July 11, 1933. R. P. MATTERN 1,918,050

METHOD OF MANUFACTURING RESISTOR UNITS

Filed Feb. 28, 1930

Fig. 1.

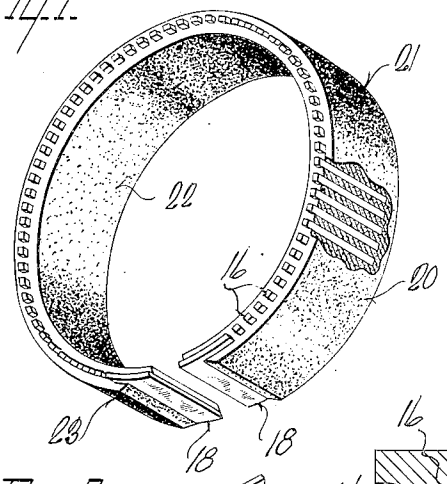


Fig. 2.

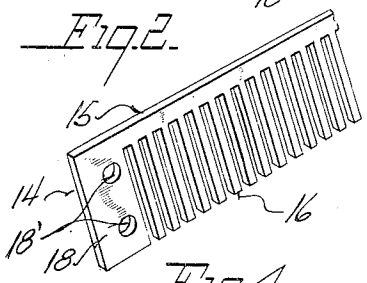


Fig. 3.

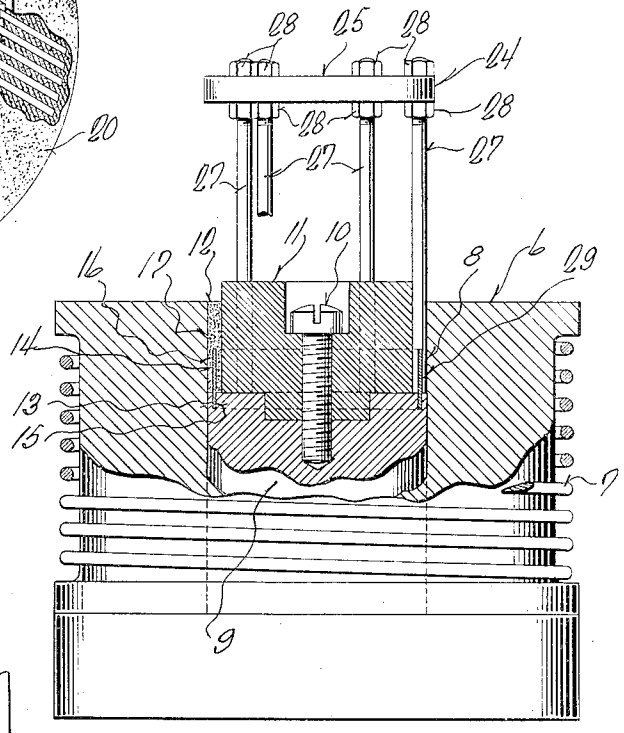


Fig. 4.

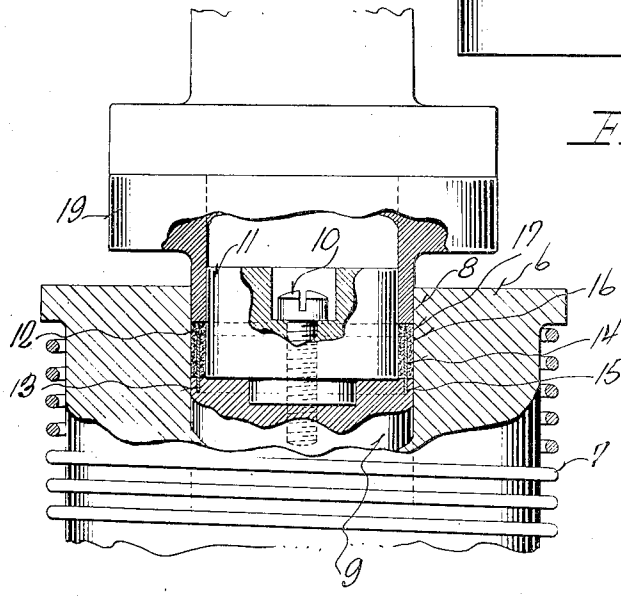
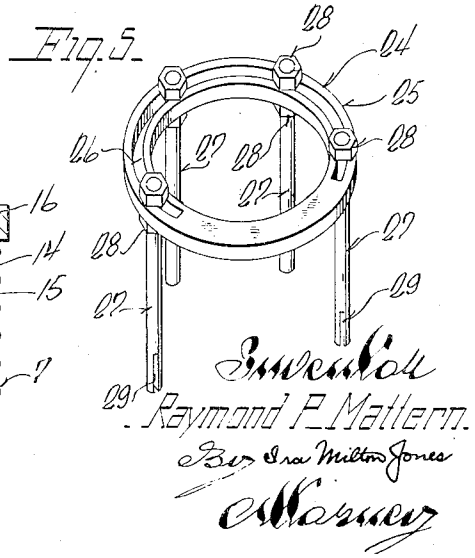


