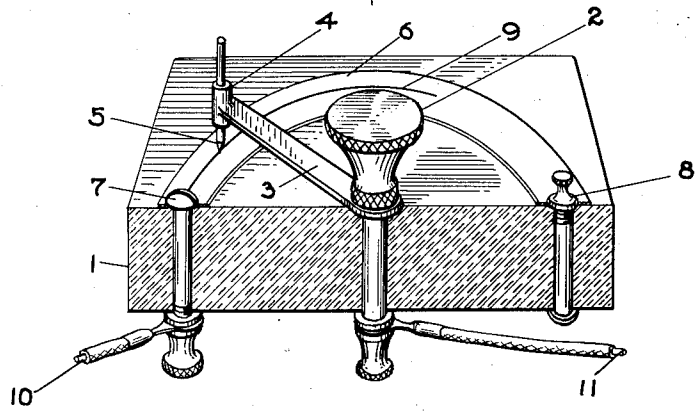
Feb. 13, 1923. 1,445,610

C. P. BROCKWAY

ADJUSTABLE HIGH RESISTANCE

Filed June 14, 1920

Fig. I.



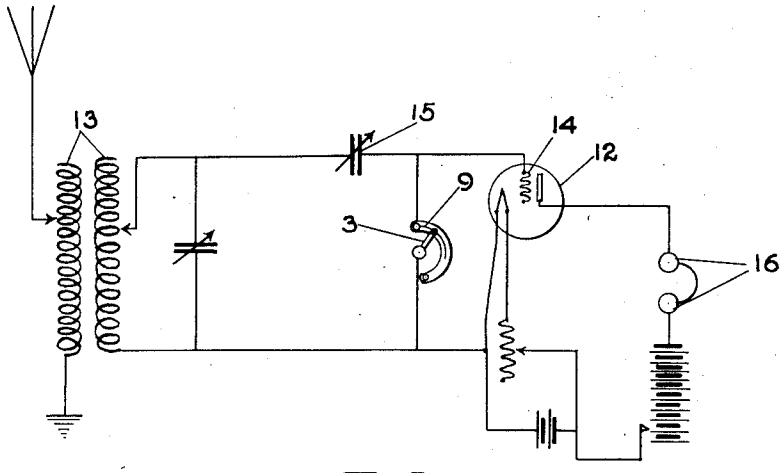


Fig. II.

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UNITED STATES PATENT OFFICE.

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ADJUSTABLE HIGH RESISTANCE.

Application filed June 14, 1920. Serial No. 388,880.

To all whom it may concern:

Be it known that I, CARL P. BROCKWAY, a citizen of the United States, residing at Toledo, in the county of Lucas and State of Ohio, have invented certain new and useful Improvements in Adjustable High Resistance, of which I declare the following to be a full, clear, and exact description.

This invention relates to an adjustable resistance, or rheostat, having a relatively high total resistance, being preferably of the order of a megohm, or more in value, but which may have a value considerably less than a megohm, depending upon the kind of materials employed in the construction.

One object of the invention is to provide a convenient form of adjustable non-inductive resistance for use in signalling and control circuits, for example: where the resistance is to be used for a shunt across the condenser located in series with the grid electrode of an audion.

Another object is to provide a single rheostat device which will perform the function of any number of rheostats by virtue of the fact that the simple form of resistance unit employed in the rheostat may be readily exchanged for a unit of different value, or may be varied in value by a very simple operation without removing the resistance unit from the rheostat.

Means are provided for moving a relatively soft conducting material over a relatively hard and somewhat roughened surface whereby a conductor of high resistance is deposited upon the hard surface by abrasion, this conductor being capable of variation in specific restivity by varying the kind of material deposited as a conductor, and being capable of the variation in resistance by varying the quantity and form of material deposited.

Further objects, and objects relating to details of construction and economies of manufacture will appear as I proceed with the description of that embodiment of the invention, which for the purposes of the present application I have illustrated in the accompanying drawing.

Referring to the drawing.

Figure I shows a perspective view, partially in section, of one modification of the variable resistance.

Fig. II shows a typical circuit in which the resistance may be employed to advantage.

Fig. I, the base 1, preferably of glass, bakelite, hard rubber, or other material of high dielectric properties supports the rotary knob 2, to which is attached the arm 3, carrying a sleeve 4 at its outer end to support a contact element 5. On the upper surface of the base 1, the annular strip 6 is secured by screw head 7 and nut 8. The strip 6 is preferably a highly insulating substance such as paper, having a high resistance conductor 9, mounted thereon; but the strip may be a conducting substance such as graphite or other suitable material having such a small area of cross section that in view of its specific restivity the desired high resistance will be obtained. Where an insulating strip is employed the conductor mounted thereon may be of india ink, graphite, or other suitable material, and may take the form of a narrow band shown as line 9 in Figure I, or it may be a thin film covering the upper surface or the entire surface of the strip 6.

