May 12, 1936. D. T. SIEGEL 2,040,277

RHEOSTAT AND POTENTIOMETER

Filed Dec. 21, 1933

Fig. 1

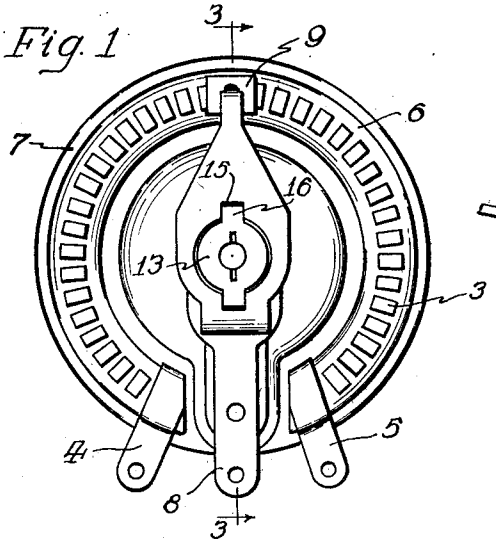


Fig. 2

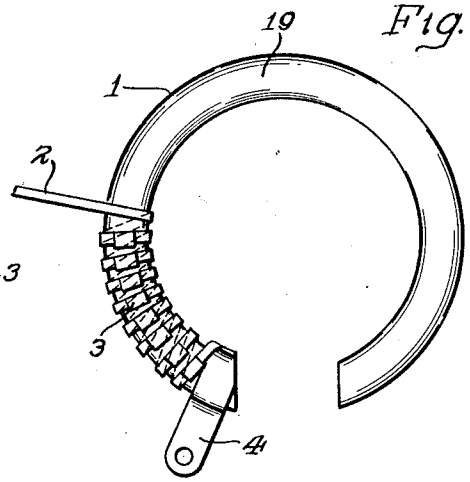




Fig. 4

Fig. 3

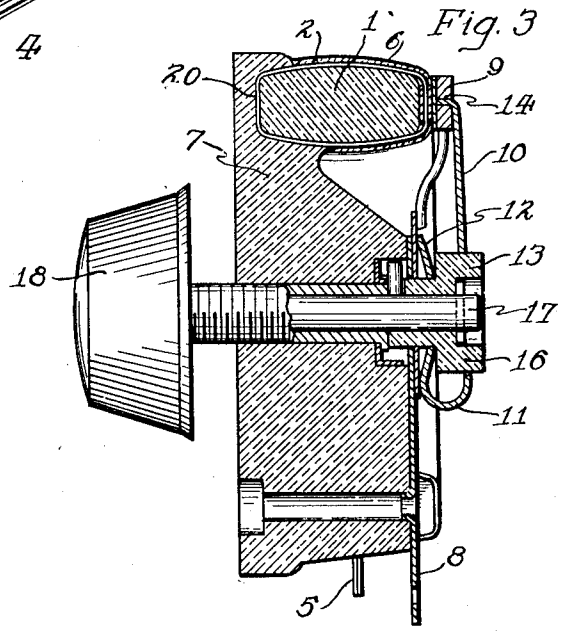
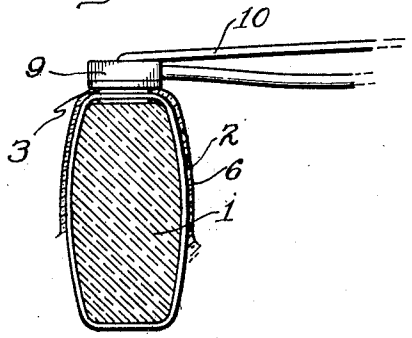


Fig. 5



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RHEOSTAT AND POTENTIOMETER

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4 Claims. (Cl. 201—56)

This invention relates to means for attaining alined contact surfaces on the resistance elements of rheostats and similar instruments whereby substantially uniform contact may be brought about between each of said contact surfaces and a brush which is adjustable from contact to contact to bring more or less of the resistance wire into the brush circuit.

The objects of the invention are attained by means of a method of forming resistance units and a construction as herein illustrated and described in the drawing.

Figure 1 is a plan view of the rear face of the instrument.

Fig. 2 is a plan view of the insulating core for the coil and shows the coil thereon in the process of winding and applying the clips.

Fig. 3 is a sectional view as indicated by the line 3—3 on Fig. 1.

Fig. 4 is a perspective view of one of the contact clips.

Fig. 5 is a sectional detail of the wound core, showing a brush bearing against one of the contact clips.

In the forming of wound resistance units, particularly such units as are made by winding a resistance wire around a molded insulating core, irregularities in the surface of the winding may occur because of imperfections in the core or the mounting thereof or manner of cementing the winding to the core, or seating and securing the resistance element to a base. This uncertainty regarding the uniformity of the contacting portions of the winding is overcome by means of the present invention which consists in clipping to separate convolutions of the winding separate contact elements which are welded to the wire in aligned position along the element.

