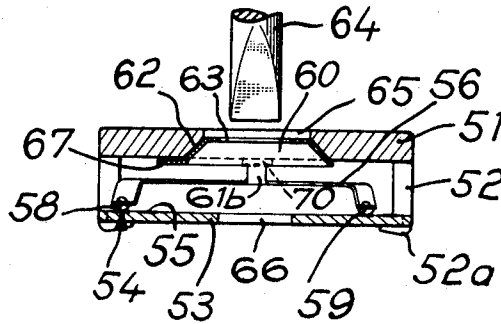


Fig. 9

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MINIATURIZED POTENTIOMETERS

This invention pertains to improved miniaturized potentiometers. Due to the general miniaturization of electronic devices, potentiometers designed to be used with printed circuits should have reduced dimensions.

The potentiometers according to the present invention comprise a simple and compact potentiometer having a minimum number of elements.

Such a potentiometer includes a metallic cover which is obtained by molding. The cover is of a single piece with two lateral terminals which are positioned at the ends of a resistance track printed on a baseplate and are separated from the cover during the crimping of the cover on the baseplate.

Out of the assembly, the rotor and the slider are maintained in tight relationship between the cover and the baseplate.

The rotor is elastically compressed over a large area against the cover and due to this fact, the rotation a friction and the necessary forces are great, which prevents undesired displacement after adjustment. The rotor does not have any axial play and the force of the slider on the track is constant. Finally, the embodiment adapted following the present invention enables good protection of the slider and the track.

For attaching the potentiometer to a printed circuit board, the terminals are extended by nondeformable extensions which are molded and have a circular cross section enabling filling completely the apertures provided in the printed circuit plate and to obtain a better soldering than in the case of extensions formed with rectangular cross sections.

Conforming to the present invention, there is a potentiometer comprising a cover of conductive material, obtained by molding a single piece with a central terminal provided to be positioned with respect to the collector and a pair of lateral terminals provided to be positioned at the ends of a resistance track printed on a base plate of insulating material, the lateral terminals are separated from the cover during the step of crimping the cover on the baseplate.

Many other advantages, features and additional objects of the present invention will become manifest to those versed in the art. Upon making reference to the detailed description and the accompanying sheets of drawings in which preferred structural embodiments incorporating the principles of the present invention are shown by way of illustrative example.

ON THE DRAWINGS

FIG. 1 is a plan view of one embodiment of a potentiometer in accordance with the invention;

FIG. 2 is an end view of the potentiometer of FIG. 1;

FIG. 3 is an extended perspective view of the potentiometer of FIG. 1;

FIG. 3a is a reverse perspective view from that of FIG. 3 of the rotor;

FIG. 4 is a plan view of an alternative slider;

FIG. 5 is a perspective view of an alternative embodiment of the invention;

FIG. 6 is a plan view of a further alternative embodiment of the invention including three potentiometers;

FIG. 7 is a plan view of a further embodiment of the potentiometer of the invention including four potentiometers;

FIG. 8 is a cross-sectional view of a further embodiment of the invention without a rotor; and

FIG. 9 is an extended perspective view of the potentiometer of FIG. 8.

AS SHOWN IN THE DRAWINGS

The principles of this invention are particularly useful when embodied in a potentiometer as illustrated in FIG. 1 to 3a having a cover 1, a rotor 2, a slider 3 and a baseplate 4. On the baseplate are screen printed a resistance track 5 and a collector 6.

The cover 1, as shown in FIGS. 1 and 2 before mounting, is made of an electrically conductive moldable material and has on one of its faces a pair of lateral terminals 7, 7a and projec-

tions, 8, 8a which engage the baseplate 4 by means of the apertures 9, 9a. The apertures 9, 9a are positioned at the ends of the resistance track 5. The cover includes a central terminal 10. The central terminal 10 has a projection 11 adapted to be engaged by an aperture 12 positioned at the end of an extension 6a of the collector 6.

The lateral terminals 7, 7a are molded with the cover 1 at the ends of a pair of webs 13, 13a, respectively.

