

June 12, 1934.

G. O. WILMS

1,962,673

ELECTRICAL RESISTOR

Filed Nov. 24, 1930

2 Sheets-Sheet 1

FIG. 1.

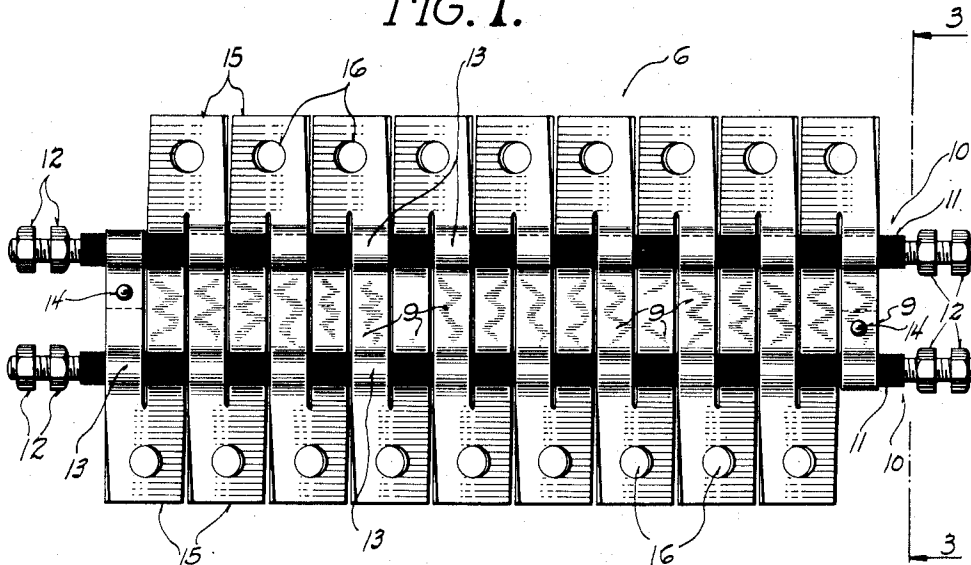


FIG. 2.

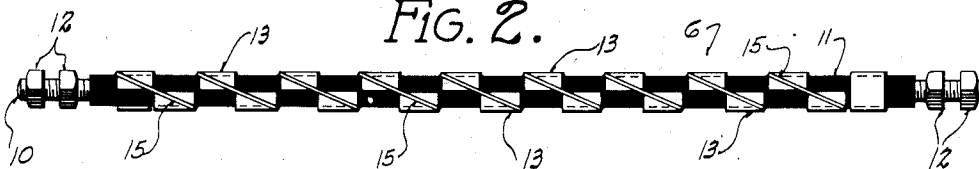
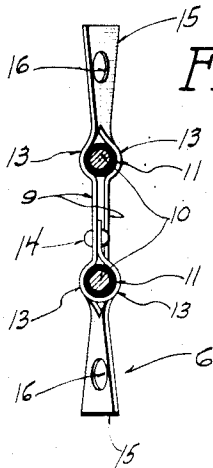


FIG. 3.



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FIG. 4.

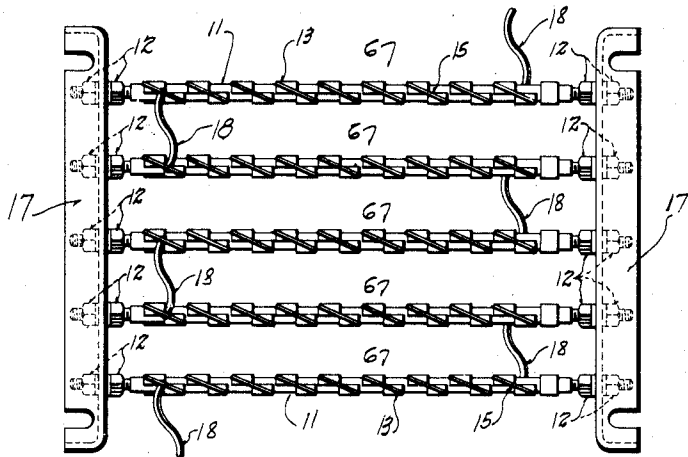


FIG. 5.

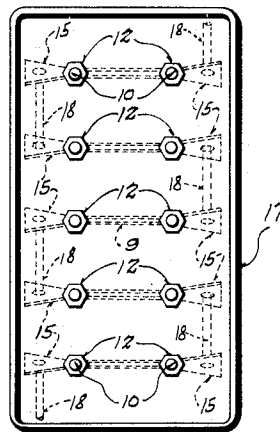
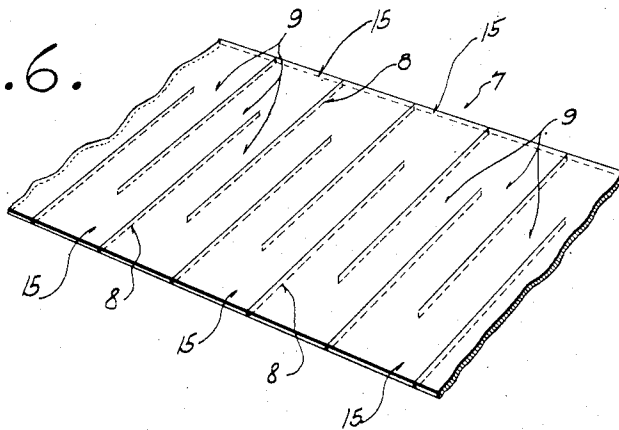


FIG. 6.