A simple method of producing the necessary conductor upon strip 6 is to employ some conducting material relatively soft with respect to the strip 6, and by rubbing or scribing this material upon the strip deposit a conductor of requisite resistance. Graphite has been found to be highly satisfactory for this purpose, and may be used in the form found in ordinary lead pencils. This form readily fits the sleeve 4, as shown by a contact 5 and may be used to produce the conductor 9 after the strip has been mounted on the base. Contact 5 is pressed with the desired force upon the strip, and swung over the surface of the strip making a line concentric with the knob 2. This line is made up of a large number of conducting particles having a limited area of contact with each other, and may be varied in thickness or compactness by varying the pressure of the contact upon the line, and the number of times that the contact is swung back and forth over the surface of the strip.

After the necessary conductor has been applied to the strip, the graphite contact may be replaced by a contact which will not be abraded by the surface of the strip, but

the graphite contact is preferably left in the sleeve 4 to act as an electrical contact and at the same time furnish ready means for adjusting the thickness or character of the conductor 9. One end of the conductor 9 should be clamped under the screw head 7 before placing the rheostat in circuit, in order to insure positive contact between the conductor 9 and the screw head 7.

The circuit of the rheostat may be traced from lead 10, through the screw head 7, conductor 9 or strip 6 in case the strip is the conducting element, contact 5, arm 3, knob 2, to lead 11. The resistance between leads 10 and 11 is proportional to the length of conductor between screw head 7 and contact 5.

It is obvious that by providing a number of strips 6, each having a different value of resistance, that any one of the resistances could be substituted in the rheostat, and thus enable one to obtain a rheostat of the desired value, without requiring the bulk or expense of having a separate base with its associated parts for each value of resistance to be used.

It is not necessary, however, to remove the strip 6 in order to obtain a rheostat having a different resistance or working conductor, but the conductor may be changed in resistance by varying the thickness or width of the strip of material deposited by the contact 5, thereby varying the area of cross section of the conductor. A still further method of varying the resistance is by varying the pressure of the contact 5, while rubbing it over the conducting element. The rubbing under pressure has the effect of making a more compact deposit so that with a given amount of material deposited the more compact deposit will possess the higher conductivity, or in other words will have a lower specific restivity. By increasing the pressure of an abradable contact 5 upon the conductor 9 and then sliding the contact along over the conductor under the increased pressure, three results may be simultaneously accomplished: first, the conductor 9 which existed before the operation, may be made more compact and of higher conductivity by the operation; secondly, a new layer of conducting material may be deposited upon the conductor 9; and thirdly, the length of conductor in circuit between the terminals of the rheostat may be increased provided the contact is moved toward the open end of the conductor. One advantage of this form of adjustment consists in the rapidity with which the three results can be obtained without interrupting the circuit, and another advantage consists in the ability to conveniently increase the ratio between the surface area and the electrical resistance of a circuit.

Fig. II shows a receiving system for high frequency signalling currents employing an electron tube detector 12. The high frequency potential is applied through the transformer 13 to the grid 14 of the detector 12. The circuit between the transformer 13 and the grid 14 includes condenser 15 which is shunted by resistance 9. Receivers 16 are provided in the output circuit of the detector to respond to the signal current. In the circuit shown, resistance 9 acts as a leakage path for the electric charge accumulated upon the grid 14 and the condenser 15 as the result of the rectifying action of the detector 12 upon the input current. By varying the position of the arm 3 the desired resistance in shunt of the condenser 15 may be obtained.

I am aware that the particular embodiment of my invention above described, and illustrated in the accompanying drawing is susceptible of considerable variation without departing from the spirit thereof, and therefore I desire to claim my invention broadly as well as specifically as indicated by the appended claims.

I claim as my invention:

1. In a rheostat, a non-absorbent insulating base, two circuit terminals supported thereon, and means including a movable contact member of relatively soft conducting material supported on said base and electrically connected to one of said terminals to deposit a conductor upon said base between the other terminal and said contact member.

2. In a rheostat, a non-absorbent insulating base, two circuit terminals supported thereon, and means including a movable graphite member supported on said base and electrically connected to one of said terminals to deposit a conductor upon said base between the other terminal and said graphite member.

3. In a rheostat, a non-absorbent insulating base, two circuit terminals supported thereon, and means including a movable graphite pencil supported on said base and electrically connected to one of said terminals to deposit a conductor upon said base between the other terminal and said graphite pencil.

4. In a rheostat, a non-absorbent insulating base, a relatively soft conducting element pressing upon said base, and means for moving said element across the surface of said base whereby a portion of said element is deposited as a high resistance conductor upon said base.

5. A rheostat comprising an insulating base, an electrical contact fixed in said base, an annular high resistance unit mounted thereon and connected to said contact, a pivoted arm mounted on said base and having a sleeve at the outer end, and an abradable contact member supported in said

sleeve to electrically connect said high resistance unit and said arm.

6. In a rheostat, an insulating base, clamping contact members thereon, and an annular strip of insulating material clamped to said base by said contact members, a pivot centrally disposed with respect to said annular strip, an arm attached to said pivot and extending radially over but separated from said strip, a sleeve supported on said arm above said strip, and a pencil shaped member supported in said sleeve and in contact with said strip to deposit a conducting coating upon said strip.

7. A rheostat comprising a non-absorbent insulating base, an annular high resistance unit mounted thereon, a pivoted arm mounted on said base and having a sleeve at the outer end, and an abradable contact member supported in said sleeve to electrically connect said high resistance unit, said arm and said contact.

In testimony whereof I affix my signature.

CARL P. BROCKWAY.