Aug. 18, 1959 H. A. GOTTSCHALL ET AL 2,900,615

POTENTIOMETER

Filed Aug. 24, 1956

2 Sheets-Sheet 1

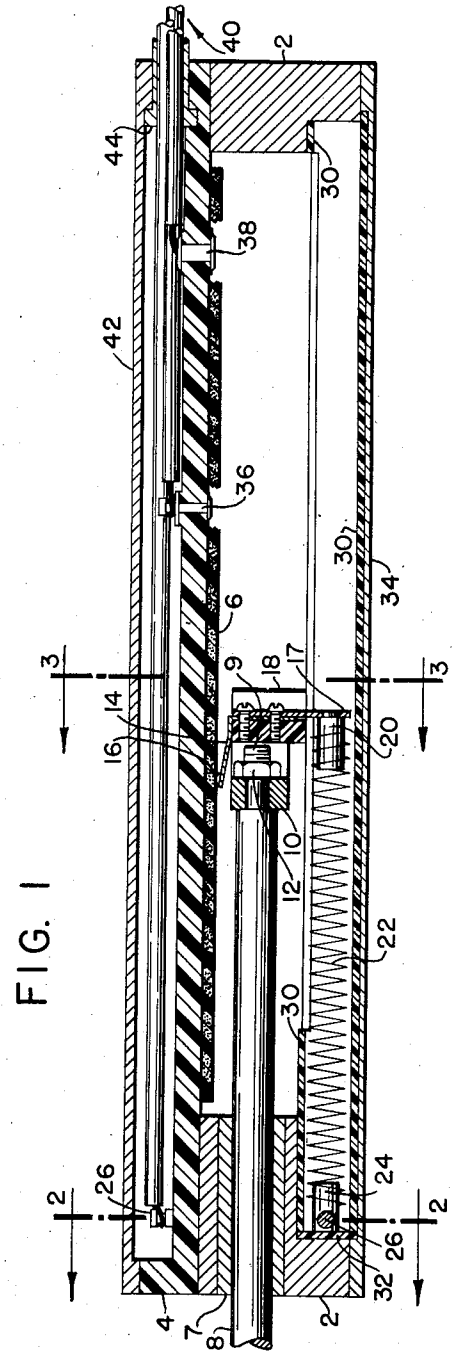


FIG. 1

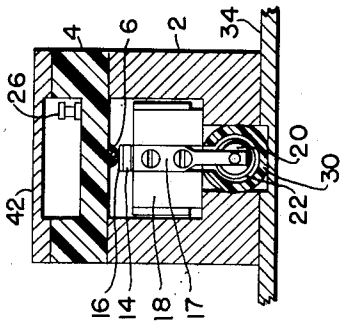


FIG. 3

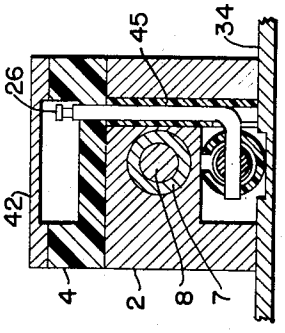


FIG. 2

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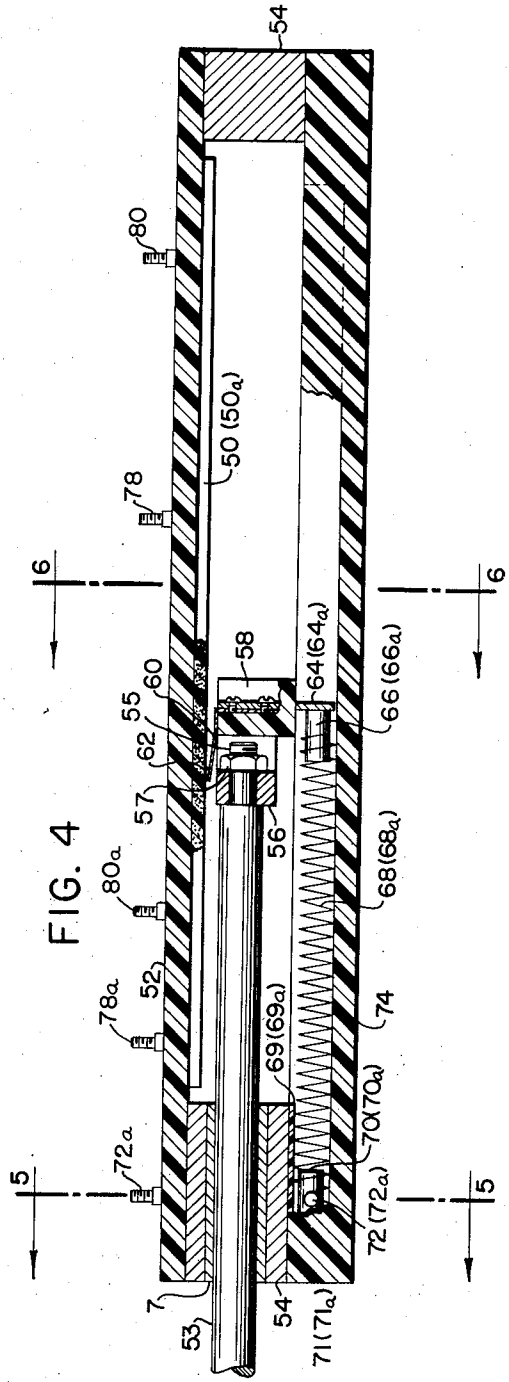


