

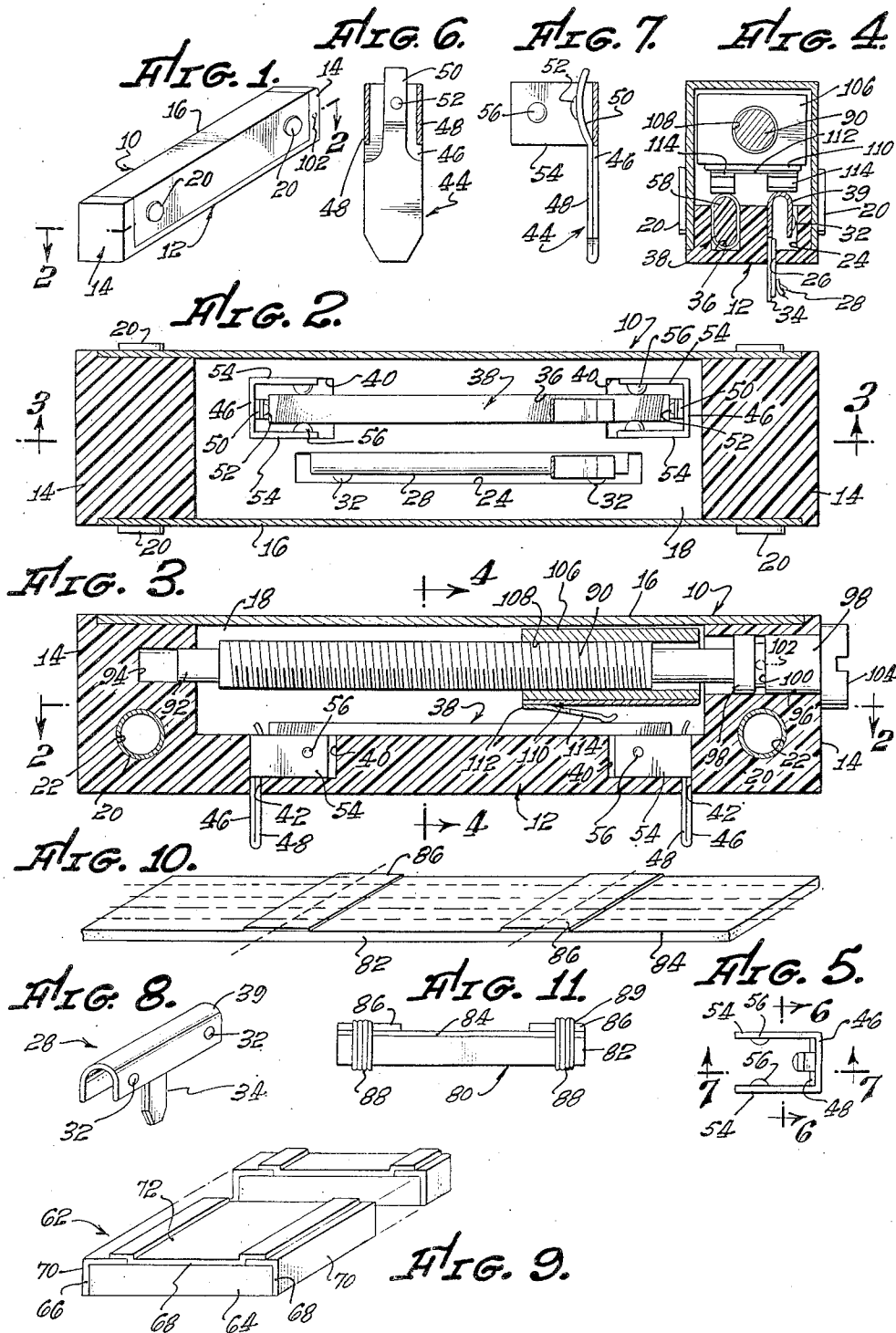
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POTENTIOMETER

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POTENTIOMETER

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The present invention relates to a new and improved potentiometer construction.

At the present time potentiometers are used in a wide number of different electrical and electronic devices, having both civilian and military applications. To be acceptable in the present market, a potentiometer must be comparatively small, must be very light and rugged, and must be very dependable in use. An object of this disclosure is to provide a new type of potentiometer construction having all of these characteristics.

A more specific object of this invention is to provide a potentiometer construction which can be utilized with a wide variety of different types of resistance elements. This is quite important from a commercial standpoint, inasmuch as different types of resistance elements are required for different applications. As nearly as is presently known, no potentiometers, having a stock type of design, have been manufactured which are specifically adapted to be utilized with a number of different types of resistance elements.

