Aug. 13, 1968 M. W. BANG 3,397,374

TWO-PIECE POTENTIOMETER

Filed July 6, 1967

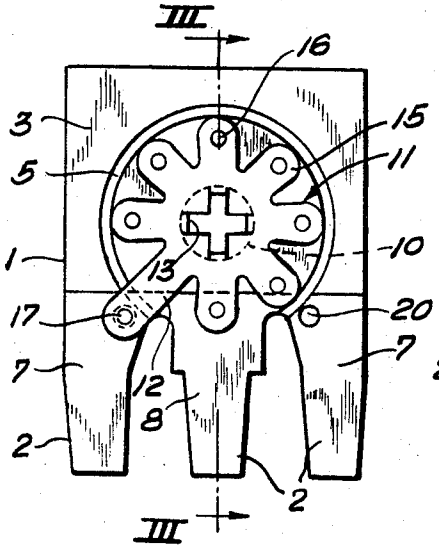


Fig. 1.

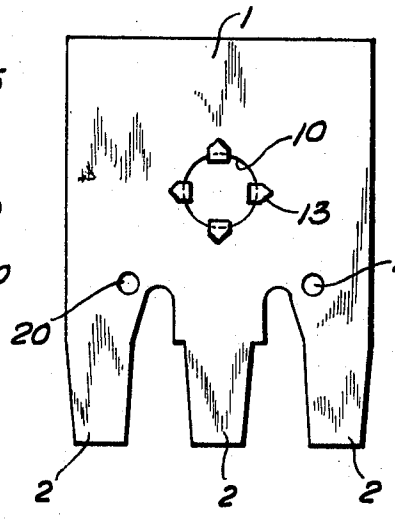
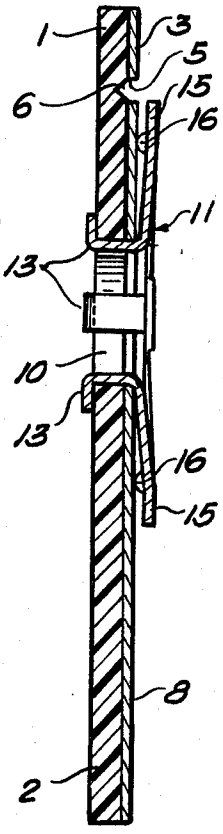


Fig. 2.

Fig. 3.



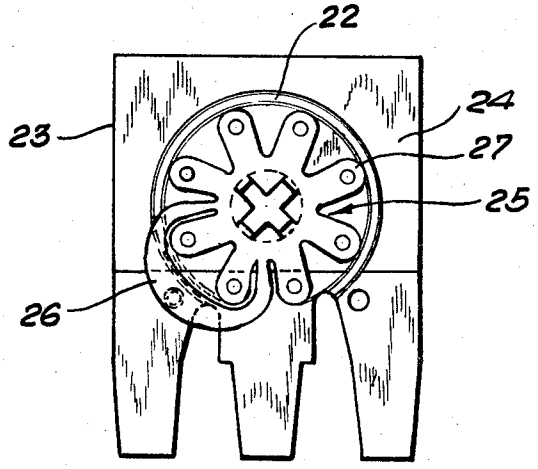
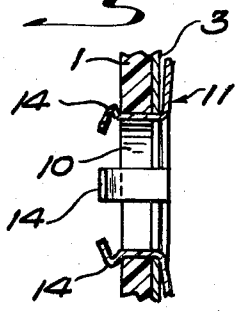


Fig. 4.

Fig. 5.



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TWO-PIECE POTENTIOMETER

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ABSTRACT OF THE DISCLOSURE

A substrate supports an electrical resistance element having a curved body with a circular inner edge and laterally spaced ends, to which electric terminals are connected. The substrate also supports conductive material in the area between a central opening through the substrate and the space between the ends of the resistance element. This material likewise is connected with a terminal. Mounted in the opening is a metal rotor disposed in constant engagement with the adjoining conductive material and carrying an electric contact engaging the resistance element.

It is among the objects of this invention to provide a potentiometer that is formed from only two parts, has high power capacity, considerable strength and is very easy and inexpensive to make.

The invention is illustrated in the accompanying drawings in which:

FIG. 1 is a front view of the potentiometer;

FIG. 2 is a rear view;

FIG. 3 is an enlarged central cross section taken on the line III—III of FIG. 1;

FIG. 4 is a front view of a modification; and

FIG. 5 is a detail of a further modification.

Referring to FIGS. 1 and 3 of the drawings, a flat substrate **1** is formed from a thin plate of insulating material that preferably is rectangular and has three laterally spaced tongues **2** projecting from one edge. This substrate supports an electrical resistance element **3** that may be formed by applying a coating of resistance material to one side of the substrate. The coating preferably is rectangular and spaced a short distance from the tongues.

In order to form a resistance path along the resistance material, there is a circular gap **5** in the coating. The gap extends from one edge of the substrate at a point between the central tongue and one of the outer tongues and around to the same edge at a point between the central tongue and the remaining tongue. The curved portion of the resistance material outside of a gap forms the resistance element that will be engaged by a sliding contact. Although the outside as well as the inside of the resistance element may be curved, it is preferred that the outside be rectangular as shown because it provides a greater area of resistance material for heat dissipation and thus increases the wattage rating of the element. The gap **5** can be formed in different ways. One way is to form a circular groove **6** (FIG. 3) in the substrate before the resistance material is applied. During application of that material, care is taken to prevent it from bridging the groove, so a gap is left in the coating. The two outer tongues are covered with metal coatings **7** that are joined to the ends of the resistance element to form electric terminals for it. The center tongue likewise is coated with metal to form a terminal, but this coating **8** extends inwardly between the ends of gap **5** and a short distance into the area encircled by the gap.