Fig. 5.



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UNITED STATES PATENT OFFICE

RAYMOND P. MATTERN, OF WAUWATOSA, WISCONSIN, ASSIGNOR, BY MESNE ASSIGNMENTS, TO ALLEN-BRADLEY COMPANY, OF MILWAUKEE, WISCONSIN, A CORPORATION OF WISCONSIN

METHOD OF MANUFACTURING RESISTOR UNITS

Application filed February 28, 1930. Serial No. 432,211.

This invention relates to certain new and useful improvements in resistor units of the type illustrated in my co-pending application Serial No. 432,210, filed February 28, 1930, which issued as Patent 1,877,926, Sept. 20, 1932, and refers more particularly to the method of making the same.

The resistor unit comprises a substantially ring like member molded of material having high resistivity, and which, to provide good electrical contact between it and a contact member movable thereover, has contact members of low resistance embedded therein, and it is an object of this invention to provide a simplified and efficient manner of forming resistor units of this type.

Another object of this invention is to provide a novel construction for and method of forming resistor units of the character described whereby absolute stability is assured throughout the life of the unit.

And a further object of this invention resides in the provision of a novel method of forming resistor units of the character described which materially reduces the cost of production and enables the manufacturer to more easily meet competition.

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 drawing, 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 perspective view of a completed resistor unit constructed in accordance with my invention;

Figure 2 is a perspective view of a portion of a comb from which the embedded terminal members are formed;

Figure 3 is a view partly in elevation and partly in section of a forming press illustrating one step in the formation of the unit;

Figure 4 is a view similar to Figure 3 illustrating the manner of compressing the powdered resistance material, and

Figure 5 is a perspective view of a novel divider structure whereby the mold may be divided into separated compartments to facilitate the molding of the unit in sections having different degrees of resistivity.

Referring now more particularly to the accompanying drawing in which like numerals designate like parts throughout the several views, the numeral 6 represents the base of a mold or female die block which is preferably cylindrical and has a heating coil 7 wound thereon. A central bore 8 extends through the base 6 to receive a removable plug 9, the top of which, when in position, is spaced beneath the top surface of the base, and secured to the top of the removable plug 9 by a screw 10 is a smaller block or cylindrical member 11, the diameter of which is less than the diameter of the bore 8 to define an annular recess or channel 12 which forms a mold for the unit.

The bottom of the annular channel 12 has a narrow groove 13 formed therein medially of its sides to receive and support a metal comb member 14. The comb member is positioned in the annular channel or mold with its back or closed edge 15 disposed in the groove 13 so that its tines or prongs 16 project upwardly to be embedded in powdered material 17 with which the mold is filled and which, upon being compressed, forms the resistor unit, and to increase the intimacy of contact between the prongs and the powder, the entire comb is silver plated and coated with the deflocculated graphite, previous to its insertion in the mold. If desired ordinary graphite may be employed in place of deflocculated graphite.

The overall length of the comb is such that when placed in the groove 13, its ends 18 are spaced slightly from each other. It is noted that the ends 18 have apertures 18′ to increase the bond between them and the molded material. With the comb in position the powdered material is poured or otherwise inserted into the mold, tamped down, and then compressed by means of a male die 19, as illustrated in Figure 4, and while in compression, is baked by heat from the coil 7.

