

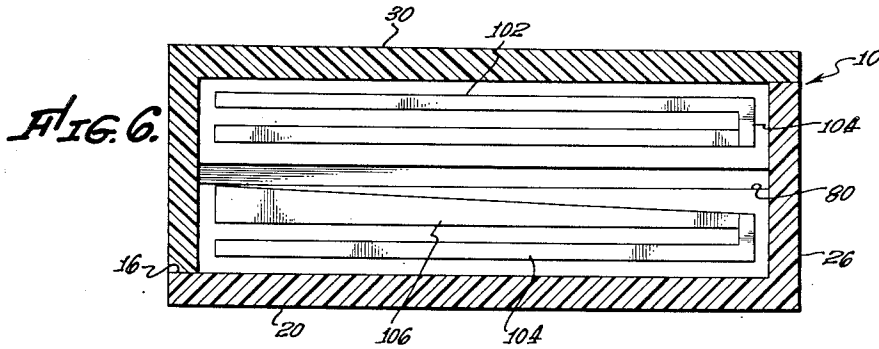
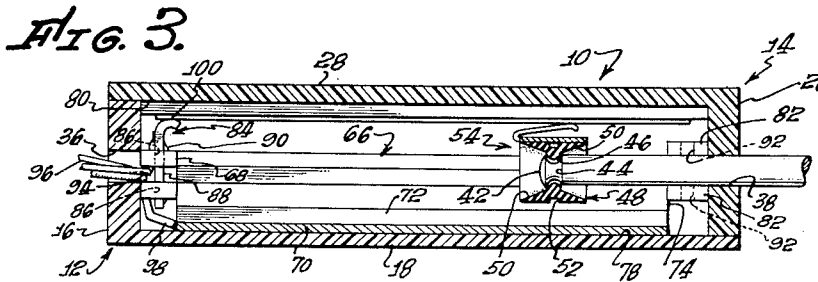
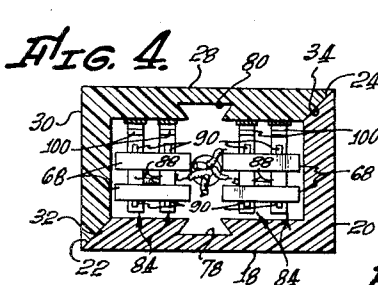
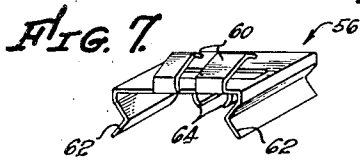
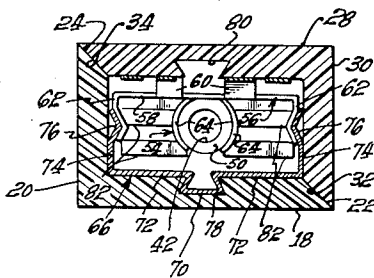
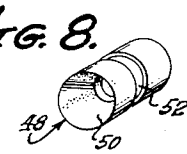
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VARIABLE RESISTOR CONSTRUCTIONS

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VARIABLE RESISTOR CONSTRUCTIONS

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The present invention relates to new and improved variable resistor constructions.

This invention may be briefly summarized, as required by the Patent Office Rules, as being primarily concerned with variable resistors including two shell-like sections fitting together so as to form a complete housing, combined guide and electrical return means positioned within this housing, electrically conductive means secured on the inside of the housing, movable contact means held by said combined guide and electrical return means so as to establish electrical communication between the combined guide and electrical return means and the electrically conductive means, and means for moving the contact means.

Unfortunately a brief summary of this category is not sufficient so as to completely apprise those skilled in the art as to the true nature of an invention, or as to the scope of an invention. Certain of the features of the variable resistor construction described in this specification and illustrated in the accompanying drawings are of such nature that they need not be employed with variable resistors as defined in the above brief summary, but can be employed to advantage in other units of a related category. However, it is thought that these features are most advantageously incorporated into a complete unit as herein described.

