June 3, 1924. 1,496,745

H. S. SCOTT

POTENTIOMETER

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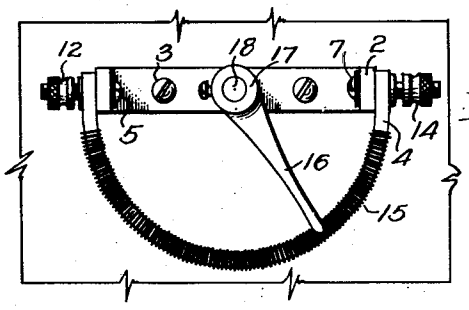

Fig. 1

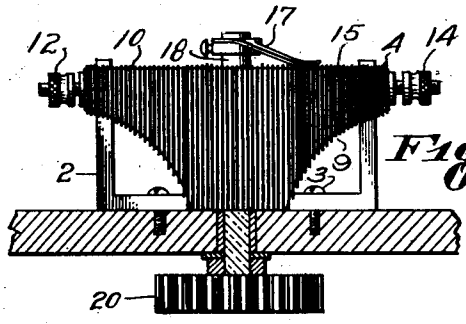

Fig. 2

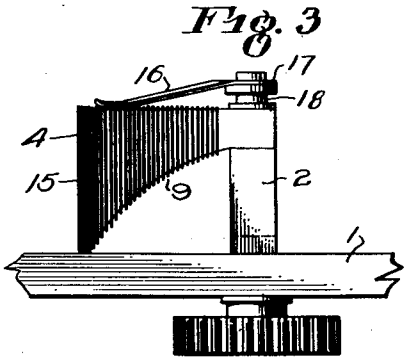

Fig. 3

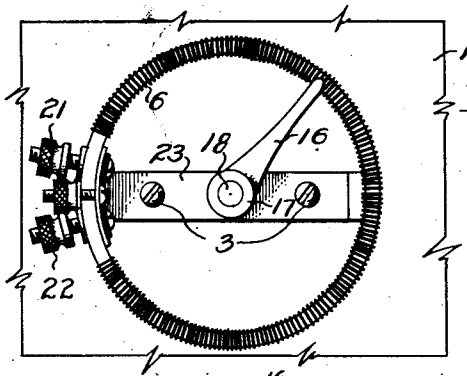

Fig. 4

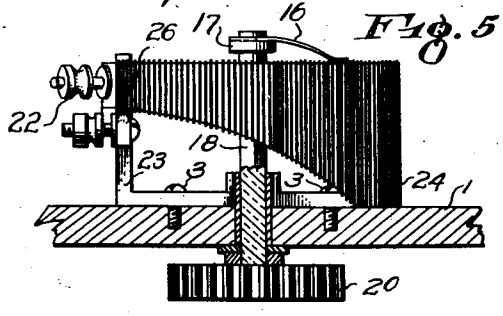

Fig. 5

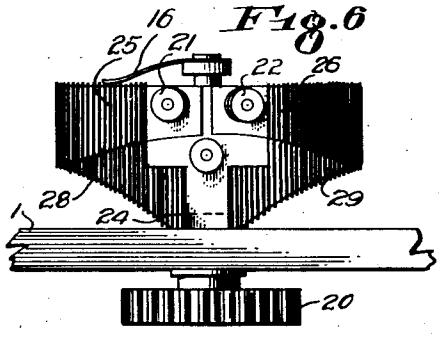

Fig. 6

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POTENTIOMETER

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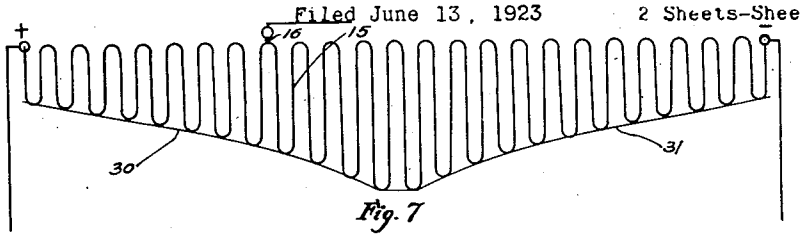