After having been baked a sufficient period of time, the formed unit is removed from the die or mold and the back of the comb is cut away leaving the prongs projecting a slight distance beyond the adjacent face of the unit to form a plurality of contact points which

provide a good electrical contact between the resistor unit and the movable contact arm of a rheostat or similar instrument with which the unit is used.

The resistance material between the end portions 18 of the comb and part of that which covers the outer surface of the said end portions is preferably removed to provide means to which terminal conductors, not shown, may be soldered. It is noted that the prongs or tines 16 are substantially entirely embedded in the unit and have only one end slightly projected therefrom, thus providing a maximum area of contact between the prongs and the unit, and as they are securely held against shifting during the formation of the unit, perfect contact between them and the resistance material and their proper spacing will be assured. Furthermore, the comparatively small cross sectional area of the prongs and the fact that they are straight and parallel with the sides of the unit reduces internal stresses to a minimum and insures permanent stability throughout the life of the unit.

If desired the unit may comprise sections having different degrees of resistivity, and the unit illustrated in Figure 1 of the drawing consists of four sections 20, 21, 22 and 23 depicted by a difference in shading. To facilitate the formation of a sectional unit, a novel powder divider 24 is provided, which is best illustrated in Figure 5.

The divider consists of an annular ring 25 having an annular recess 26 extending throughout the major portion of its circumference and in which a number of studs or stems 27 are adjustably secured by means of nuts 28. The diameter of the recess in which the studs or stems 27 are secured, coincides with that of the annular channel or mold 12 so that the lower ends of the stems are readily receivable in the mold. Slots 29 in the stem ends permit their extension over the upwardly extending prongs of the comb.

The diameter of the stems 27 is substantially equal to the width of the channel or mold to effectively divide the same into spaced compartments and the extension of the stem ends over the upwardly projecting prongs of the comb aids in maintaining the comb in its proper position. With the divider in position, the different powdered materials are placed in their respective compartments, and after being tamped down, the divider is replaced by the male die 19 to permit the compression of the powders as illustrated in Figure 4.

It will be noted that this manner of dividing the resistor unit into sections having different degrees of resistivity obtains the desired division without a sharp break between the adjacent sections as the powders merge with each other and fuse during their compression.

After the unit is completed in the manner hereinbefore described, it is preferably impregnated with wax or other similar material to make the same impervious to moisture.

From the foregoing description, taken in connection with the accompanying drawing, it will be readily apparent to those skilled in the art to which an invention of the character described appertains, that I provide a resistor unit of novel construction, and a simple and economical method of forming the same.

What I claim as my invention is:

1. The hereindescribed method of forming a rheostatic resistor which comprises, silver plating a metallic comb, inserting the metallic comb in a mold, molding materials having high resistivity entirely about the prongs of the comb, and cutting away the back of the comb whereby its prongs are exposed from the molded material to provide contact surfaces.

2. The hereindescribed method of forming a rheostatic resistor which comprises coating a metallic comb with graphite, inserting the metallic comb in a mold, molding materials having high resistivity about the prongs of the comb, and cutting away the back of the comb whereby its prongs are exposed from the molded material to provide contact surfaces.

3. The hereindescribed method of forming a rheostatic resistor which comprises, silver plating and coating a metallic comb with graphite, inserting the metallic comb in a mold, molding materials having high resistivity about the prongs of the comb, and cutting away the back of the comb whereby its prongs are exposed from the molded material to provide contact surfaces.

4. The hereindescribed method of forming a rheostatic resistor, which comprises coating a comb member having intermediate prongs and end terminal portions with material of low resistance value, molding material of high resistance value about the comb, cutting away the back of the comb whereby its prongs are electrically disconnected save for the intervening low and high resistance materials and their outer ends are exposed from the molded material to provide a plurality of successive contact surfaces, and exposing the sides of the terminal end portions for connection therewith of conductors.

In testimony whereof I have hereunto affixed my signature.

RAYMOND P. MATTERN.