A broad object of the present disclosure is to teach the construction of new and improved variable resistors which are relatively easy to assemble, comparatively inexpensive to manufacture, and which are exceedingly effective in use. A more specific general object of the present invention is to provide devices of the class indicated which are capable of being used under conditions where these devices are subjected to comparatively rough treatment either from vibration or from normal handling.

A detailed objective of the invention is to provide, in devices of the class indicated, a housing consisting of two shell-like sections of substantially identical configuration secured together. The term "shell-like" is used herein as not to be considered in meaning as defining sections which may be clamped together in the manner of an oystershell, but is intended to indicate two sections of substantially identical configuration, each of which includes an end wall and attached means defining an elongated side extension attached thereto. Such a side extension may consist of either a single curved wall, or several flat walls attached to one another. One major advantage of this type of construction lies in the fact that only a single mold is required to form the two shell-like sections employed, when making these sections of any common non-conductive resinous material. Further, with the invention, only a single size of these shell-like sections need be stocked by a manufacturer, and such a manufacturer may, by merely cutting off the undesired length of the wall extensions of two of these sections, construct from them a variable resistor of virtually any desired size or capacity. This feature is quite im-

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portant because of the very high cost of molds for use with common plastics.

Another more detailed object of the invention is to provide in variable resistors of the category to which this invention relates a new type of guide member for the movable contact member normally employed in such resistors, such guide member operating so as to engage the movable member with a spring-like action which is uniform at all points of travel of the movable member. This type of construction is very resistant to vibration, and promotes to a very decided extent uniform operation of a variable resistor by providing a uniform amount of tension on the movable member at all times. Preferably, in accordance with this disclosure, the guide means employed are combined with, or used as, the electrical return means within the unit in a manner which will be best apparent from the drawings accompanying this application. When variable resistors are constructed using such combined means the common shorting strip frequently employed in constructions of the class to which this invention relates can be eliminated.

A further detailed object of the invention is to provide a novel type of contact means for use with combined guide and electrical return means as discussed in the preceding paragraph, and to provide novel means of attaching such contact means to a member such as a shaft employed to move the contact means along the combined guide and electrical return means employed. A still further objective of the invention is to provide various electrically conductive structures as will be subsequently indicated for use in variable resistors. Another object is to provide novel spring contact means which may be employed to electrically connect the electrically conductive means used with wires extending externally of a variable resistor.

It is not considered necessary for an understanding of the present invention to describe in detail further objectives of it, inasmuch as other aims of the invention, as well as many advantages of the various constructional details involved in this disclosure are best more fully apparent from a consideration of the accompanying drawings in which:

Fig. 1 is a side-view of a variable resistor of the invention;

Fig. 2 is an end-view taken in the direction of the arrow 2 in Fig. 1;

Fig. 3 is a cross-sectional view taken at line 3—3 of Fig. 2;

Fig. 4 is a cross-sectional view taken at line 4—4 of Fig. 1;

Fig. 5 is a cross-sectional view taken at line 5—5 of Fig. 1;

Fig. 6 is a cross-sectional view taken at line 6—6 of Fig. 1;

Fig. 7 is an isometric view of part of a movable member employed with the invention; and

Fig. 8 is an isometric view of another part of the movable member employed with the invention.

In Figs. 1 and 2 of the drawings a complete variable resistor 10 is shown as including first and second shell-like sections 12 and 14. The section 12 includes an end wall 16 attached to elongated side walls 18 and 20. All three of these walls 16, 18, and 20 are positioned at right angles to one another; further the walls 18 and 20 include shoulders 22 and 24 slanted across these walls at a 45° angle to the plane in which the walls themselves are disposed. The section 14 includes an end wall 26 and side walls 28 and 30, all of which are formed so as to be identical in dimension with the corresponding walls 16, 18, and 20 of the section 12. Thus the side walls 28 and 30 include shoulders 32 and 34 which fit against the shoulders 22 and 24 when the two sections 12 and 14

are fitted together in the manner illustrated in the various figures of the drawings. Normally the sections 12 and 14 are formed of a common resinous material which is non-conductive in character by conventional molding processes and is secured together so as to form a complete housing in the manner illustrated in the drawings through the use of a suitable conventional adhesive (not shown) employed to secure the adjacent edges of these sections to one another. If desired other conventional means such as screws or rivets may be used to accomplish the same objective.