The cover 1 includes a pair of support feet 14, 14a which with the lateral terminals 7, 7a and central terminal 10 form struts for fixing of the cover 1 on the support plate 4 by means of lips 15, 15a. The lips 15, 15a are folded and crimped on the plate 4.

The other face of the cover 1 includes extension members 16, 16a for the terminals 7, 7a and an extension member 17 for the central terminal 10.

The extension members 16, 16a and 17 are identical and have a circular cross section. The extensions 16, 16a have their axis generally perpendicular to the face or surface of the cover 1. The extension members are adapted to be engaged in the holes of a printed circuit, for example, by soldering.

The cover 1 includes a bore 18 in which is rotatably mounted a rotatable projection 19 of the rotor 2. The cover 1 further includes a circular slot 20 in which is engaged a boss 21 of the rotor 2.

The circular slot 20 is interrupted by the stop 22 against which the boss 21 abuts on either side on traversing the slot 20. The distance of rotation of the rotor 2 is relatively important, approximately 300° with respect to known types of potentiometers, of similar dimensions.

The rotor 2 is made of insulating material having the general form of a disc 2a and including on the opposite side to the central projection 19 and coaxially thereto a rod 23 which is engaged in an aperture 24a provided in the baseplate 4. The rod 23 has at its end a slot 24 in which may be engaged the blade of a screwdriver in order to turn the rotor.

The rod 23 may also be provided with indentations or a knob to enable turning of the rotor 2 for adjustment of the potentiometer.

During assembly of the cover 1 with the base 4, there is simultaneously effected the separation of the lateral terminals 7, 7a from the body of the cover 1 by separating the webs 13, 13a following the cutting lines x , x_1 and y , y_1 .

There is shown an alternative embodiment of potentiometer in FIG. 5 in which the rotation axis of the rotor is parallel to the plate carrying the printed circuit.

This potentiometer comprises a cover 35 and two lateral terminals 34, 34a which are fixed on a baseplate 35 as disclosed above.

The rotor 36 extends beyond the edge of the cover 33 and has knurling or indentations 37. The user may manually turn the rotor 36 by means of the indentations in order to make adjustments without being disturbed by components closely positioned to the potentiometer.

The extensions 38, 38a from the terminals 34, 34a, respectively, and the extension 39, from the collector, are positioned with their axis extending perpendicularly to the axis of rotation of the rotor, or parallel to the general axis of the potentiometer.

In the embodiments of FIGS. 6 and 7 are shown several potentiometers grouped on the same cover.

Three potentiometers 40a, 40b, 40c, are mounted on the cover 41 which is molded with the terminals 42a, 42b, 42c, for each potentiometer, shown only for potentiometer 40a, FIG. 6.

The terminals 42 and the three potentiometers are positioned between themselves and the cover 41 by a linking bar 43. The linking bar 43 is separated from the cover 41 and the terminals 42 following three cutting lines such as a , a_1 , b , b_1 , and c , c_1 when crimping the cover 41 on the baseplate of the potentiometers.

In a further embodiment four potentiometers 44a, 44b, 44c, 44d, are grouped on the cover 45, FIG. 7.

The potentiometers are grouped in pairs, that is, 44a, 44b, and 44c, 44d and the terminals of each such as 46a, 46b, 46c are positioned with respect to the cover 45 by two linking bars 47 and 48 which are cut along cutting lines as disclosed above.

Where in certain applications of adjustable potentiometers, the control rod of the rotor is not utilized and it is not necessary to insulate the adjustment means of the potentiometers from the slider.

Effectively, it is possible to provide on the slider a slot in which may be engaged the end of a screwdriver in order to move the slider and adjust the device.

In this case, it is possible to eliminate from the potentiometer described above, the rotor made of insulating material and to utilize a slider which is compressed elastically between the cover and the baseplate of insulating material on which are printed the resistance track and the collector. Good contacts are thereby achieved between the slider and the resistance track and collector as well as preventing undesired movements of the slider.

This embodiment of potentiometer is especially economical and may be made with a minimum of elements.

Moreover, the potentiometer of this embodiment is capable of being automatically mounted, as the three pieces are of simple structure, strong and of large dimensions relative to the dimensions of the device.

