April 22, 1930. A. J. CARTER 1,755,314

RHEOSTAT AND POTENTIOMETER

Filed June 11, 1928

Fig. 1

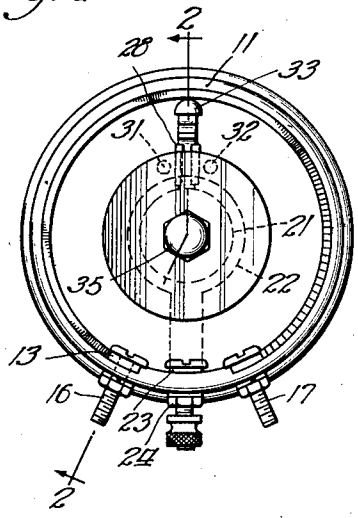


Fig. 2

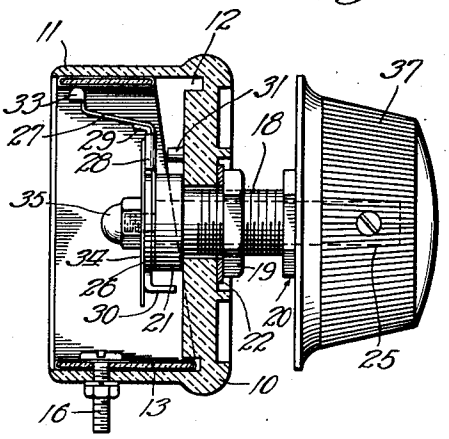


Fig. 3

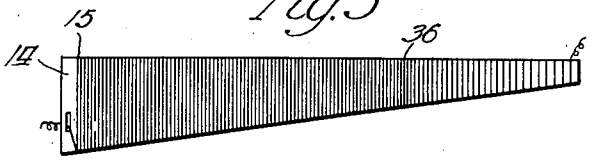


Fig. 4

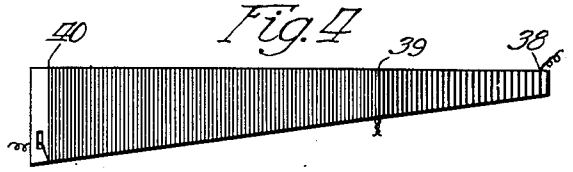


Fig. 5



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UNITED STATES PATENT OFFICE

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RHEOSTAT AND POTENTIOMETER

Application filed June 11, 1928. Serial No. 284,387.

My invention relates to rheostats and potentiometers and has for its principal object the provision of a novel means of constructing the resistance winding in such devices whereby the rate of change of resistance per unit change in length may be varied to suit the particular purpose for which the device is to be used.

A further object is to provide in one simple apparatus for increasing the resistance at a relatively slow rate when comparatively little resistance is connected in circuit and for increasing the resistance at a gradually higher rate as the resistance included in the circuit increases.

It is also an object of this invention to provide a rheostat or potentiometer construction such that the resistance range and current carrying capacity of the rheostat are capable of meeting a wide variety of voltage and current control requirement. Thus for example in the case of the heating current for the filament of vacuum tubes, my rheostat may be utilized with tubes having much different requirements of current for the same voltage.

In carrying out this invention, I employ a rheostat winding wherein the length of each turn varies from one end to the other and wherein the spacing of the turns relative to each other may be varied in the different portions of the rheostat winding.

To further the adaptability of the device for use with different apparatus requiring different current capacity for various voltages, my invention also contemplates the use of wire having a relatively low resistance for a portion of the wind and a wiring having a relatively high resistance for the remainder thereof.

I attain the aforementioned objects by the device illustrated in the accompanying drawings in which:

Fig. 1 is an elevation of a rheostat including my device and illustrating the connections therefor;

Fig. 2 is a section on the line 2—2 of Fig. 1;

Fig. 3 is a detailed view of one form of resistance winding;

Fig. 4 is a view similar to Fig. 3 of a slightly modified form of winding; and

Fig. 5 is a detailed view of a further modification.

Referring now in detail to the drawings, the rheostat consists of a base 10 of molded phenol condensation product or similar material having the upstanding rim 11 and provided with the annular groove 12 immediately adjoining the interior of the rim 11 and in which the resistance unit 13 is adapted to be mounted. The unit 13 consists of a core 14 and winding 15 which will be hereinafter described in detail. This unit 13 extends through most of the circumference of the rim 11 and is secured thereto by means of the terminal screws 16 and 17 at the opposite ends thereof which screws contact with the ends of the winding 15 and may be connected to the apparatus with which a rheostat is to be used.