Another object of this specification is to provide potentiometers in which new and improved means are provided as herein indicated which are specifically adapted to engage the extremities of different types of resistance elements so as to establish electrical contact with such different types of resistance elements without damaging these elements. A further object of the present invention is to provide novel constructions for resistance elements which are capable of being utilized in a potentiometer construction herein specified. Obviously, such resistance elements are also of utility in other types of units. Another objective of this invention is to provide novel processes for creating such resistance elements.

Further objects of this invention as well as many advantages of it will be more fully apparent in the remainder of this description, the appended claims, and the accompanying drawings in which:

Fig. 1 is an isometric view of a potentiometer of the invention;

Fig. 2 is a cross-sectional view taken at line 2—2 of Fig. 1 of the drawings;

Fig. 3 is a cross-sectional view taken from line 3—3 of Fig. 2 of the drawings;

Fig. 4 is a cross-sectional view taken at line 4—4 of Fig. 3 of the drawings;

Fig. 5 is a top detailed view of a spring contact employed with the invention;

Fig. 6 is a cross-sectional view taken at line 6—6 of Fig. 5;

Fig. 7 is a cross-sectional view taken at line 7—7 of Fig. 5;

Fig. 8 is an isometric view of a novel shorting strip employed with the invention;

Fig. 9 is a perspective view diagrammatically indicating the formation of a novel resistance element capable of being employed with a potentiometer shown in Fig. 1;

Fig. 10 is a perspective view similar to Fig. 9 illustrating

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ing the formation of another novel resistance element capable of being employed with the invention; and

Fig. 11 is a side elevational view of a resistance element formed as indicated in Fig. 10 of the drawings.

In all figures of the drawings like numerals are employed to designate like parts. The drawings have been scaled in such a manner as to most clearly illustrate the various features of the invention. Hence, they do not necessarily represent any commercial unit drawn to scale.

The present invention may be briefly described as required by Rule 73 of the Rules of Practice of the United States Patent Office in patent cases as being concerned with a potentiometer which includes a non-conductive base member; a cover fitting over said base member so as to form a cavity between said cover and said base member; means defining an elongated slot within said base member adjacent to said cavity; a shorting member held in position within said slot by spring tension; means defining a second slot within said base member adjacent to said cavity; means defining enlarged openings communicating with the ends of said second slot in said base member; an electrical resistance element positioned within said second slot; spring contact clips located within said enlarged openings so as to hold said resistance element within said second slot, said spring contact clips being in electrical communication with the ends of said resistance element; a shaft positioned so as to project through said cavity; means for moving said shaft; a slider mounted upon said shaft so as to move therewith; and contact means attached to said slider, said contact means including resilient fingers engaging said shorting strip and said resistance element.

Obviously, a brief summary of this category is largely incapable of explaining the precise invention herein described. This invention is of course more fully summarized or defined by the appended claims forming a part of this specification. Also various aspects of the present invention not directly indicated in the above brief summary are defined in these claims.

In Figs. 1, 2, and 3 of the drawings a potentiometer 10 of the invention is shown, which includes a base member 12 having upstanding ends 14 formed thereon. This base member is formed of an appropriate non-conductive resin, such as for example, phenol-formaldehyde resin. A cover 16 is positioned over the base 12 so as to define a cavity 18 located between this cover 16 and this base. The cover is preferably held in position through the use of rivets 20 passing through openings 22 formed in the ends 14 of the base 12.

Within this base there is formed a first slot 24, which is best seen in Fig. 4 of the drawings. This slot is open to the cavity 18 and is in communication with the exterior of the potentiometer 10 through the use of a small elongated opening 26. Within this slot 24 there is disposed a shorting strip 28, the construction of which is best shown in Fig. 8 of the drawings. This shorting strip includes a U-shaped top 39 having formed on one side thereof projections 32 adapted to engage a wall of slot 24 so as to force the other side of U-shaped top 39 against another wall of this slot. Attached to this other side of the shorting strip 28 is a dependent lug 34, which is adapted to be passed downwardly through the opening 26. The lug 34 is of course designed so that it may be connected to various wires or the like when the potentiometer 10 is used for the purpose intended.

Formed within the base 12, so as to be parallel with the slot 24, is another slot 36 of the same dimension as the slot 24. This slot 36 is open to the cavity 18 and is adapted to retain a resistance element 38 in such a manner that this resistance element projects into the cavity 18 in much the manner in which the top 39 of the

shorting strip 28 projects into this cavity. The ends of the resistance element 38 are located within enlarged openings 40 formed in the base 12 so as to be in communication with the cavity 18. Each of these enlarged openings is connected externally of the potentiometer 10 through the use of a slot 42.