The substrate and its resistance coating are provided with an opening **10** therethrough concentric with the circular gap. This opening positions and retains a rotor **11** that carries a contact **12** that is slidable along the resistance element outside of the gap and onto the inner ends of the end terminals. The rotor is formed from a single piece of sheet metal, the central portion of which may be provided with several struck-out tongues **13** which, as shown in FIG. 2, are bent back through opening **10** and then outwardly to overlie the rear surface of the substrate. Or, as shown in FIG. 5, the ends of the tongues may be provided with humps **14** that snap out over the rear edge of opening **10** when the tongues are inserted. In either case, the tongues engage the side wall of the opening to prevent lateral movement of the rotor, and the ends of the tongues hold the rotor in the substrate. The rotor is large enough in diameter for a portion of it to be in constant engagement with the metal coating **8** inside the area encircled by the circular gap.

It has been found that the pressure of the rotor against metal coating **8** is more uniform if the rotor is provided with a plurality of circumferentially spaced fingers **15** radiating from its center. Each finger forms a spring finger, some of which engage the resistance material encircled by the gap and one or more of which always engages the metal coating **8**. For smoother operation, the outer end of each finger is provided with a pressed-out nib **16**. One of the fingers is longer than the others and extends out across the gap **5** for engagement with the resistance element around the gap. The outer end of this finger **12** has a pressed-out nib **17** for engaging the resistance element.

It will be seen that the rotor can be turned in either direction far eough for its contact to slide off the resistance element and onto the inner end of one of the outer terminals. To indicate that the contact should be turned no further, each of these terminals may be provided with a stop of any suitable form. For example, the stop may be a recess, such as a hole **20**, into which nib **17** will snap when it reaches the hole. The rotor can be turned by any suitable instrument, such as a screw driver, inserted in the slots formed by its struck-out tongues.

This potentiometer is easy and inexpensive to make because it is formed from only two pieces, i.e., the coated substrate and the metal rotor with its integral tongues and contact, which can be assembled quickly. There are no separate contacts nor fastening members. The two pieces are inexpensive to make and a simple bending operation or snap action fastens them together. Furthermore, due to its particular construction, this potentiometer is very thin and can be used in areas that are quite confined.

In the modification shown in FIG. 4, the gap is formed by a ridge **22** on the substrate **23** from the top of which the resistance coating **24** has been removed by grinding or some other suitable action. Also, the sliding contact of the rotor **25**, instead of being the outer end of a long straight spring finger, is a loop **26**, the ends of which are integral with the rotor between some of its spring fingers **27**. Otherwise, this potentiometer is the same as the one first described and has the same advantages.

According to the provisions of the patent statutes, I have explained the principle of my invention and have illustrated and described what I now consider to represent its best embodiment. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. A potentiometer comprising a substrate, a coating of resistance material thereon, three integral tongues projecting from one edge of the substrate, said coating having a gap therein extending inwardly from said edge of the substrate between the center tongue and one of the

outer tongues and around in a circle to said edge between the center tongue and the remaining tongue to form a resistance element around the outside of the gap, conductive material on the two outer tongues joined with the ends of said resistance element, conductive material on the center tongue and extending between the ends of said gap into the area encircled by the gap, the substrate being provided with an opening through it and said coating concentric with said gap, a metal rotor rotatably mounted in said opening and disposed in constant engagement with the conductive material in said area, and an electric contact carried by said rotor and electrically connected therewith, the contact engaging said resistance element and being movable along it by the rotor.

2. A potentiometer according to claim 1, in which the portion of the substrate supporting said resistance coating is rectangular and the resistance coating substantially covers one side of said portion except for said gap and opening.

3. A potentiometer according to claim 1, in which said resistance coating joins said conductive material along a substantially straight line extending across the substrate between said opening and tongues.

4. A potentiometer according to claim 1, in which said rotor has a plurality of circumferentially spaced fingers radiating from its center toward said gap, the outer end of at least one of the fingers always engaging said conductive material in said area as the rotor is turned.

5. A potentiometer according to claim 1, in which said rotor is a single piece of sheet metal provided centrally with struck-out tongues bent through said opening and engaging the side wall thereof, the free ends of the tongues being shaped to overlap the edge of said opening remote from said resistance element to connect the rotor to the substrate, and the openings in the center of the rotor created by said tongues forming a slot to receive a tool for turning the rotor.

6. A potentiometer according to claim 1, in which said gap is formed from a ridge projecting from the surface of the substrate, with the top of the ridge free of said resistance coating.

7. A potentiometer according to claim 1, in which said contact has a projection on one side slidable against the resistance element, and said substrate is provided with a recess near each end of said element for receiving said projection to limit movement of the contact.

8. A potentiometer comprising a substrate having a rectangular portion and three laterally spaced tongues projecting from one edge, an electrical resistance element on said rectangular portion having a curved body with a circular inner edge between laterally spaced ends, said element extending outwardly from said inner edge substantially to three contiguous edges of said rectangular portion of the substrate, the substrate being provided with an opening therethrough concentric with said circular edge, conductive material on said tongues and extending inwardly into the area encircled by the resistance element and also into contact with said element ends, the inner edge of said conductive material extending in a straight line across the substrate, a metal rotor rotatably mounted in said opening and disposed in constant engagement with the conductive material in said area, and an electric contact carried by said rotor and electrically connected therewith, the contact engaging said resistance element and movable along it by the rotor.

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