The base 10 is connected to a supporting stud 18 by which it may be mounted upon a suitable support and clamped thereon by means of the nuts 19 and 20 in a well known manner. Supporting stud 18 has a head 21 within the recess of the base 10 which cooperates with the nuts 19 to clamp the base 10 firmly thereon. The connecting member 22 is also held in place by the nut 19 and has a portion extending upwardly as at 23 along the inner wall of the rim 11 to connect with the wiring terminal 24, the base 10 being slotted to permit passage of the upturned portion 23 of the member 22 therethrough.

A shaft 25 is journaled in the member 18 and has non-rotatably mounted thereon the members 26 and 27 which engage the member 21 to make electrical contact therewith. The member 27 as shown has the upturned flange 28 engaging the projecting portion 29 of member 26 so that they rotate together and the member 26 is provided with the downturned portion 30 cooperating with the stop projections 31 and 32 so as to limit the rotation thereof and prevent the connecting portion 33 of member 27 from moving entirely off the resistance element 13. A disc 34 rests on top of the member 26 and may be used for indicating the total resistance of the element

or other suitable marking and the members are held in position by means of the nut 35.

Referring now to Figs. 3, 4, and 5, in Fig. 3, I show the resistance element consisting of the insulating strip 14 and the winding 15 mounted thereon. The strip 14 as shown gradually increases in width from one end to the other so that each turn of wire thereon is of greater length as they approach the large end of the strip.

Also, in the right hand portion substantially to the point 36 of the winding 15, the spacing of the turns of the wire is gradually decreased from the wide spacing at the extreme right hand end of the strip to a comparatively small spacing at the point 36, and, from this point to the left hand end of the strip, the spacing is substantially the same between the turns.

The advantage of winding the wire in this manner in addition to making the strip of varying size throughout its length lies in the fact that it permits a greater rotation of the controlling handle 37 for unit change in resistance when a comparatively small amount of resistance is in the circuit, and, as the amount of resistance in the circuit increases, the amount of rotation per unit change of resistance decreases gradually. If the turns were placed the same distance apart throughout the length of the strip, the initial step of rotation would increase the resistance a much greater proportion of the whole amount of resistance in the circuit.

That is not the case with the gradually decreasing spacing between the turns of the wires in the winding as illustrated in Fig. 3. This spacing makes it possible to more nearly approach a logarithmic increase in the resistance as the contact member is rotated thereover to increase the total amount of resistance in the circuit, since it is possible by properly spacing the windings and properly tapering the strip 14 to make the amount of resistance added by each degree of rotation have the same proportion to the total resistance included in the circuit as the previous and succeeding amounts included by the previous and succeeding steps of rotation of the contact member.

In Fig. 4 a further modification is shown whereby there is combined with the tapering of the strip and the gradually decreasing spacing of the turns of the winding a combination of two portions of resistance, the right hand portion of which between the points 38 and 39, is of a lower resistance per unit length of wire than the left hand portion between the point 39 and 40. This makes it possible to use the rheostat interchangeably for use with apparatus requiring a relatively low resistance and a high current capacity, and apparatus requiring a relatively high resistance and lower current carrying capacity. The difference in resistance between the portions of the windings shown in Figs. 2 and 4 may be provided either by making the portions between the points 38 and 39 of larger wire having the same specific resistance as the portion between the points 39 and 40 or by making the portion between the points 38 and 39 of the same size wire having a lower specific resistance than points 39 and 40.

Also, whenever it is desired, a resistance unit may be made in the form shown in Fig. 5 wherein the spacing between the turns of wire gradually decreases from the extreme right hand end of the winding to the extreme left hand end thereof. By utilizing the form shown in Fig. 5, the change in resistance per unit length of the strip may be made to bear a constant ratio to the total resistance between the unit of length selected and either end of the strip which is exceedingly desirable in use of certain types of apparatus such as the filament current control in radio sets.

From the above description it is thought that the construction and advantages of this device will be clear to those skilled in this art.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A device of the character described comprising an insulating base having wound thereon a resistance wire the adjacent turns of which gradually decrease in distance apart and increase in length from one end to the other of the strip.

2. A resistance unit comprising a strip of insulating material gradually increasing in cross-sectional perimeter from one end to the other thereof and a resistance wire wound upon said strip each turn of which is spaced a less distance from the preceding turn from the smaller end of the insulating strip to the larger end.

In witness whereof, I hereunto subscribe my name this 26th day of May A. D., 1928.

ALVA J. CARTER.