April 18, 1933. L. BRADLEY 1,904,352

ELECTRICAL RESISTOR

Filed Nov. 23, 1928 2 Sheets-Sheet 1

Fig. 1.

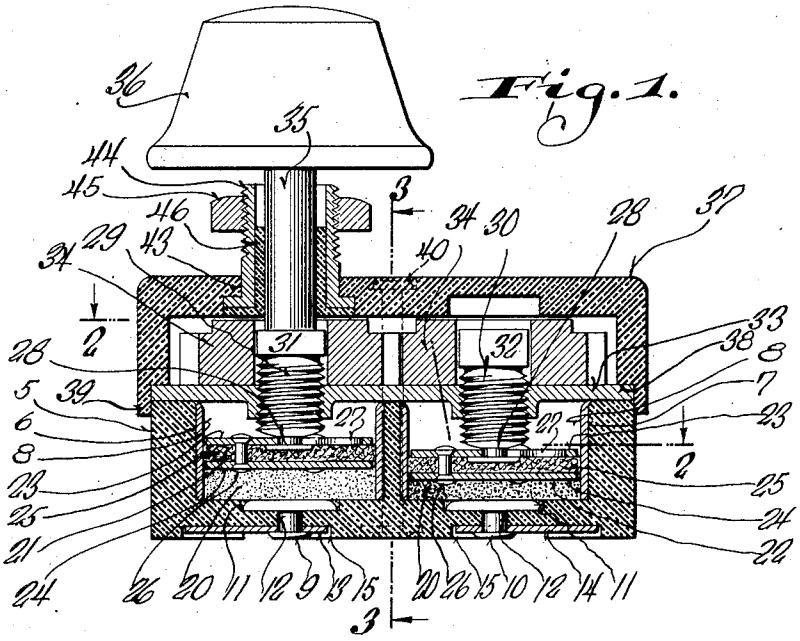
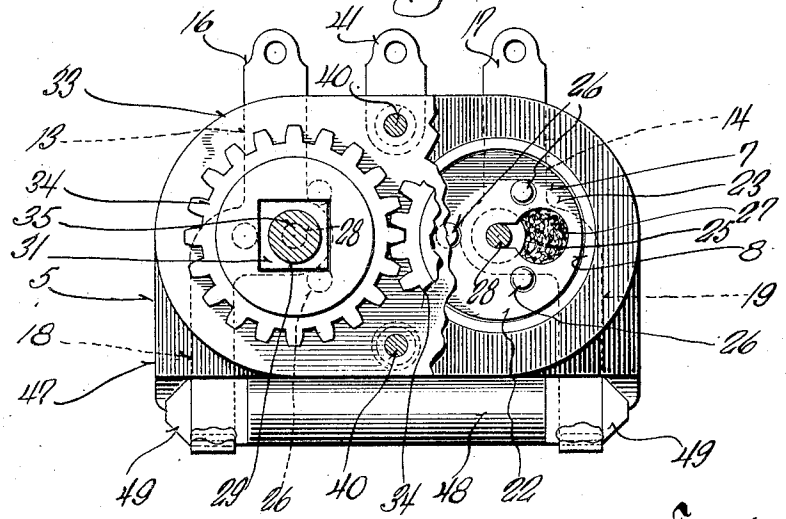


Fig. 2.



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Fig. 3.

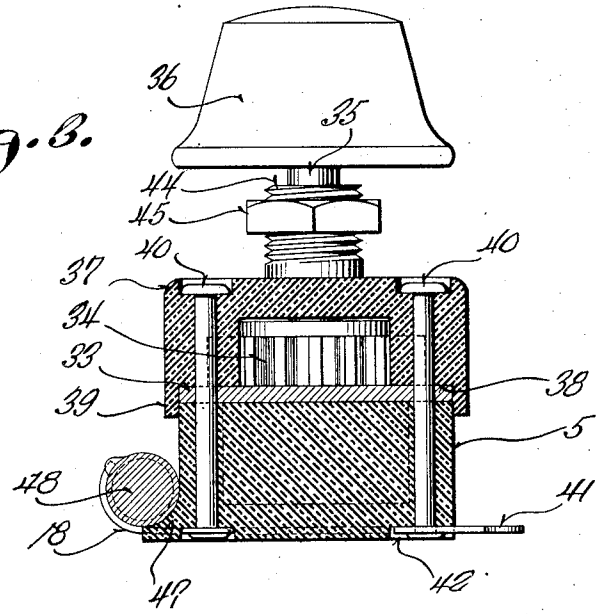


Fig. 4.