The exposed surfaces of the clips are then trued up by a grinding operation. It is then possible to bring about uniformly good connections between a brush which is movable along the coil and the separate contacting elements of the coil.

In the illustration a molded horseshoe shaped insulating core 1 has wound thereon a flat resistance wire or ribbon 2. As the winding proceeds, metallic clips 3 are regularly applied to separate turns of the winding as illustrated in Fig. 2. These clips, as best shown in Fig. 4, are each formed from a rectangular section of sheet metal, doubled on itself to provide a very narrow space between the leaves; that is, a space not materially greater in depth than the thickness of the flat wire or ribbon on which the clip is to be mounted. As the turn is tightly drawn around the core it binds the clip in position against the core. These clips are shown as all lying in the same plane on the top of the core and may therefore be conveniently ground so that their surfaces are trued to the same plane, but before the grinding operation the clips are permanently united to the wire, and the ends of the winding are welded to terminal clips 4 and 5, and an insulating enamel 6 is applied and baked to the unit for the purpose of embedding and retaining each convolution against displacement and cementing the core to the base 7. By the term "permanently united" I intend to cover welding, brazing, or soldering; that is, union by fusion of metals as distinguished from mere contact by clamping two parts together. In order to insure a good electrical contact it is desirable that one or both of the leaves of the clip should be completely joined to the ribbon before the enamel in fluid form is applied; otherwise the insulating enamel is likely to flow between the parts and when the baking takes place, actually break what might otherwise be a fairly good contact.

In Fig. 1 the finished unit is illustrated and includes a central terminal element 8 which is electrically connected with brush 9 carried upon the rotatably mounted arm 10 and held thereby resiliently against the contacting surfaces of the clip.

The brush carrying arm 10 is bent upon itself as indicated at 11, and terminates in a ring shaped contact 12 which encircles the hub of an insulator 13 and contacts with the stationary central terminal element 8.

The brush has recess 14 for receiving the bent end of its operating arm 10, and the latter is notched out at 15 to receive lugs 16 on the insulator 13. Thus the brush arm is rotated by turning the insulator and the insulator is pinned to shaft 17, which carries the operating knob 18.

The clips 3 are applied to the separate turns of the resistance wire preferably as the wire is wound upon the core, and the clips are tightly bound against the surface 19 of the insulating core by the wire. When the winding is completed the end terminals 4 and 5 are clipped over the ends of the core in contact with the ends of the wire, and then the unit is welded, so as to weld each clip 3 to its particular convolution of the wire and to weld the terminals 4 and 5 to the ends of the wire. The wound core is then placed in the receiving recess 20 of the insulating base 7 and the article is dipped in an insulating enamel which serves to permanently bind all parts in

their set positions. The enamel is removed, preferably after hardening, from the outer surfaces of the clips 3. Then the exposed surfaces of the clips are ground to render them absolutely flat and true to the same plane. By this last operation correction is made for irregularities which otherwise might occur due to imperfections of the core or lack of uniform tension in the separate convolutions of the coil. The enamel will fill the spaces between the elevated portions formed by the clips, but after baking will be slightly below the clip surface.

If the brush were to ride over the surface of the coil rather than on the finished surfaces of the clips, a uniform area of contact between the brush and segments of the coil in the various settings of the brush could not be maintained as well as with the trued-up surface provided for by the clips. In using the instrument electric connections are made with the terminals 4, 8, and 5, according to whether it is used as a rheostat or potentiometer, and the desired amount of resistance wire is brought into the circuit by the usual adjustment of the brush carrying arm through rotation of the operating knob 18. The contact clips perform the function not only of improving the contact surface but also of reducing the resistance, and consequently the heat, at the contact surfaces. Inasmuch as rheostats of the type shown herein are intended for high duty—that is, the handling of heavy wattage—the heat developed is usually very high. Consequently the reduction of such heat on the actual contact area is desirable.

Although but one specific embodiment of this invention is herein described, it will be understood that details of the construction shown may be altered or omitted without departing from the spirit of this invention as defined by the following claims.

I claim:

1. A rheostat comprising an insulating core having wound thereon a flat ribbon resistance element, and flat U-shaped contact clips applied to separate turns of the resistance element.

2. A rheostat comprising an insulating core having wound thereon a flat ribbon resistance element, and flat U-shaped sheet metal contact clips applied to separate turns of the resistance element.

3. The method of making a high duty rheostat which consists in forming clips by doubling a section of metal on itself, winding a flat resistance wire on a core and progressively applying said clips to the wire during winding whereby the clips are clamped against the core with a portion of each clip projecting above the wire surface, then permanently uniting the clips and wire, then embedding the wire and clips in a vitreous enamel and baking the enamel, and then truing the brush contact area.

4. A rheostat comprising in combination a core and base composed of heat resisting dielectric material, a flat resistance wire wound on the core, contact clips each composed of a section of metal doubled on itself and applied to the wire, one leaf of the clip being clamped between the wire and the core and the other leaf projecting above the surface of the wire, and vitreous enamel covering the winding joining the core to the base and embedding the clip, and a contact brush engaging the elevated portions of the clips.

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