March 27, 1956 R. O. PERRINE ET AL 2,740,033

ELECTRICAL RESISTOR UNITS

Filed Aug. 27, 1952 2 Sheets-Sheet 1

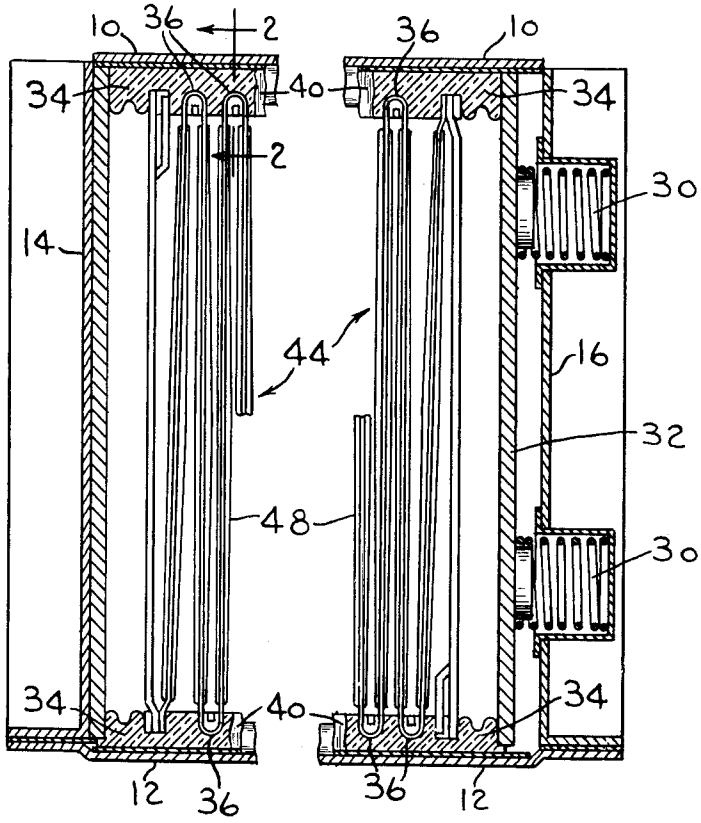


FIG. 1

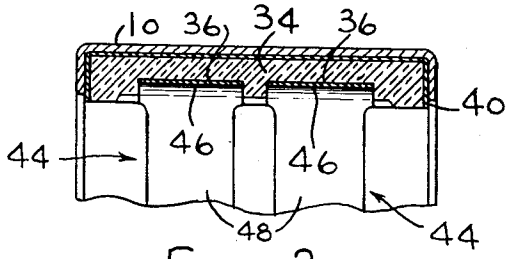


FIG. 2

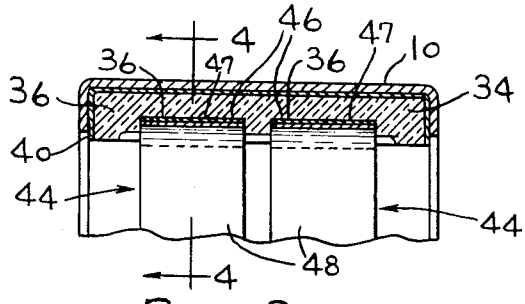


FIG. 3

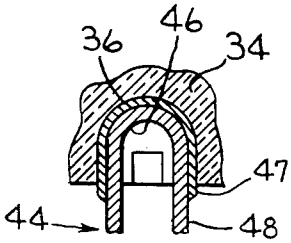


FIG. 4

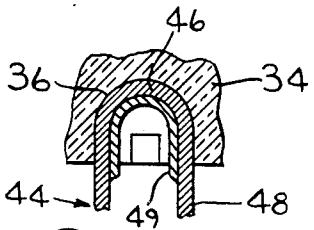


FIG. 5

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ELECTRICAL RESISTOR UNITS

Filed Aug. 27, 1952 2 Sheets-Sheet 2

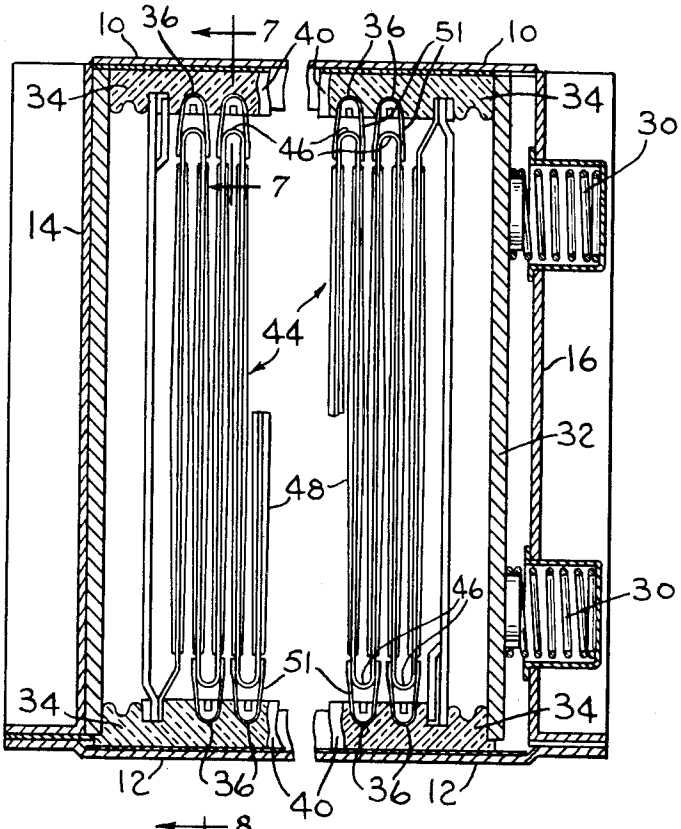


FIG. 6

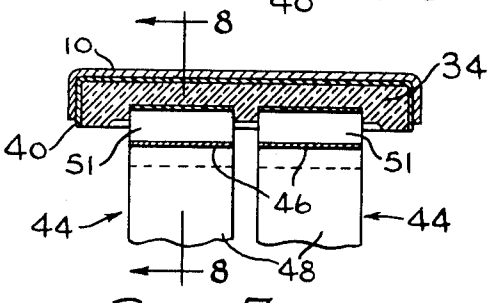


FIG. 7

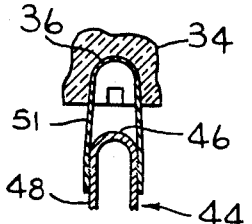


FIG. 8

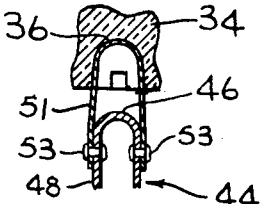


FIG. 9

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ELECTRICAL RESISTOR UNITS

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Application August 27, 1952, Serial No. 306,576

8 Claims. (Cl. 201—74)

This invention relates to improvements in electrical resistor units, particularly of the type used in the dynamic braking of electric motors.

Resistors of this type are described and claimed in the patent of Clarence W. Kuhn and Jerome B. Welch, No. 2,680,178, granted June 1, 1954, for Resistor Unit and Method of Making the Same, and assigned to the same assignee as the present application. The capacity of such units is limited, however, by overheating occurring in the loops or reflexes of the grid and in the insulators where such loops are usually supported.

It is the object of this invention therefore to provide a resistor in which overheating in the loops of the grid and the insulator where such loops are supported is prevented and the capacity of the resistor increased without appreciable increase in physical dimensions.

This object is obtained by increasing the cross sectional area of the loop of the grid to lessen the resistance at such loop and thereby decrease overheating of both loop and insulator, and hence prevent any damaging overheated areas in such loops or insulators.