Fig. 7

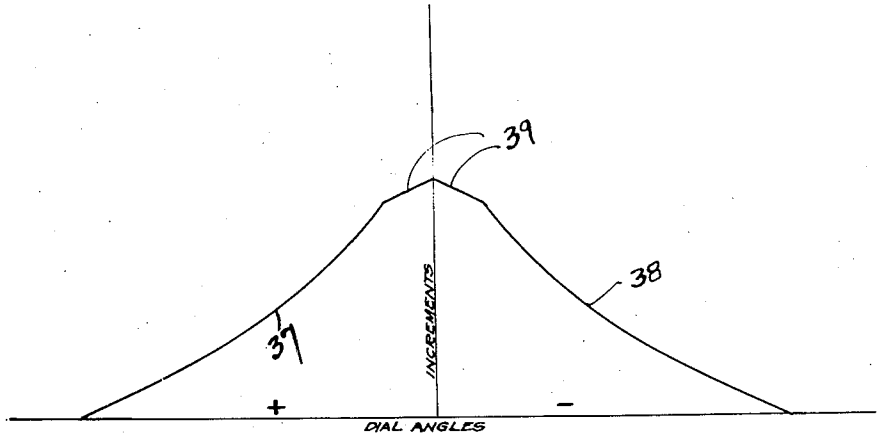

Fig. 8

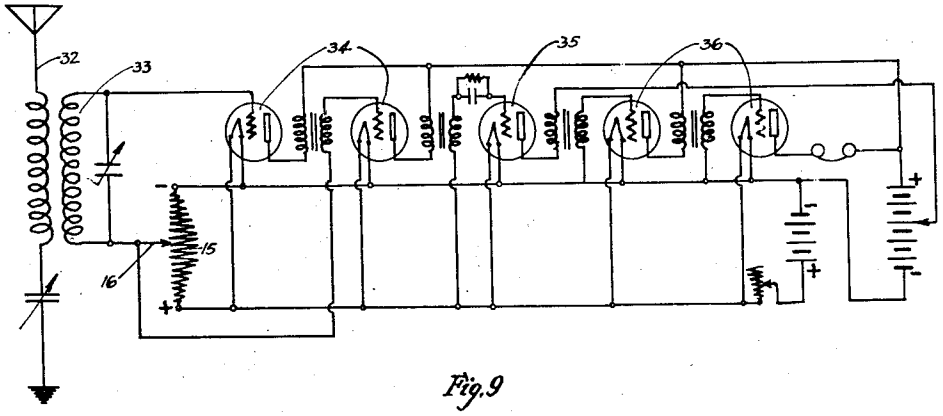

Fig. 9

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UNITED STATES PATENT OFFICE.

HOYT S. SCOTT, OF CLEVELAND, OHIO.

POTENTIOMETER.

Application filed June 13, 1923. Serial No. 645,117.

To all whom it may concern:

Be it known that I, HOYT S. SCOTT, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in a Potentiometer, of which the following is a specification.

My invention relates broadly to apparatus for varying the resistance of an electrical circuit, and more particularly to a construction of potentiometer.

One of the objects of my invention is to provide a construction of potentiometer whereby the resistance of its associated electrical circuit may be varied by small and gradually increasing or diminishing increments of adjustment.

Another object of the invention is to provide a potentiometer construction whereby the resistance of the electrical circuit associated with the potentiometer may be varied by small increments of adjustment near either end of the potentiometer and larger increments of adjustment intermediate the ends of the potentiometer.

A further object of the invention is to provide a variable resistance device operative to control the resistance of an electrical circuit in accordance with a logarithmic law.

A still further object of the invention is to provide a potentiometer construction in which the variation in resistance takes place in accordance with a logarithmic curve gradient adjacent each end of the potentiometer and in accordance with a different law intermediate the ends.

Other and further objects of the invention will be understood from the following specification by reference to the accompanying drawings, in which:

Figure 1 is a plan view of one form in which the potentiometer construction of my invention may be embodied; Fig. 2 is a front elevation of the potentiometer construction illustrated in Fig. 1; Fig. 3 is a side elevation of the potentiometer construction shown in Fig. 1; Fig. 4 is a plan view of a modified form of potentiometer constructed in accordance with my invention; Fig. 5 is a front elevation of the modified construction shown in Fig. 4; Fig. 6 is a side elevation of the potentiometer construction illustrated in Fig. 4; Fig. 7 is an elementary diagram showing the principle of construction of my potentiometer; Fig. 8 indicates the characteristic curves obtainable in an electrical circuit employing my potentiometer; and Fig. 9, illustrates one application of my invention wherein the potentiometer is employed to regulate the grid potential for a plurality of electron tubes functioning as a radio frequency amplifier in a radio receiving apparatus.