Within the enlarged openings 40 there are disposed spring clips 44, the construction of which is best seen with reference to Figs. 5, 6, and 7 of the drawings. These spring clips each include a center section 46 having an upturned end 48, which is located so as to project immediately adjacent to the center section 46. Attached to these ends 48 are curved tongues 50 having formed thereon small dimple-like projections 52. Attached to the center sections 46 are side arms 54, upon each of which there is formed a projection 56, such as the projections 52.

These spring clips 44 are quite important with the invention. When they are used as shown in Figs. 2 and 3 of the drawings, the projections 56 resiliently engage the sides of the resistance element 38 within the enlarged openings 40 so as to establish electrical communication with these ends. Normally the projections 52 upon the tongues 50 resiliently bear against the ends of the resistance element 38 so as to prevent unwanted motion in this resistance element within the slot 36.

Those skilled in the art will realize that with this construction there is comparatively little danger of damage to the resistance element 38, whether this resistance element include a non-conductive base 58, upon which there is located a composition layer 60, or whether this resistance element be formed in a conventional manner so as to include a non-conductive base around which there is positioned a continuous wire coil of a wire having a comparatively high coefficient of resistance. With this construction the spring clips 44 may be turned or otherwise moved with respect to the resistance element 38 during the assembly of potentiometer 10 without danger of damage to the resistance element, regardless of how fine the resistance coating placed upon this element is.

When it is desired, it is possible to utilize novel resistance elements such as are indicated in Figs. 9 and 11 of the drawings in place of the resistance element 38. Normally such replacement is desired when high resistance and various resistance effects such as unusual temperature coefficients of resistance, are desired. In Fig. 9 of the drawings a complete resistance element 62 is shown, which comprises a generally rectangular base 64 of an appropriate non-conductive resin, such as previously indicated. Upon the ends 66 of this base and the adjacent sections of the top 68 of it there are located conductive layers 70, such as for example, are formed of copper or the like by various laminating or printed circuit procedures. A thin resistance strip 72 is placed upon the top 68 so as to overlie the adjacent portions of the conductive layers 70.

This resistance element 62 is created from a larger block 64 of resin by placing elongated conductive layers such as the layers 70 upon this block and then covering the top of it with an appropriate resistance material 72 by conventional techniques, such as for example, printed circuit techniques or vapor phase deposition, and then cutting the block 64 so as to separate the element 62.

This type of construction is quite advantageous, inasmuch as there is no problem with it in establishing electrical communication between the conductive strips 70 and the resistance layer 72. The spacing of the conductive strips 70 may be quite accurately controlled, and resistance elements, such as the resistance element, 62, can be formed by merely cutting the block 64 as indicated by the dotted lines in Fig. 9. When the resistance element 62 is used with the spring clips 44, the projections 56 engage the sides of the base 64, while the projections 52 engage the conductive layer 70 upon the ends 66 of this resistance element. The same advantages with respect to the movability, etc., previously discussed, are of course

also obtained when the resistance elements such as the resistance element 62 are used with spring clips 44.

Another modified resistance element 80 which is specifically adapted to be used with the spring clips 44 is shown in Fig. 11 of the drawings. This resistance element 80 is formed as indicated in Fig. 10 of the drawings by coating a large sheet 82 of a non-conductive resin, such as previously indicated, with a uniformly thick layer 84 of a resistance material. Upon this layer strips 86 of silver paint or like conductive composition are then placed, and the sheet 82 is cut along the dotted lines indicated in Fig. 10 of the drawings so as to produce a number of separate parts each of which is capable of being formed into a resistance element, such as the resistance element 80, by wrapping a number of turns 88 of a conductive wire around the ends of each part, these turns engaging parts 89 of the strips 86. Preferably the turns of wire at each end of a resistance element, such as for example, resistance element 80, may be secured to the parts 89 through the use of silver paint or other equivalent means.

When the resistance element 80 is employed with the spring clips 40 the projections 56 engage the turns 88 while the projections 52 serve to aid in positioning the resistance element. Obviously the spring clips 44 when used in this manner do not present any danger of damage to the resistance element 80.

In order to complete the potentiometer 10 it is necessary to provide means for moving a contact element along both the shorting strip 28 and the resistance element 38. Such means in the potentiometer 10 comprises a threaded shaft 90 having an unthreaded end 92 located in a cavity 94 in one of the ends 14. The other end of the shaft projects outwardly from the potentiometer 10 through an opening 96 formed within the other end 14. The opening 96 and the cavity 94 are aligned with one another. The portion of the shaft 90 projecting through the opening 96 is provided with an enlarged shoulder 98 within which there is formed an annular groove 100. Preferably the shaft 90 is prevented from moving externally of the potentiometer through the use of a small pin 102 passing through the end 14 so as to engage the walls of this groove 100. A conventional slotted head 104 is provided on the shaft 90 so as to bear against the end 14 containing the opening 96.