Both of the sections 12 and 14 have within the end walls 16 and 26 openings 36 and 38 which are so located within these walls that as the two sections are assembled in the manner shown these two openings are aligned with one another. The opening 38 within the end wall 26 is intended to be used in carrying a shaft 40 into the interior of the resistor 10. This shaft may be of either conductive or non-conductive material. It is preferably formed so as to have an end 42 of slightly curved configuration adjacent to which there is located a circumferential groove 44 of generally curved cross-sectional configuration. This groove is designed to be engaged by a correspondingly shaped internal ring-like projection 46 formed in the inside of a ring-shaped elastomeric member 48 (Fig. 8). This elastomeric member has internal side walls 50 sloping away from the ring-like projection 46 as is best seen in Fig. 3 of the drawings, and includes an outer groove 52 located in generally the same plane perpendicular to the same axis of this elastomeric member 48 as the ring-like projection 46.

The elastomeric member 48 forms a part of a contact member 54 used in the complete resistor 10 in order to vary resistance values. This contact member includes a conductive metal slider 56, the construction of which is best seen in Fig. 7 of the drawings. This slider has a generally flat top 15 to which there are attached resilient contact arms 60 of conventional design and parallel grooved sides 62. The slider 56 also is formed with curved arms 64 which are so designed as to fit within the groove 52 of the elastomeric member 48 so as to firmly hold this elastomeric member in a fixed position with respect to the slider 56.

The precise construction of the contact member 54 and the shaft 40 illustrated is considered to be desirable inasmuch as the elastomeric member 48 is normally non-conductive in character and hence serves to insulate the shaft 40 from the conductive slider so that this slider may be employed as part of an electrical return as will be subsequently indicated. This construction is also desirable inasmuch as the inherent resiliency of the elastomeric member 48 permits slight misalignment of the shaft 40, regardless of the cause of this misalignment, and acts to absorb shock transmitted through the shaft 40 which might tend to affect the operation of the contact arms 60. The construction shown is also advantageous in that the slider 56 and the elastomeric member 48 may be easily and cheaply manufactured with a minimum of difficulty by established techniques. It is also desirable since the shaft 40 may be easily secured to the elastomeric member 48 by merely pushing the curved end 42 of this shaft against a sloping side wall 50 and the ring-like projection 46 until such time as the material from which the member 48 is constructed is compressed sufficiently so that the shaft 40 slides into place with the groove 44 engaged by the projection 46. If desired this assembly can take place after the sections 12 and 14 have been secured together.

When this is done the contact member 54 is moved along electrically conductive metal guide means 66 to adjacent the end 16 where this contact member is held in place against bars 68 formed on the end wall 16. The guide means 66 along which the contact member 54 is normally moved during the operation of the resistor 10

through movement of the shaft 40 include a bottom section 70 of generally trapezoidal shape connected to bottom walls 72 which are in turn connected to side walls 74 having ridges 76 of substantially the same configuration as the grooved sides 62. These grooved sides are normally carried upon these ridges 76. Further the side walls 74 are normally formed so as to hold the grooved sides under spring tension so that a uniform amount of force is exerted upon the contact member 54 at all times during the operation of the resistor 10. The bottom section 70 is employed to engage a groove 78 of the same shape as this section formed within the side wall 18 of the bottom section 12 so as to hold the guide means 66 in a fixed position within the resistor 10 at all times. These guide means are normally mounted upon the section 12 by merely sliding the bottom section 70 within the groove 78 prior to the assembly of the sections 12 and 14 together. A groove 80 of the same shape as the groove 78 is provided within the side wall 28 of the section 14. If desired the bottom section 70 and the grooves 78 and 80 can be omitted.