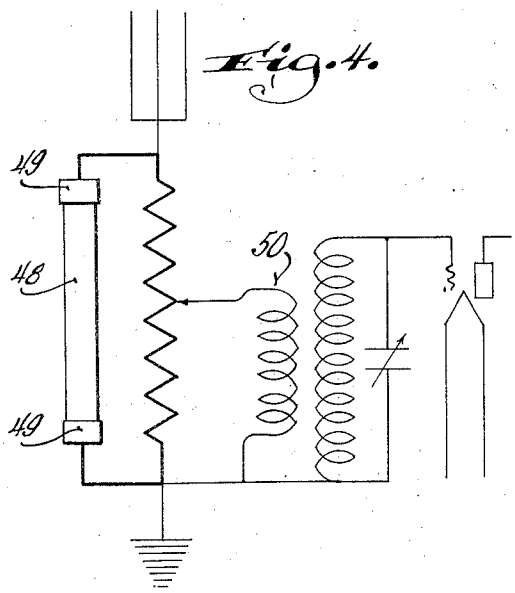
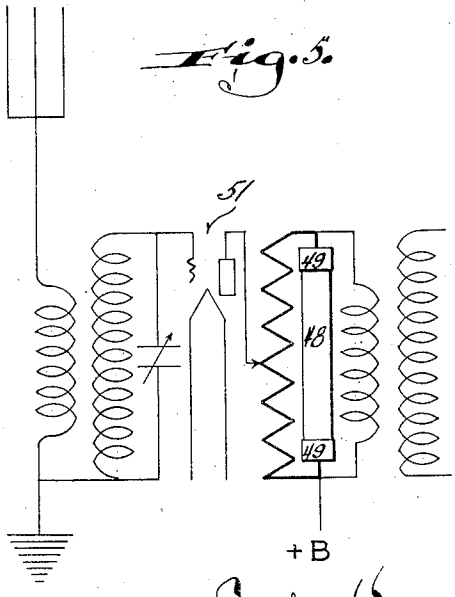


Fig. 5.



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UNITED STATES PATENT OFFICE

LYNDE BRADLEY, OF MILWAUKEE, WISCONSIN, ASSIGNOR, BY MESNE ASSIGNMENTS, TO ALLEN-BRADLEY COMPANY, OF MILWAUKEE, WISCONSIN, A CORPORATION OF WISCONSIN

ELECTRICAL RESISTOR

Application filed November 23, 1928. Serial No. 321,336.

This invention relates to certain new and useful improvements in electrical resistors adapted particularly for use as voltage dividers or potentiometers.

Many types of variable resistors adapted for use as potentiometers have been produced in the past, all of which however had an unchangeable definite ohmic limit and, therefore, this invention has as one of its objects to provide a new and improved potentiometer having means whereby its effective range may be readily adjusted.

Another object of this invention resides in the provision of a potentiometer which includes a fixed resistance the value of which is substantially equal to the mean or average resistance the potentiometer is to maintain.

Another object of this invention is to provide a potentiometer having a fixed resistance readily detachably connected across its end terminals whereby the potentiometer effective range may be varied in accordance with different requirements.

A further object of this invention resides in the provision of an improved resistor or potentiometer in which infinite variations of its resistance values may be obtained.

And a still further object of this invention resides in the provision of improved means for simultaneously and inversely varying the resistance value of the two units of a potentiometer.

With the above and other objects in view which will appear as the description proceeds, my invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the herein disclosed invention may be made as come within the scope of the claims.