The novel features which are considered characteristic of the invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and its method of operation, together with additional objects and advantages thereof, will best be understood from the following description of specific embodiments when read in connection with the accompanying drawings in which:

Figure 1 is a horizontal plane sectional view of the first form of a resistor embodying the present invention;

Fig. 2 is an enlarged fragmentary sectional view taken on the line 2—2 of Fig. 1;

Fig. 3 is an enlarged fragmentary sectional view similar to Fig. 2 of a second form of a resistor embodying the present invention;

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 3;

Fig. 5 is an enlarged fragmentary sectional view similar to Fig. 4 of a third form of a resistor embodying the present invention;

Fig. 6 is a horizontal plane sectional view of the fourth form of a resistor embodying the present invention;

Fig. 7 is an enlarged fragmentary sectional view taken on the line 7—7 of Fig. 6;

Fig. 8 is a sectional view taken on the line 8—8 of Fig. 7; and

Fig. 9 is an enlarged sectional view similar to Fig. 8 of a fifth form of a resistor embodying the present invention.

In all of the forms of the resistor shown and described the metal frame has side channels 10 and 12, end plates 14 and 16, pressure plate 32 and compression springs 30 all identical in structure and function with the frame disclosed in the aforesaid Patent No. 2,680,178. In all forms the grid 44 except for differences hereinafter particularly described is of the same construction as that

described and claimed in said Patent No. 2,680,178. In all of the forms shown (Figs. 1 to 9, inclusive) the insulators 34 are the same as those of said Patent No. 2,680,178 and have spaced grooves 36 adapted to hold the reflexes or loops 46 of the grid 44. As in said Patent No. 2,680,178, a sheet of mica 40 or other like insulating material is placed between the metal frame and the insulators 34.