FIG. 4

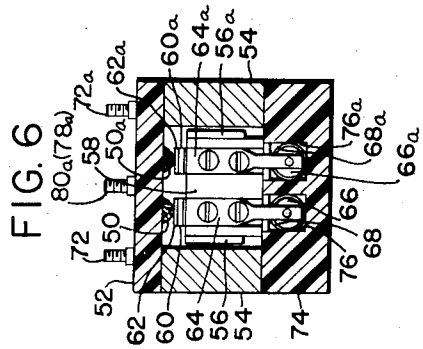


FIG. 6

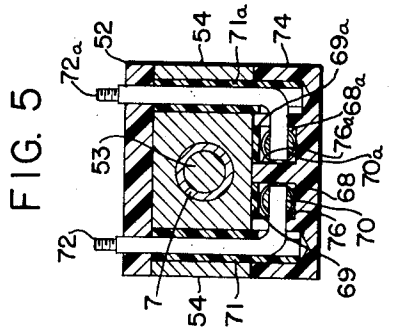


FIG. 5

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POTENTIOMETER

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2 Claims. (Cl. 338—176)

This invention relates to improved take-offs for variable resistance devices, and in particular, to such devices having a movable contact member solidly connected to a fixed terminal.

Basically, the conventional potentiometer includes a resistance element provided with a pair of fixed terminals and a movable arm which carries a contact which is positionable at any point along the resistance element. In order to electrically connect the movable contact to a fixed terminal, a take-off is employed. The take-off usually consists of a metal strip paralleling the resistance element. A movable brush or wiper is provided which "rides" on the take-off. A jumper electrically "ties" the brush to the wiper on the movable arm.

A major source of noise in such prior variable resistance devices has been found to result from the rubbing of the wiper against the take-off strip.

There is disclosed hereinafter a variable resistance device which utilizes a permanently connected take-off member which is free of the aforementioned disadvantages.

Accordingly, it is an object of this invention to provide an improved variable resistance device.

It is another object of this invention to provide a low-noise potentiometer.

It is a particular object of this invention to provide an improved rectilinear potentiometer.

It is a specific object of this invention to provide a variable resistance device utilizing a spring member as a current carrying means between the variably positioned wiper of a variable resistance device and a fixed output terminal.

These and still other objects and advantages will be pointed out with particularity or will become obvious as the following description proceeds, taken in conjunction with the accompanying drawings, wherein like numbers refer to like members.

In the drawings:

Figure 1 shows, in plan, a cross-sectional view of a single element variable resistance rectilinear device of this invention.

Figure 2 is a section taken along plane 2—2 as indicated in Figure 1.

Figure 3 is a section taken along plane 3—3 as indicated in Figure 1.

Figure 4 is a plan view of a two element potentiometer of this invention.

Figure 5 is a section taken along plane 5—5 of Figure 4.

Figure 6 is a section taken along plane 6—6 as indicated in Figure 4.

Figures 1–3 disclose a metal casing 2, aluminum being a suitable material for the casing. Attached to casing 2, there is provided an insulating plastic base 4 having molded thereon a resistance element 6 of electrically conductive plastic. The conductive plastic is preferred because of its excellent wear properties but wire wound or other conventional elements may be employed in carrying out the invention. Shaft 8 is rigidly supported by a porous bronze bushing 7. Shaft 8 carries a yoke member 10 which is attached thereto by means of a threaded stud 9 which passes through a hole in the yoke 10 and is secured by nut 12. The nut is adjusted so that the shaft is freely rotatable but still free of end play. The nut 12 is then soldered in place.

As an alternative to soldering the nut, a self-locking nut, as for example the type using a deformable insert or interference thread may be employed.