In the accompanying drawings I have illustrated one complete example of the physical embodiment of my invention constructed according to the best mode I have so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a transverse, sectional view through a potentiometer embodying my invention, parts thereof being in elevation;

Figure 2 is a view taken through Figure 1 on the plane of the line 2—2 with the cover member removed;

Figure 3 is a cross sectional view taken through Figure 1 on the plane of the line 3—3;

Figure 4 is a diagrammatic view illustrating one application of my improved potentiometer, and

Figure 5 is a view similar to Figure 4 illustrating another application thereof.

Referring now more particularly to the accompanying drawings, in which like numerals designate like parts throughout the several views, 5 represents the body or housing of my improved potentiometer which is preferably formed of insulating material and has a pair of parallel wells 6 and 7 extending downwardly from its upper surface. Lining the cylindrical walls of the wells 6 and 7 are metal sleeves 8 the upper peripheries of which are flared outwardly and extend a slight distance above the top surface of the body for a purpose to be later described.

Passing through the bottoms of the wells are contact members 9 and 10 having enlarged heads received in recesses 11 in the bottoms of the wells and having stems extending through apertures 12 communicating with the recesses 11 connected at their outer ends with terminal members 13 and 14 by riveting or the like. The terminal members 13 and 14 are disposed in correspondingly shaped recesses 15 formed in the under side of the body 5, and extend beyond the opposite sides of the body to provide terminal lugs 16 and 17 on one side and resistor supports 18 and 19 on the other side for a purpose later described.

Resistor elements 20 in the form of powdered material having the desired degree of conductivity are positioned in the wells 6 and 7 to be selectively compressed by plungers 21 and 22 working in the wells 6 and 7 respectively, to vary their resistance. The plungers each consist of spaced discs 23 and 24 having a felt or other like disc 25 of greater diameter therebetween to frictionally engage the sleeves 8 in the wells and prevent rotation of the plungers, the plunger units being held together by rivets or the like 26. The upper disc 23 of each plunger is provided with a key hole slot 27 in which the grooved ends 28 of actuating members 29 and 30 are engaged, to provide means for longitudinally moving the plungers.

The actuating members 29 and 30 consist of micrometer screws having square heads 31 and 32, respectively, and threaded in suitable apertures in a plate 33 positioned across the top of the body 5 and closing the wells 6 and 7; and the flared peripheries of the metal linings 8 of the wells being disposed slightly above the top of the body member are thus electrically connected with the metal plate 33.

The square heads 31 and 32 of the actuating members 29 and 30 are slidably received in square openings in meshed pinion gears 34 and the actuating member 29 has a stem 35 extending outwardly to mount a knob or the like 36 whereby simultaneous and opposite rotation of the actuating members threads one into and the other out of its respective aperture in the plate 33. As the direction of rotation of the actuating members 29 and 30 is at all times opposite, it will be readily apparent that when one is threaded into its aperture to compress the resistor element within its well, the other is threaded outward of its aperture to relieve the pressure on the resistor element within its respective well, thus decreasing the resistance of one well and increasing the resistance of the other.

A cover member 37 having the lower edge of its side walls recessed to provide a shoulder 38 and a peripheral flange 39 is fitted over the plate 33 with its flange extended therebelow to engage over the adjacent upper edge of body 5 and maintain the parts against shifting, rivets or other means 40 extending through aligned apertures in the cover, plate 33 and the body 5 retain the several parts in their proper assembled position.

The rivet 40, positioned at that side of the device from which the terminals 16 and 17 project, preferably has a tight fit in the plate 33 to form an electric contact therewith and a neutral or middle terminal 41 disposed in a recess 42 formed in the under side of the body member forms a washer for the lower end of the rivet and is thus electrically connected therewith and through the plate 33 with the metal sleeves 8 in the wells 6 and 7.

The cover member is apertured in axial alignment with the well 6, as at 43, to receive a mounting bushing 44 adapted to be passed through an aperture in a panel, not shown, to which the device is secured by a clamp nut 45 threaded on the bushing 44. The bushing 44 is insulated from the stem 35 which passes therethrough by a flanged sleeve 46 of insulating material and disposed within the bushing 44.