Carried upon the shaft 100 within the cavity 18 is a small rectangular non-conductive block or slider 106 having a threaded opening 108 formed therein. One surface of this block is provided with a metallic coating 110, which may be copper, silver, or any other metal which may be readily secured to the block 106. Attached to this coating 110 through the use of solder or equivalent means is a small contact member 112 having resilient fingers 114 which engage both the shorting strip 28 and the resistance element 38. The construction of the block 106 and the contact member 112 is considered to be quite important with the invention inasmuch as this assembly is comparatively simple and yet is exceedingly effective for the purpose intended. The block 106 may be formed out of any common non-conductive resin, such as previously indicated.

Those skilled in the art will realize that the present invention is capable of a wide number of modifications falling within the scope of the noted disclosure. All such modifications of this disclosure are to be considered as part of the inventive concept insofar as they are defined by the appended claims.

We claim:

1. A new and improved potentiometer which includes: a non-conductive base member having upstanding ends; a cover fitting over said base member and said ends so as to form a cavity; means defining an elongated slot within said base member adjacent to said cavity; means defining a slot in said base member leading from said elongated slot to the exterior of said cavity; a shorting strip including a generally U-shaped top having projections

formed on one side thereof, and a dependent lug attached to the other side thereof positioned within said elongated slot with said lug projecting through said slot leading to the exterior of said cavity, said shorting strip being held in position by said projections engaging one side of said elongated slot so as to hold said other side of said U-shaped top against the other side of said elongated slot; means defining a second elongated slot within said base member adjacent to said cavity; means defining enlarged openings in said base member communicating with the ends of said second slot; means defining slots in said base member leading from said enlarged openings to the outside of said cavity; an electrical resistance element having ends positioned within said second slot with said ends projecting into said enlarged openings; spring contact clips, each including a center section having formed thereon a curved tongue having a projection formed thereon attached to said center section, side arms formed on said center section adjacent to said tongue, and projections formed on the adjacent sides of said side arms, said spring contact clips being positioned within said enlarged openings with part of said center sections projecting through said slots leading from said enlarged openings to the exterior of said cavity, said spring contact clips resiliently engaging the ends of said electrical resistance element; a shaft positioned so as to project through said cavity, the extremities of said shaft being supported by the ends of said base member; means for moving said shaft; a non-conductive block having an opening formed therein located within said cavity with said shaft projecting through said opening; a metallic coating on one surface of said block; and contact means attached to said metallic coating, said contact means including resilient fingers engaging said shorting strip and said resistance element.

2. A new and improved potentiometer as defined in claim 1 wherein said resistance element includes: a non-conductive base having a top surface; a resistance layer positioned upon said top surface; conductive strips located upon said resistance layer adjacent to the ends of said base; wire windings placed about said base and said conductive strips, said wire windings being in electrical communication with said conductive strips; and wherein said projections on said side arms of said spring clips engage said wire windings so as to be in electrical communication with said resistance layer.

3. A new and improved potentiometer as defined in claim 1 wherein said electrical resistance element comprises: a non-conductive base having a top surface and ends; conductive layers located upon said base so as to overlie said ends and part of said top surface adjacent to said ends; a resistance strip located upon said top surface, said resistance strip overlying parts of said conductive layers; and wherein said projections on said tongues of said contact clips engage said conductive layers upon the ends of said non-conductive base and wherein said projections on said side arms of said spring contact clips engage the sides of said non-conductive base.

4. A new and improved potentiometer which includes: a non-conductive base member having upstanding ends; a cover fitting over said base member and said ends so as

to form a cavity; means defining an elongated slot within said base member adjacent to said cavity; means defining a slot in said base member leading from said elongated slot to the exterior of said cavity; a shorting strip including a generally U-shaped top having projections formed on one side thereof, and a dependent lug attached to the other side thereof positioned within said elongated slot with said lug projecting through said slot leading to the exterior of said cavity, said shorting strip being held in position by said projections engaging one side of said elongated slot so as to hold said other side of said U-shaped top against the other side of said elongated slot; means defining a second elongated slot within said base member adjacent to said cavity; means defining enlarged openings in said base member communicating with the ends of said second slot; means defining slots in said base member leading from said enlarged openings to the outside of said cavity, an electrical resistance element having ends positioned within said second slot with said ends projecting into said enlarged openings; spring contact clips, each including a center section having formed thereon a curved tongue having a projection formed thereon attached to said center section, side arms formed on said center section adjacent to said tongue, and projections formed on the adjacent sides of said side arms, said spring contact clips being positioned within said enlarged openings with part of said center sections projecting through said slots leading from said enlarged openings to the exterior of said cavity, said spring contact clips resiliently engaging the ends of said electrical resistance element and said shorting strip, a contact on said slider wiping on said resistance element and said shorting strip, and means for moving said slider along said path.

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