As shown in FIGS. 8 and 9 such an alternative embodiment of potentiometer includes a cover 51, which is made according to the process of the invention and includes support feet 52, whose ends 52a are turned down on the baseplate 53 which is identical to the baseplate 4. The baseplate 53 is made of insulating material and has a resistance track 54 and a collector 55 thereon.

Between the cover 51 and the baseplate 53 is elastically engaged in mounting a slider 56 made of a generally annular metallic member 57, which is suitably bent. The member 57 through the projection 58 engages the resistance track 54 and through the projection 59 engages the collector 55. The annular member 57 is positioned by the radial arms 61a, 61b with respect to a central member 60 which guides and drives the annular member 57. The central member 60 is in the shape of a truncated cone.

The central member 60 is engaged in a correspondingly shaped housing 62, in the form of a truncated cone, in a manner to assure the centering of the slider 56 with respect to the cover 51 and the baseplate 53.

The central member 60 is compressed elastically between the truncated cone housing 62 and the friction of these conical surfaces against each other creates a turning force proportional to the angle of the cone. The force is sufficiently great in order to prevent the displacement of the slider under the effect of shocks and vibrations.

The member 60 has an adjustment slot 63 in which may be engaged a blade 64 of a screwdriver either through the opening 65 provided in the cover 51, or through the opening 66 provided in the baseplate 53, the openings 65 and 66 being situated concentrically to the housing 62.

On the base of the central member 60 there is provided a foot 67 which extends radially and whose edges 68a, 68b are capable of coming in stopping contact with the edges 69a, 69b of a boss 70 attached to the cover 51 and projecting towards the slider 56. The post 67 and the boss 70 thereby limit the radial movement of the slider. Thus in abutting the boss 70 on

either edge 69a, 69b, the foot 67 limits the radial movement of the slider 56.

Although many modifications may be suggested by those versed in the art, it should be understood that I wish to embody within the scope of the patent warranted hereon all such embodiments as reasonably and properly come within the scope of my contribution to the art.

I claim:

1. A potentiometer device comprising in combination: a conductive cover formed as a single piece molding with a central terminal; a baseplate of insulating material fixed on said cover by means of lips folded and crimped on said plate; a resistance track and collector printed on said baseplate, said collector having an aperture in which is engaged a projection of the central terminal, said resistance track having apertures in which are engaged projections of at least one pair of lateral terminals, at least one rotor of insulating material; at least one slider, said slider being operatively associated with said rotor and in contact with said resistance track and said collector.
2. A potentiometer according to claim 1, wherein said slider is of annular metallic form, said slider having an aperture and a slot diametrically positioned, the aperture and the slot being engaged by a pair of knobs projecting from the disc of said rotor, the aperture and the slot being positioned at equal distances between the points of contact of said slider with said resistance track and said collector.
3. A potentiometer according to claim 2 wherein the points of contact of said slider are a pair of feet one of which is in contact with said resistance track and the other being in contact with said collector.
4. A potentiometer according to claim 3 including extension means extending from each of said terminals, said central terminal extension means being molded with said cover and extending perpendicularly therefrom.
5. A potentiometer according to claim 3, including extension means operatively connected to said central terminal molded with said cover and extending parallel to the plane of said cover.
6. A potentiometer according to claim 5, wherein said extension means have circular cross sections.
7. A potentiometer according to claim 2, including a rod extending from said rotor, said rod having a slot capable of being engaged by an adjustment tool.
8. A potentiometer according to claim 2 wherein said rotor is provided with a knurled outer edge.
9. A potentiometer according to claim 2, wherein the disc of said rotor is elastically deformable.
10. A potentiometer according to claim 4, wherein said central terminal extension means has a circular cross section.
11. A potentiometer according to claim 1, including a slider having a central member in the form of a truncated cone received in a correspondingly shaped recess in said cover, said central member including a slot in which may be engaged an adjustment tool.
12. A potentiometer according to claim 11, wherein said central member has a foot and said cover has a boss forming a stop with the foot and thereby limit the radial movement of said slider.
13. A potentiometer according to claim 11, wherein said cover and said baseplate have openings through which the adjustment tool may pass to engage the slot of said central member.