Bars 82 of the same configuration as the bars 68 are provided upon the end wall 26 of the section 14. These bars 82 serve as stop means limiting the movement of the contact member 54. The bars 68 serve this function and in addition hold resilient metal spring contact 84 in a fixed position. For this purpose the bars 68 are provided with openings 86 which are designed to be traversed by main body sections 88 of the contacts 84. These body sections 88 are preferably provided with small resilient raised projections 90 serving to engage the edges of the bars 68 in order to secure the contacts 84 in a fixed position. With this construction the contacts 84 may be merely snapped into place by being pushed through the openings 86. Openings 92 corresponding to the openings 86 are provided within the bars 82, although they are not normally used in the resistor 10.

It is noted that when the contacts 84 are positioned within the openings 86 the body sections 88 are spaced from the end wall 16 so as to, in effect, provide passages 94 which are normally used to convey wires 96 attached to the spring contacts 84 in a manner in which these wires are securely held adjacent to the end wall 16 so that it is impossible for them to become entangled with the contact member 54 during the operation of the resistor 10. The wires 96 normally project into this resistor along with another wire 98 through the opening 36. The wire 98 is preferably, with the invention, directly connected to the adjacent portion of the guide means 66 through the use of conventional expedients such as solder. If desired the space directly behind the ridges 76 in the guide means 66 between these ridges and the adjacent walls 20 and 30 may be used to convey one or more wires which can be connected to the extremity of the guide means 66 at the end of the guide means remote from the end wall 16, or which can be connected by other conventional means, or through the use of spring contacts (not shown) of a similar construction to the contacts 84 mounted within the openings 92 to the electrically conductive means employed.

The spring contacts 84 are provided with curved resilient tops 100 which are designed to engage extremities of electrically conductive means secured to the wall 28 of the section 14. As is best seen in Fig. 6 of the drawings, such electrically conductive means may incorporate a strip 102 of a resistance composition placed directly upon the wall 28, and a generally L-shaped strip 104 of comparatively low resistance mounted immediately adjacent to the strip 102 so as to overlap the end of the strip 102 adjacent to the end wall 26 and to extend to adjacent to the end wall 16. If desired a resistance strip 106 of varying width may be employed instead of the strip 102 as one or both of the resistance elements in a "double" unit of the type shown. All of these strips 102, 104, and 106 can be easily formed upon the side

wall 28 by using established printed circuit techniques. With the construction shown only the strips 102 and 106 are designed to be engaged by the contact arms 60 upon the contact member 54 so as to be electrically connected to guide means 66 serving as a combined guide and electrical return means. The resistor 10 shown may be technically described as a potentiometer in which the guide means 66 serves as a collecting element.

It is considered obvious that a number of minor modifications within the scope of the present invention may be made by those skilled in the art. As an example of such modification grooves may be formed within the walls 18 and 28, the grooves within one of these walls being employed to hold either a molded composition resistor or a conventional type of spiral resistance element, or various types of metal connecting strips. If desired any number of contact arms and electrically conductive elements engaged by such arms can be employed. All such modifications of this category are to be considered as part of the inventive concept insofar as they are defined by the appended claims. These claims are not to be considered as being limited by the precise shape or dimension of any of the parts illustrated inasmuch as the shape and dimension of many of the parts shown have been altered for convenience of illustration and explanation.

It is considered that those skilled in the art will easily realize the many advantages of various constructional details specified herein. As an example of one of these advantages attention is directed to the fact that the electrically conductive means used can be located upon one of the sections used at the same time the rest of the elements employed are positioned upon the other of these sections, and that electrical contact can be made to the electrically conductive means by merely placing the two sections in an operative position with respect to one another. It is not necessary with the invention that the guide means 66 be formed of a single piece of metal in order to achieve the results herein indicated. Thus, if desired this member can be formed of two separate parts secured to an appropriate supporting surface. These parts, or the entire guide means, can of course be mounted by such conventional means as screws, especially if the groove 70 is omitted. While the construction of the slider 56 herein described is considered to be quite advantageous, it is to be understood that approximately equivalent functional results can be obtained by altering the shape of this member, so long as a slider is employed utilizing the broad type of construction herein described.

