March 12, 1957 M. E. BOURNS 2,785,262

DUST SHIELD FOR LINEAR MOTION VARIABLE RESISTOR

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FIG. 1

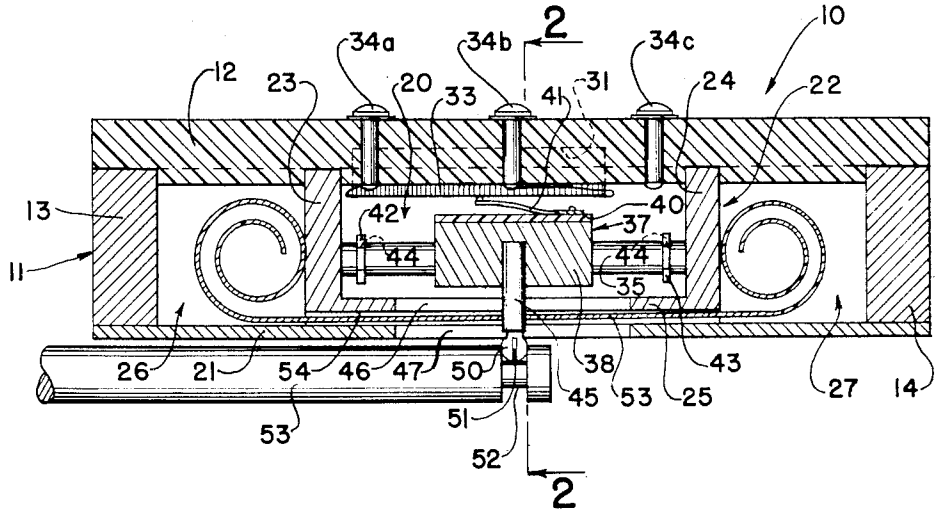
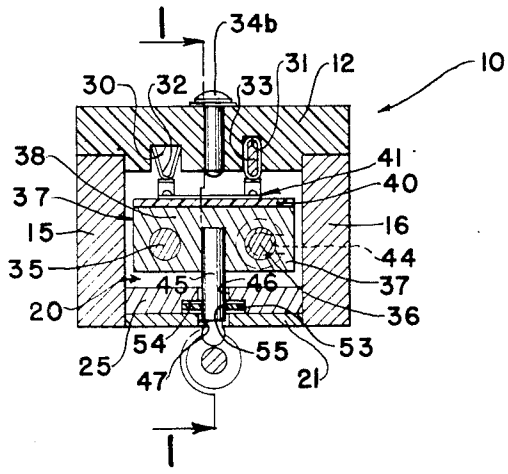


FIG. 2



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FIG. 3

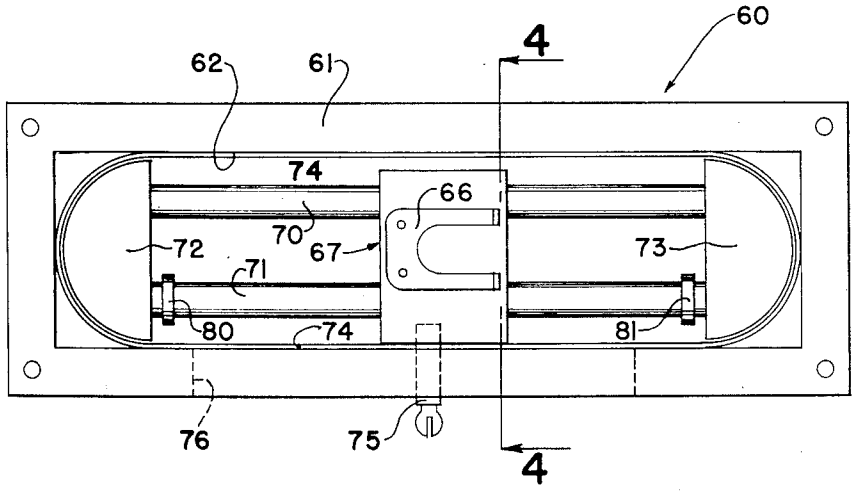
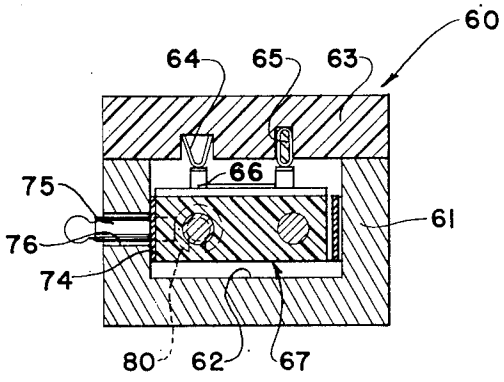