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1,962,673

ELECTRICAL RESISTOR

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Application November 24, 1930, Serial No. 497,775

1 Claim. (Cl. 201—69)

This invention relates to certain new and useful improvements in electrical resistors and particularly to fixed resistance units used with motor control apparatus.

Heretofore units of this type consisted of grids of cast iron or other metal having the desired degree of ohmic resistance, but this construction was costly and objectionable in that it resulted in a cumbersome and bulky unit very susceptible to breakage and lacking in flexibility of installation. Such cast grids were also objectionable for their lack of proper radiation.

The shortcomings of resistors of this type were recognized and attempts have been made to overcome these objections, but all devices so far proposed have been entirely too costly.

It is therefore an object of this invention to provide a durable and economically manufactured electrical resistor suitable for the purpose stated.

A further object of this invention is to reduce the cost of resistors of the character described by forming them entirely of sheet metal.

Another object of this invention is to provide a resistor of the character described which has a large radiating surface to efficiently dissipate heat incidental to the passage of current there-through.

Another object of this invention is to provide a resistance unit of the character described which is flat to facilitate stacking of a number of units to be connected in series or in parallel.

A further object of this invention is to provide a resistor of the character described which has convenient means for attaching conductors at any portion thereof, formed integral therewith.

And another object of this invention resides in the method of constructing or forming electrical resistors of strips of sheet metal.

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 claim, 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 claim.

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 plan view of an electrical resistance unit constructed in accordance with my invention;

Figure 2 is a side view of the unit illustrated in Figure 1;

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

Figure 4 is a side view of a block of resistance units shown in Figure 1 illustrating the manner of stacking them;

Figure 5 is an end view of the structure shown in Figure 4; and

Figure 6 is a fragmentary, perspective view illustrating a strip of sheet metal showing its appearance after it is punched and before it is formed into the finished resistance unit.

Referring now more particularly to the accompanying drawings, it is seen that the resistor, designated generally by the numeral 6 is formed entirely of sheet metal. In forming the resistor, a strip of sheet metal 7, see Figure 6, is cut as at 8 alternately from opposite sides to divide the strip into a plurality of sections 9 connected alternately at opposite ends. The intermediate portions of the sections 9 are pressed alternately downwardly and upwardly to permit a pair of mounting rods 10 to be woven therebetween, as illustrated in Figure 1. The rods 10 have insulating sleeves 11 extending throughout substantially their length to electrically insulate the sections 9 therefrom, and the ends of the rods are threaded to receive nuts 12.

After the mounting rods 10 are interwoven between the oppositely directed sections 9, the intermediate portions of the sections are pressed down over the rods, as at 13, see Figure 3, to secure the rods against shifting, but it is noted that sufficient space is left between the adjacent edges of the sections to provide electrical clearance. The endmost sections 9 are folded over the adjacent rods 10 and riveted in place as at 14.

The metal 15 at the ends of the sections 9 between the cuts 8 and by which adjacent sections are connected, provides a terminal for each section, and to facilitate the attachment of conductor wires thereto, apertures 16 are formed therein. Preferably the terminals or connecting portions 15 are twisted at an angle to the longitudinal axis of the unit, as best shown in Figure 2, to insure sufficient electrical clearance therebetween. The sections 9 thus form a zigzagging current path between the ends

of the unit or between any two spaced terminal members 15.

The slots 8 may be cut into the blank sheet in any desired manner and a very simple and efficient method is to feed the blank, as a strip, to a punch press or other suitable machine having means for cutting the slots. The material may be unreeled from a roll as it is fed to the press, so that a continuous manufacturing operation is possible and wasting of material precluded.

Punched or slotted strips of materials having different degrees of ohmic resistance may be carried on hand and in this manner units of any practical resistance requirements may be quickly and economically manufactured by merely cutting the slotted strips to the necessary lengths and mounting the cut lengths on the supporting rods in the manner hereinbefore described.

This construction, as will be readily apparent, has numerous advantages over the grid structures heretofore used as resistors in motor control apparatus, as it provides a substantial and non-breakable unit of small dimensions, and the fact that it is formed entirely of sheet metal gives it a large capacity for heat radiation. It is also possible with this unit to obtain a relatively high degree of resistance in a comparatively small space, and by the use of different materials various degrees of ohmic resistance may be had without changing the over-all physical dimensions of the unit.

The fact that the unit is flat greatly facilitates stacking or combining a number of individual units in a single structure and in Figures 4 and 5 one method of combining or stacking a

number of units is illustrated. As herein shown, the ends of the mounting rods 10 are passed through suitable apertures formed in end plates or supports 17 and by means of the nuts 12 are secured thereto.

With this arrangement, connection of the units in series or in parallel is a simple matter and in Figure 4, conductors 18 are shown connecting the units in series.

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 novel and extremely simple electrical resistor particularly adapted for use with motor control apparatus which may be easily manufactured at a low cost, is substantial and nonbreakable, and has numerous advantages not found in resistors heretofore proposed for this purpose.

What I claim as my invention is:

An electrical resistor comprising, a sheet of metal having the desired ohmic resistance and having cuts extending partially therethrough alternately from opposite sides to provide a plurality of adjacent sections connected alternately at opposite ends, supporting rods extending transversely across the sections and disposed in said cuts, tubular rigid self-supporting insulators on the rods to electrically space the intermediate portions of adjacent sections, and the connecting end portions having apertures to afford terminal means for the attachment of external conductors at different points in the length of the unit.

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