The resistor supports 18 and 19 of the terminal members 13 and 14 are directed upwardly as continuations of an arc forming the top of a shoulder 47 extended from the adjacent side of the body 5 to receive a fixed resistance unit 48, the ends 18 and 19 being in electrical connection with the unit terminals 49. The value of the resistance unit is such as to be substantially equal to the mean or average resistance the potentiometer is intended to maintain and in this manner it is only necessary to replace the unit 48 to change the range of the device, which, therefore, provides the potentiometer with an unlimited range.

The circuit from the middle terminal 41 to either of the terminals 16 and 17 is through the adjacent rivet 40, the plate 33, to the cups 8, through the resistance units 20 within the wells, where the value of the current is adjusted, and through the contact members 9 and 10 to the terminals 16 and 17.

The uses to which a device of this nature may be adapted are numerous and in Figure 4 one method is illustrated in which the device is used as a volume control for radio circuits. In this instance, the terminals 16 and 17 are connected with the antennæ and ground respectively and the middle terminal 41 is connected with one side of the primary coil 50 of the first radio frequency transformer of the circuit. As the circuit illustrated is of conventional design and forms no part of this invention a detailed description thereof is deemed unnecessary. In Figure 5, another similar mode of application is illustrated in which the device is connected in series with the plate voltage of the first thermionic tube 51.

From the foregoing description, taken in connection with the accompanying drawings, it will be readily apparent to those skilled in the art to which an invention of the character described appertains, that I provide a new and novel potentiometer or variable resistor which functions efficiently throughout practically an unlimited range and in which infinitely small variations of the resistance values of its two circuit branches may be obtained.

What I claim as my invention is:

1. A potentiometer, comprising two variable resistors electrically connected at one of their ends and having their resistances variable under pressure, means for simultaneously and inversely varying the resistances of said

resistors, a fixed resistor, and common terminals for the other ends of the variable resistors and the fixed resistor whereby the fixed resistor electrically bridges said other ends of the variable resistors, said common terminals being adapted to have conductors attached thereto to connect the potentiometer in an electric circuit, and said fixed resistor having a resistance value to adapt the potentiometer to a particular circuit requirement.

2. A potentiometer comprising a body member having a pair of wells, a resistance element disposed in each well and composed of compressible material the resistance of which is adjustable by pressure, plungers movable into and out of said wells for applying various degrees of pressure to said elements, means for simultaneously and oppositely moving the plungers, contact members electrically connected with the resistance elements within the wells, and a fixed resistor carried by and electrically connected with the contact members whereby the value of the fixed resistor defines the effective resistance value of the potentiometer, said contact members being adapted to have conductors connected therewith to connect the potentiometer in an electric circuit, and the value of the fixed resistor being chosen to adapt the potentiometer to a particular circuit requirement.

3. In a rheostat, a supporting body, an adjustable resistor element carried by the supporting body, terminals for the adjustable resistor element projecting from one side of the supporting body, and a fixed resistance element supported jointly by the terminals and said side of the body, the terminals being adapted to have conductors connected therewith for connecting the rheostat in an electric circuit, and said fixed resistance element being electrically connected with the terminals to define the overall value of the rheostat and adapt the same to a particular circuit requirement.

4. In a potentiometer, spaced terminals, two electrical resistors, one connected with each terminal, means to simultaneously and oppositely vary the individual resistance of said resistors and connect the resistors in series across the terminals so that the sum of both is always constant, and a fixed resistance mounted on the potentiometer and connecting the terminals to define the effective resistance across the terminals.

5. A potentiometer comprising a supporting member having spaced pockets, spaced terminals each having a portion extending into one pocket, a variable resistance element in each pocket in electrical connection with the terminal part therein, a cover to close the pockets, means carried by the cover to simultaneously and oppositely vary the individual resistance of said resistance elements and connect the resistance elements in series across the terminals so that the sum of both is always constant, and a fixed resistor mounted on the outside of the supporting member and electrically bridging the spaced terminals to define the effective resistance across the terminals, the value of said fixed resistor being chosen to adapt the potentiometer to a particular circuit requirement.

In testimony whereof I have hereunto affixed my signature.

LYNDE BRADLEY.