FIG. 4



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DUST SHIELD FOR LINEAR MOTION VARIABLE RESISTOR

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4 Claims. (Cl. 201—62)

The present invention relates to variable resistors or potentiometers of the type wherein a contact member is moved rectilinearly along the length of a resistance element by means of an operating member or lug projecting laterally through a slot in the side of the instrument housing. Such instruments are known commonly as "side actuated" linear motion potentiometers or resistors.

The primary object of the invention is to provide a new and improved dust shield for closing the said slot so as to exclude dust and moisture from the interior of the instrument. A more specific object of the invention is to provide a dust shield that covers the slot from end to end for all positions of the operating member within the slot, yet is so constructed and arranged as to require a minimum length of housing to contain the same.

Another object of the invention is to provide a dust shield of the class described that is effective yet relatively free of friction, and at the same time simple and inexpensive to manufacture and assemble.

A further object of the invention is to provide a side actuated linear motion resistor that is extremely compact and of a minimum length for a given length of contact travel.

Still another object of the invention is to provide a new and improved stop for the contact member in the form of a retainer ring that is snapped into a groove in one of the guide rods on which the contact member is slidably supported.

The foregoing and other objects and advantages of the present invention will become apparent to those skilled in the art upon consideration of the following detailed description of two illustrative embodiments thereof, reference being had to the accompanying drawings, wherein:

Figure 1 is a longitudinal vertical section through a linear motion potentiometer embodying the principles of my invention;

Figure 2 is a transverse vertical section through the same, taken along the line 2—2 in Figure 1;

Figure 3 is a top plan view of another form of our invention, wherein the cover-plate has been removed to show the details of internal construction; and

Figure 4 is a transverse section through a completely assembled unit, taken along the line 4—4 in Figure 3.

Referring first to Figures 1 and 2 of the drawings, the potentiometer shown is designated in its entirety by the reference numeral 10, and is seen to comprise a generally rectangular, box-like body 11, with a non-conductive plastic cover-plate or lid 12 attached to one side thereof. The body 11 is formed with ends 13 and 14, and side walls 15 and 16 which are arranged in the form of a rectangle, leaving an elongated rectangular cavity 20 in the center thereof. The cavity 20 is closed at the bottom by a slotted bottom plate 21, which fits in between the side walls 15, 16 and overlies the ends 13, 14.

Mounted within the cavity 20 is a U-shaped block 22, having ends 23, 24 and a bottom 25. The U-shaped block 22 fits snugly between the side walls 15, 16 of the body 11 and is secured thereto by any suitable means,

with the bottom 25 bearing flat against the inner face of the bottom plate 21. The ends 23, 24 of the U-shaped block 22 are spaced inwardly from the corresponding ends 13, 14 of the body 11, leaving pockets 26 and 27, the purpose of which will be explained presently.

The plastic lid 12 is attached to the open side of the body 11 and encloses the cavity 20 and pockets 26, 27. Formed in the inner face of the lid 12 are two laterally spaced, longitudinally extending, parallel channels 30 and 31; and seated within these channels is a conductor strip 32 and resistance element 33, respectively. The resistance element 33, is preferably, although not necessarily, of the wire-wound type and its ends are connected to terminals 34*a* and 34*b*, which are embedded in the lid. The conductor strip 32 is preferably formed of a strip of sheet metal bent into a U-shaped cross section as shown in Figure 2, and is connected to a third terminal 34*c* in the lid.

