July 25, 1933. J. L. BONANNO 1,919,614

FINE ADJUSTMENT FOR POTENTIOMETERS

Filed June 11, 1929

Fig. 1

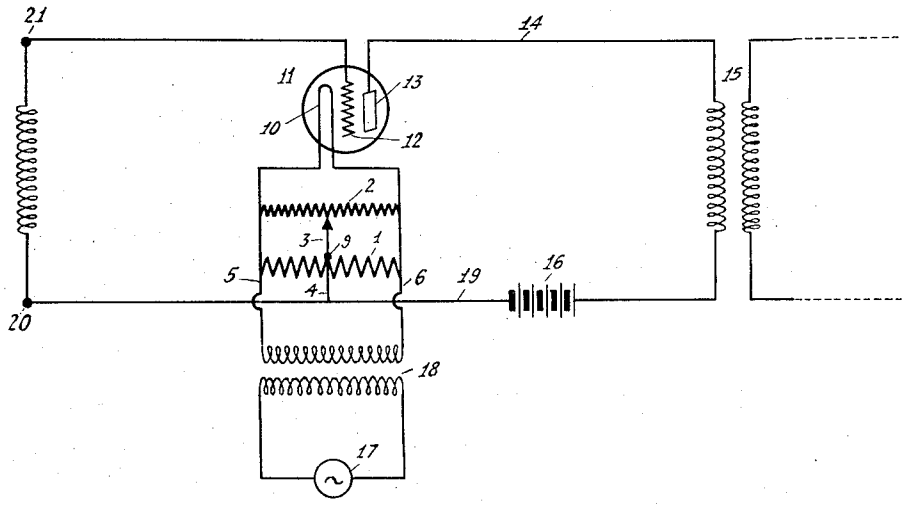
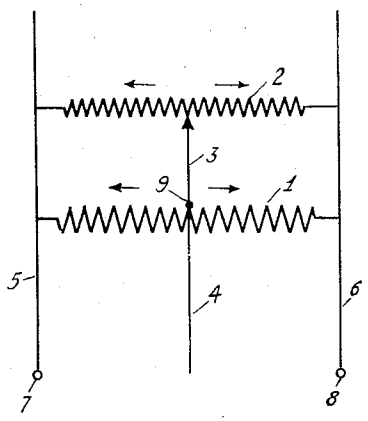


Fig. 2



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FINE ADJUSTMENT FOR POTENTIOMETERS

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My invention relates to a potentiometer which is admirably adapted for obtaining fine adjustments.

In its complete aspect my invention particularly relates to obtaining an accurate center tap on alternating current tubes in radio circuits. Certain features of the invention, however, are applicable generally to electrical systems where a potentiometer may be utilized.

The objects of my invention will be brought out in the course of the following description:

The usual center tap potentiometer such as is used at the present time for obtaining balance in alternating current tube receivers does not allow very close adjustment due to the fact that a finite number of wires are utilized. If, for example, in such a device 100 turns of wire are employed, and the contact arm of the center tap is moved to the first turn on either side of center, a voltage of 49/100 will exist between the arm and one side of the resistance. This corresponds to a 1% variation of voltage. If the turns of wire are shunted across a 1.5 volt filament as is usually the case in radio circuits it is easily calculated that this 1% variation in voltage will produce a 15 millivolt change. Such a change applied to the grid of an amplifier will produce considerable hum and in fact if additional stages of amplification are utilized for a gain in the signal strength, this hum will be amplified to the same extent as the signals with the result that pure reception is impossible. It can be seen that no smaller variation than one turn in such a device as described above and as heretofore used can possibly be obtained.

My present invention has for one of its objects to disclose a means whereby practically any value of resistance between two turns may be obtained with a result that a smooth acting resistance or potentiometer is obtained.

The novel features which I believe to be characteristic of my invention are set forth with particularity in the appended claims. The invention itself, however, as to its organization and method of operation together with any further objects and advantages thereof will best be understood by reference to the following description taken in connection with the accompanying drawing, in which;

Figure 1 represents diagrammatically an embodiment of this invention shown in connection with an electron discharge device; and,

Figure 2 diagrammatically illustrates an enlarged view of the essentials of the invention.

Referring to Figure 1 there is shown a vacuum tube 11 containing the usual heated filament 10, grid 12 and plate 13. Connected to the input terminals 20, 21 is some source of variable currents (not shown) to be amplified or rectified or otherwise operated upon in any manner. The output circuit comprises the plate 13, conductor 14, primary of transformer 15, current source 16, conductor 19 and filament 10. The secondary of the transformer 15 may be connected to any suitable apparatus adapted to utilize the output energy. The filament 10 is shown as supplied with alternating current from a generator 17 coupled through transformer 18 to the filament circuit. The usual center tap is shown by 4 as attached to the approximate center of the resistance 1 shunted across the filament. The free ends of the resistance are connected as a potentiometer across the filament tap leads 5 and 6.

Also connected to said leads 5 and 6 there is an additional high resistance 2 (see Fig. 2). Tap 4 is arranged so that it may be adjusted along any portion of resistance 1 as shown diagrammatically by the sliding contact 9. For further adjustments a conducting device or contact arm rotating about 9 as a center is conductively attached to 9 and adapted to slide along resistance 2. It is evident, therefore, that as constructed contact arm 3 rotating about 9 may be made to contact with any portion of resistance 2. The resistance 2 is preferably many times greater in value than the resistance 1. The number of times greater being determined by the fineness of adjustment desired;

the higher the resistance the finer the degree of adjustment obtainable.

At this point it is believed that a problem will illustrate the advantages of my invention. Assuming a 20 ohm center tap, resistor 1 shunted with a 200 ohm potentiometer 2, an effective resistance of 9.09 ohms each side of the center tap results when the potentiometer arm is in its central position. If as in the previous example 100 wires are used in winding the 200 ohm potentiometer, a change of one term, that is, moving the contact arm 3 to the next winding results in a resistance change of two ohms, that is, from 100 to 98 ohms. The combined resistance of the two resistors 1 and 2 to the low side is now 9.073 ohms which represents a change of only 0.19% or approximately 5 times as fine a variation as in the previous example. This represents a voltage change of 2.85 millivolts as compared with 15 millivolts obtained above. It is to be noted that one of the main features of my invention is the fact that the adjustment is completely variable and is not in any way restricted to any particular range.

While I have described a single embodiment of my invention it will be apparent to one skilled in the art that my invention is not limited in any way to the exact arrangement shown, but that many modifications may be made in the circuit arrangements and apparatus used without departing in any way from the scope of my invention as set forth in the appended claims.

I claim:

1. In a device of the kind described a pair of conductors, a low resistance for connecting said two conductors, a high resistance in parallel with said low resistance, a variable connection for said low resistance and means for connecting any portion of said low resistance to any point of said high resistance.

2. A potentiometer comprising a source of current, a relatively low resistance shunted across said source a connection to a point of said resistance, a relatively high resistance shunted across said low resistance, and means including said last named resistance for obtaining vernier adjustments of said connection along said low resistance.

3. A potentiometer comprising a source of current, a pair of conductors connected to the terminals of said source, a circuit including high and low value resistances shunted across said two conductors, a third conductor variably connected to said circuit adapted to form two conductive paths, one thereof comprising one of said pair of conductors, a portion of said circuit including certain of said high and low resistances and said third conductor and the other conductive path comprising the other of said pair of conductors, a portion of said circuit including others of said high and low resistances and said third conductor.

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