An insulating plastic brush block 18 is secured to yoke 10 by means of recessed flat head screws (not shown).

A metal member 17 supports a cylindrical metal rod 20, to which is affixed one end of a spring 22. The other end of spring 22 is supported by metal rod 24. In turn, rod 24 is supported by terminal 26 which has a bent portion extending through the rod 24 and is welded thereto.

Spring member 14 is secured to brush block 18. A precious metal alloy wiper 16, such as coin silver (90% silver, 10% copper), provides a contact between spring member 14 and resistance element 6. It will be noted that spring member 14 is in physical contact with metal member 17 so as to complete the electrical path from terminal 26 to wiper 16.

Slotted insulator tube 30 and insulator 32 prevent spring 22 from touching the metal casing 2. Plate 34 is attached to casing 2, by means of screws, as a protective cover. Plate 34 may be provided with mounting slots.

Terminals 36 and 38 are electrically connected to respective ends of resistive element 6.

Cable 40 is connected to terminals 26, 36 and 38.

Cover plate 42 locks cable clamp 44 into the casing 2. Insulator sleeve 45 prevents terminal 26 from grounding to casing 2.

In Figures 4–6, there is shown an alternative embodiment wherein two resistance elements 50 and 50*a* are mounted on insulator plate 52; shaft 53 supports a metal yoke 56 which is attached thereto by means of a threaded stud 55 which passes through a hole in the yoke 56 and is secured by nut 57. The nut is so adjusted that the shaft is freely rotatable but still free of end play. The nut 57 is then soldered into place. A second nut may be used as a locking means in lieu of soldering of the previously mentioned self-locking type of nut.

An insulator plastic block 58 is secured to metal yoke 56 by means of recessed flush head screws (not shown).

Metal bracket members 64 and 64*a* support cylindrical metal rods 66 and 66*a* and spring members 60 and 60*a*.

Springs 68 and 68*a* are supported at one end by metal rods 64 and 64*a* and at the other end by rods 70 and 70*a*.

Rods 70 and 70*a* are in turn supported by terminal rods 72 and 72*a* which extend through holes in rods 70 and 70*a* are welded thereto.

Whereas we have chosen to employ an insulating tube 30 in the embodiment of Figure 1, we disclose an alternative method of insulating springs 68 and 68*a*. The insulation consists of insulating plastic cover 74 provided with deep slots 76 and 76*a* which receive the springs 68 and 68*a*. Plasic strips 69 and 69*a* are positioned in housing 54 by means of an adhesive and serve to insulate the electrically conducting elements from the housing 54.

Electrical connection between the ends of resistance elements 50 and 50*a* and external equipment may be made by connection to screw terminals 78, 78*a*, 80 and 80*a*.

Thus, while we have disclosed the best mode presently contemplated for carrying out the invention, be it understood that after reading the foregoing, many variations and modifications will become apparent without departing from the spirit of the invention.

What is claimed is:

1. In a rectilinear potentiometer, the combination comprising: a housing; a resistance element; means for supporting said resistance element in said housing; means to connect said resistance element to an external circuit; an actuating shaft extending into said housing; an insulator block carried by said shaft; electrically conductive wiper means carried by said insulator block and arranged to electrically contact said resistance element; a fixed terminal for connecting said wiper means to an external circuit; a tubular insulator member substantially coextensive with said resistance element, provided with a slot parallel to its axis, an electrically conductive arm member, carried by said insulator block, having one end connected to said wiper means; and a stretchable helically coiled spring member, positioned entirely within said tubular member, and having one end electrically connected to said fixed terminal and the other end mechanically and electrically connected to said arm member so that said spring member is stretched to an extent relative to the position of said wiper on said resistance element.

2. In a rectilinear potentiometer, the combination comprising: a housing; a resistance element; means supporting said resistance element in said housing; means to connect said resistance element to an external circuit; an actuating shaft extending into said housing; an insulator block carried by said shaft; electrically conductive wiper means carried by said insulator block and arranged

to electrically contact said resistance element; an insulator member having an elongated groove parallel to said resistance element and substantially coextensive with said resistance element; a stretchable helically coiled spring, positioned in said groove, provided with a fixed end and a movable end; an arm carried by said insulator block and attached to the said movable spring end; means to electrically connect said movable spring end to said wiper; means maintaining said fixed spring end against movement; and means to connect said fixed spring end to an external circuit, said spring being unstretched when the said wiper is at the end of the resistance element closest to said fixed end and stretched to an extent relative to the position of said wiper along said resistance element, when said wiper is moved.

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