Mounted in the ends 23, 24 of the U-shaped block 22 are two laterally spaced guide rods 35 and 36, which extend parallel to the conductor strip 32 and the resistance element 33. Slidably mounted on the rods 35, 36 is a contact member 37, comprising a block 38 having an insulating card 40 attached to the top surface thereof. Mounted on top of the card 40 is a U-shaped contact 41, one arm of which wipes the conductor strip 32, while the other arm wipes the resistance element 33. The block 38 is drilled to receive the guide rods 35, 36, and slides lengthwise thereon between two stops 42 and 43.

The limit stops 42, 43 are mounted on the right hand rod 36 (Figure 2) adjacent the ends thereof, and are preferably in the form of split, C-shaped retainer rings which are seated within circumferential grooves 44 in the rod. The ends of the block 38 abut against the limit stops 42, 43 when the contact member 37 reaches the end of its travel in either direction, thereby preventing the contact from running off the end of the resistance element 33 or conductor strip 32.

The contact member 37 is shifted along the guide rods 35, 36 by means of an operating member or lug 45 projecting laterally from the side of the block 38 opposite the contact 41, through aligned slots 46 and 47 in the bottom of the U-shaped block 22 and in the plate 21, respectively. The operating member 45 is preferably in the form of a round pin, the outer end of which is spherically formed at 50 and transversely slit at 51 to provide a snug fit within a circumferential groove 52 in the end of an actuating rod 53. The actuating rod 53 may be entirely separate from the instrument, as in the illustrated potentiometer, or it may be an integral part thereof. In either case, the actuating member 53 is connected to and is moved by the device with which the instrument is associated, and movement of the said device causes a corresponding movement of the contact member 37.

The slots 46, 47 are closed from side to side and from end to end by means of a flexible dust shield 53, which is in the form of a thin, elastic strip of metal or other material. The strip 53 extends lengthwise of the body 11 through a shallow channel or recess 54 formed in the under side of the bottom 25 of the U-shaped block 22 along both sides of the slot 46. The width of the strip 53 is only a few thousandths of an inch less than the width of the recess 54, thereby providing substantially complete closure for the slots. The operating member 45 extends through a hole 55 in the strip 53.

In the two pockets 26, 27, the ends of the strip 53 are curved around to minimize the length of the body 11. In the embodiment illustrated in Figures 1 and 2, the strip 53 is coiled into a helix at each end. The coiling up of the strip 53 into a helix at each end may be done by merely guiding the end of the strip into a curved path as the same is pushed into the pocket, or the coiling may

be the result of prestressing the strip to cause it to coil up on itself when released from the constraint of the channel 54. In this latter case, the strip has a natural tendency to coil up into a tight helix whenever unrestrained, and the excess material at the ends of the strip, being unrestrained against coiling, tends to wind itself into a coil as shown.

One thing that I wish to make clear at this point is that the strip 53 need not necessarily be wound into a helix to come within the scope of the invention. For example, Figures 3 and 4 show another embodiment of the invention wherein the dust shield is in the form of an endless strip or band turning 180° at each end of the instrument and passing along the back side of the contact member. This embodiment is designated in its entirety by the reference numeral 60, and comprises a generally rectangular body 61 having a cavity 62 formed in one side thereof. A non-conductive plastic lid 63 is mounted on the open side of the body 61 to enclose the cavity 62. A conductor strip 64 and resistance element 65 are mounted in the lid 63, as in the preceding embodiment, and these are engaged by the arms of a U-shaped contact 66, which is mounted on a contact member 67. The contact member 67 is slidably supported on a pair of parallel guide rods 70, 71, which are secured at their ends in semicircular blocks 72 and 73.

The semicircular blocks 72, 73 are attached to the bottom of the cavity 62, and their diameter is such that a small clearance is left between the sides and ends of the body 61. A thin, elastic dust shield strip 74 is secured to one side of the contact member 67 by the laterally projecting operating member 75, which extends through a slot 76 in the side of the instrument body. The strip 74 extends around the semicircular blocks 72, 73 at each end of the cavity 62 and extends across the back of the instrument from one end to the other. Thus, as the straight portion of the strip 74 adjacent to slot 76 is moved from left to right, the portion of the strip extending across the back of the cavity 62 travels from right to left, and vice versa.