We claim:

1. A new and improved variable resistor which comprises: two corresponding sections which cooperate to define a housing; an electrical element positioned within said housing on one of said sections; spring contact means positioned on the other of said sections within said housing, said spring contact means engaging said electrical element when said sections are joined together; guide means located within said housing; a movable contact located within said housing, said movable contact being slidably supported by said guide means and engaging said electrical element so that said movable contact means may be reciprocated within said housing while in electrical engagement with said electrical element; and means for moving said movable contact means, said means extending through one wall of said housing to the outside thereof.

2. A new and improved variable resistor which comprises: means defining a housing, said housing being electrically non-conductive; elongated guide means having parallel side walls including projections extending therefrom positioned within said housing, said guide means being electrically conductive; electrically conductive means positioned within said housing; contact means held by said guide means within said housing, said contact means engaging said electrically conductive means, said contact

means being formed so as to place said electrically conductive means in electrical communication with said guide means whereby said guide means may be used as electrical return means; and means for moving said contact means.

3. In a device of the class described: elongated electrically conductive guide means having parallel projections extending therefrom; electrically conductive means positioned within said housing adjacent to said guide means; contact means held by said guide means, said contact means engaging said electrically conductive means so as to establish electrical communication between said guide means and said electrically conductive means, said projections engaging part of said contact means.

4. A construction as defined in claim 3 wherein said projections are resiliently biased against said contact means.

5. A new and improved variable resistor which comprises: means defining a housing; electrically conductive means located within said housing; guide means located within said housing adjacent to said electrically conductive means; contact means held by said guide means, said contact means including resilient arm means engaging said electrically conductive means and an elastomeric ring having an internal ring-like projection formed therein; and a shaft having a groove formed adjacent to the end thereof held by said elastomeric member with said ring-like projection engaging said groove, said shaft extending externally of said housing.

6. A new and improved variable resistor which comprises: means defining a housing; electrically conductive means located within said housing; guide means located within said housing adjacent to said electrically conductive means; contact means held by said guide means, said contact means including resilient arm means engaging said electrically conductive means and an elastomeric ring; and a shaft held by said ring, said shaft extending externally of said housing.

7. A new and improved variable resistor which includes: two shell-like sections each of which includes an end wall and means defining an elongated side extension attached thereto, said sections being electrically non-conductive and being fitted together so as to define a housing; electrically conductive means positioned within said housing on one of said sections; spring contact means positioned on the other of said sections within said housing, said spring contact means engaging said electrically conductive means; elongated guide means having parallel side walls including projections extending therefrom positioned within said housing, said guide means being electrically conductive; and contact means including grooved sides positioned within said housing with said grooved sides held by said projections on said guide means so that said contact means is held under spring tension upon said guide means, said guide means having arms engaging said electrically conductive means; and means for moving said contact means along said guide means.

8. In a variable resistor having a housing, an electrical element mounted on said housing, and a slider having a contact wiping on said element, the improvement comprising a U-shaped guide member mounted within said housing and having side walls formed with opposed parallel ridges, and means on said slider engaged by said ridges.

9. A guide member for the slider of a variable resistor, said guide member comprising an elongated channel of sheet metal having opposed parallel side walls, and inwardly projecting V-shaped ridges formed in said side walls, said slider having correspondingly shaped grooves in the sides thereof to receive said V-shaped ridges in sliding engagement.

10. A guide member as defined in claim 9, wherein said channel has a dovetail-shaped projection extending downwardly from the bottom thereof adapted to be received within a correspondingly shaped groove in the resistor housing.

11. A slider for a variable resistor having a resistance element, opposed guide means extending parallel to said element, and an actuating member, said slider comprising a sheet metal member having downwardly bent sides with portions thereof shaped to receive said guide means in sliding engagement, an upwardly bent contact finger wiping on said resistance element, and means providing a connection between said slider and said operating member.

12. A slider as defined in claim 11, wherein said connecting means comprises at least one downwardly bent finger, and an elastomeric member gripped by said finger and resiliently engaging the end of said actuating member to provide a flexible connection between the actuating member and said slider.

13. In a variable resistor, the combination of a resistance element, a slider supported for movement parallel to said element and having a contact wiping thereon, an actuating rod, and an elastomeric member securing said actuating rod to said slider to provide a flexible connection therebetween.

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