Referring more particularly to the drawings, reference character 1 represents a panel on which the potentiometer of my construction may be mounted. A support frame 2 is secured by any suitable means such as 3 to the panel and carries an insulated band 4. This band may be semi-circular in form as represented in Fig. 1, or substantially circular as represented at 6 in Fig. 4. The band 4 in Fig. 1 is secured to the support 2 by means of screws 5 and 7 which serve as binding posts at 12 and 14 for the opposite ends of the potentiometer. These screws pass through the band 4 and are well insulated from the support 2. The band 4 is of a substantial width at its central section and throughout a central portion as represented by reference character 8, but the width of the band gradually decreases toward each end from the central section along curves 9 and 10. A resistance element comprising turns of wire 15 are wound upon the band 4 in such manner that the turns of wire within the limits of the central section enclose a relatively large area while the turns on the portion of the band toward each end enclose relatively smaller and decreasing areas. A variable contact 16 is arranged to sweep over the turns 15 on the edge of the band 4. The contact is secured by a hub portion 17 to a shaft 18 which may be rotated by means of knob 20 whereby the contact in moving over the central portion of the band 4 varies the resistance in relatively large and equal increments throughout the length of the portion 8, whereas in sweeping over the turns throughout the length of the curved portions 9 and 10 gradually decreasing increments of resistance are obtained, the increment changes decreasing as the contact moves toward each end of the band 4.

In Fig. 4 the band 6 is substantially circular and is secured in position by binding posts 21 and 22 which pass through the supporting member 23. The resistance element is wound upon this band 6, the band being of substantial width throughout the portion 24 and gradually diminishing in width near

the ends 25 and 26. The curves 28 and 29 in the band 6 on opposite sides of the portion 24 are similar to the curves 9 and 10 of the semi-circular band 4 of Fig. 2. These curves preferably follow a logarithmic law. In Fig. 7 the principle of my invention is illustrated wherein the resistance coil 15 is of relatively large width throughout a central portion and gradually decreases in width toward each end following a logarithmic law represented by curves 30 and 31. The variable contact 16 in moving along the resistance element 15 is connected to any electrical circuit where variable potentials are required. For example, as illustrated in Fig. 9, the potentiometer may be used for regulating the grid potential of electron tubes. In this diagram the radio receiving apparatus is illustrated employing an antenna ground system 32, a tuned circuit 33, and a two stage radio frequency amplifier 34, a detector 35, and a two stage audio frequency amplifier 36. The grid potential of the tubes forming the radio frequency amplifier 34 may be accurately regulated by use of my potentiometer indicated at 15 having variable contact 16. The opposite ends of the potentiometer being at opposite polarity permits a variation in grid potential by moving contact 16 from one end of the potentiometer to the other.

The characteristic curve in Fig. 8 represents the fine degrees of potential variation obtainable in my potentiometer. As the contact 16 moves along the resistance 15 increments of resistance change are secured between plus and minus potentials in accordance with a logarithmic law 37 and 38 adjacent each end of the potentiometer while within the central portion thereof the change follows a law represented by curve 39. It is of importance that the grid potential variation near the positive and negative ends of the potentiometer be quite accurate, particularly in operating tubes near negative grid potential where the condition of oscillation must be very gradually approached. My potentiometer enables very small increment changes of potential to be secured.

While I have described my invention in certain limited embodiments it is to be understood that my invention is not limited to the particular construction shown, but that various changes may be made within the scope of the appended claims without departing from the spirit of my invention.

What I claim and desire to secure by Letters Patent of the United States is:

1. A potentiometer comprising a resistance member, a variable contact for said resistance member, said resistance member being enlarged at a section intermediate the ends of said member and tapered from said intermediate section toward said ends.

2. A potentiometer comprising a resistance element, a variable contact for said resistance element, said resistance element having relatively large degrees of adjustment adjacent a central section thereof and gradually decreasing degrees of adjustment on each side of said central section toward said ends.

3. A potentiometer comprising an insulated band, said band having a central portion and a gradually tapering portion at each side of said central portion, a resistance element carried by said band, and means whereby said variable contact sweeps over said resistance element including relatively large increments of adjustment within said central portion and relatively small increments of adjustment within said tapered portion.

4. A potentiometer comprising a cylindrical band, a resistance wire carried by said band, a variable contact for said resistance wire along the edge of said band, said wire having relatively large area turns adjacent a central portion of said band and turns gradually decreasing in area toward each end of said band.

5. A potentiometer comprising an insulated band, a resistance wire wound upon said band, a variable contact arranged to sweep over said resistance element whereby the value of said resistance varies according to a straight line law within one portion of said band and a logarithmic law on each side of said portion.

6. A potentiometer comprising in combination an insulated band having one edge contained in the same plane and the opposite edge curved in accordance with a logarithmic law, a resistance wire carried on said band and a variable contact arranged to sweep over said wire on said first mentioned edge.

7. A potentiometer comprising in combination an insulated band having one edge contained in the same plane and the opposite edge oppositely curved from each end thereof in accordance with a logarithmic law, a resistance wire carried on said band and a variable contact arranged to sweep over said wire whereby the increments of resistance change throughout said curves become increasingly large as said contact approximates a position between said curves.

HOYT S. SCOTT.