As in the embodiment of Figure 1, the contact member 67 is stopped at both ends of its travel by limit stop retainer rings 80 and 81, which are snapped into grooves in the guide rod 71. The C-shaped configuration of the retainer ring can be seen in Figure 4.

In both illustrated forms of the invention, the elastic dust shield strip is curved around at the ends of the instrument to minimize the length of the housing. It will be understood that the dust shield strip need not necessarily be enclosed within the housing, but might be wrapped around the outer surface thereof.

While I have shown and described in detail here what I believe to be the preferred forms of my invention, it will be understood that various changes may be made in the shape and arrangement of the several parts without departing from the scope of the invention as defined in the appended claims.

I claim:

1. In a linear motion variable resistor having a body with a cavity provided therein, a resistance element mounted within said cavity, a contact member movable along the length of said resistance element and making electrical contact therewith, and an operating member projecting laterally from said contact member through an elongated opening in said body, the improvement comprising a flexible dust shield strip extending across said opening from side to side and from end to end, said strip being movable with said operating member and being of a length such that the ends of said opening are covered when said contact member is at either extremity of its travel, said strip being internally stressed to be self-coiling on itself into a helix at each end of said body, and said strip having both edges thereof slidably engaged by said body along the length of said opening so as to hold the strip straight and flat to cover said opening.

2. A linear motion variable resistor comprising a body having a cavity formed therein, a resistance element mounted within said cavity, a slidably supported contact member movable along the length of said resistance element and making electrical contact therewith, an operating member projecting laterally from said contact member, said body having an elongated slot formed in one wall thereof parallel to said resistance element and through which said operating member projects, said slot being substantially the same length as said resistance element and substantially the same width as said operating member, a flexible dust shields strip attached to said operating member and movable therewith, said strip covering said slot from end to end and from side to side for all positions of said operating member so as to exclude dust and moisture from said cavity, and a pair of partitions spaced inwardly from the ends of said body and forming pockets in the end of said cavity, the ends of said strip extending into said pockets and being curled into helixes therein.

3. A linear motion variable resistor comprising a body having a cavity formed therein, a resistance element mounted within said cavity, a pair of outwardly facing semi-circular blocks mounted on said body within said cavity beyond the ends of said resistance element, a pair of guide rods extending between said blocks and attached at their ends thereto, said guide rods being parallel to said resistance element, a contact member slidably mounted on said guide rods and making electrical contact with said resistance element, an operating member projecting laterally from said contact member, said body having an elongated slot formed in one wall thereof parallel to said resistance element and through which said operating member projects, said slot being substantially the same length as said resistance element and substantially the same width as said operating member, an endless flexible dust shield strip attached to said operating member and movable therewith, said strip covering said slot from end to end and from side to side for all positions of said operating member so as to exclude dust and moisture from said cavity, said strip being enclosing within said cavity and passing around said semi-circular blocks.

4. A linear motion variable resistor comprising a body having a cavity formed therein, a resistance element mounted within said cavity, a slidably supported contact member movable along the length of said resistance element and making electrical contact therewith, an operating member projecting laterally from said contact member, said body having an elongated slot formed in one wall thereof parallel to said resistance element and through which said operating member projects, said slot being substantially the same length as said resistance element and substantially the same width as said operating member, there being a shallow recess formed in the outer surface of said one wall along both edges of said slot, a slotted cover plate mounted on said outer surface of said one wall, the slot in said cover plate being substantially the same width as said operating member and being aligned with said slot in said body, and a dust shield strip enclosed within the space defined by said shallow recess and said cover plate, said strip being attached to said operating member and movable therewith, said strip covering said slot in said body from end to end and from side to side for all positions of said operating member so as to exclude dust and moisture from said cavity.

References Cited in the file of this patent

UNITED STATES PATENTS

2,280,305	Schauer	Apr. 21, 1942
2,343,425	Smith	Mar. 7, 1944

FOREIGN PATENTS

883,528	France	Mar. 29, 1943