To prevent overheating of the loops or reflexes 46 and of the insulators 34 at the supporting grooves 36 the grid 44 is constructed so that the cross sectional area of the loops 46 is larger than the cross sectional area of the transverse lengths 48. In the first form shown in Figs. 1 and 2 such increased cross sectional area is provided primarily by making the loops 46 of greater width than the lengths 48. This may be accomplished by notching out the ribbon between loop areas to produce narrower lengths. It can also be done by cold stretching the ribbon between such loop areas before forming loops to elongate and narrow the lengths or the same step may be done while the ribbon is heated to plastic temperature. Instead of stretching the ribbon between the loop areas, the ribbon may be held at the lengths and the loop areas thickened and widened by compressing such loop areas longitudinally. In the stretching process a slightly greater original ribbon thickness is used so that upon the stretching the desired thickness at the lengths will be obtained. In the compressing method ribbon of the required thickness of the lengths 48 is used.

In the second form (Fig. 4) a metal layer 47 is applied to the outside of the loops 46. This cuts down resistance through such loops and decreases the amount of heat generated in such loops and conducted to the insulators 34 at the grooves 36. The layer 47 may be applied by chrome plating, tin bronze brazing, or any like process. The layer 47 may be a plate of stainless steel which is spot welded to the ribbon at the reflex areas before such areas are formed. Such spot welding is preferably annealed before the ribbon is formed in the reflexing machine.

In the third form (Fig. 5) a copper shunt 49 is brazed to the inner side of the loops 46. This provides a high conductive path at the loops, thus lessening the heat in the loops and insulators.

A characteristic of the forms aforedescribed is the supporting of the loops 46 within the grooves 36 of the insulators 34. In the forms hereinafter described the loops 46 are supported by metal clips, brackets or hangers extending between the insulators and loops. These brackets are so constructed as to keep the loops 46 out of heat conducting contact with the insulators to thus place such loops in the same cooling air stream as the lengths 48 and to serve as an electrical shunt for said loops as above described for certain forms. This avoids the heat insulation of the loops by the insulators and enables the loops to lose heat as rapidly as the remainder of the grid. It also subjects the loops to less current flow due to the shunting effect of the brackets, thereby decreasing the heat generated in said loops by current flow.

In the fourth and fifth forms the insulators 34 and grooves 36 are of the same design as those of said Patent No. 2,680,178. However, the use of brackets lessens the effective length of the lengths 48 and in some applications it may be necessary to slightly lengthen the end plates 14 and 16 to produce a comparable resistance.

In the fourth form (Figs. 6, 7 and 8) a bracket 51 consisting of a U-shaped metal piece has legs straddling and spot welded to the loop 46 and a bridge portion seated in the groove 36. Current is carried by the bracket 51 and hence the degree of heat generated in loop 46 is substantially reduced. Thus the insulator 34 will not

be excessively heated and the loop 46 being held out away from the insulator in the cooling air stream for the grid 44 will not get hotter than the lengths 48.

The fifth form (Fig. 9) is the same as the fourth form except that the bracket 51 is secured by rivets 53 to the sides of the loop 46. This eliminates the spot welding and the attendant heat treatment.

Although several embodiments of the invention are shown and described herein it will be understood that this application is intended to cover such other changes or modifications as come within the spirit of the invention or scope of the following claims.

We claim:

1. A forced-air-cooled resistor having oppositely positioned insulators, a ribbon type grid resistor having loops and positioned between said insulators, and means for supporting said loops and for preventing overheating in said loops, said means including grooves in said insulators in which said loops are mounted, said loops having means to effect less resistance to electrical current flow therein than in the remainder of said grid resistor.

2. A forced-air-cooled resistor having oppositely positioned insulators, a ribbon type grid resistor having loops and positioned between said insulators, and means for supporting said loops and for preventing overheating in said loops, said means including grooves in said insulators in which said loops are mounted, said loops having a greater cross sectional area than the remainder of said grid resistor.

3. A forced-air-cooled resistor as claimed in claim 2 in which said loops have a larger width than the width of the remainder of said grid resistor to provide said larger cross sectional area.

4. A forced-air-cooled resistor as claimed in claim 2 in which said loops have a greater thickness than the thickness of the remainder of said grid resistor to provide said larger cross sectional area.

5. A forced-air-cooled resistor as claimed in claim 3 in which said loops have metal layers of higher conductivity than said loops applied to said loops to cut down resistance through said loops.

6. A forced-air-cooled resistor as claimed in claim 3 in which said loops have metal layers of higher conductivity than said loops applied to the outside of said loops to cut down resistance through said loops.

7. A forced-air-cooled resistor as claimed in claim 3 in which said loops each have a copper shunt brazed to the inner side thereof to cut down resistance through said loops.

8. A forced-air-cooled resistor having oppositely positioned insulators with grooves adapted to receive the loops of a ribbon type grid resistor, and a ribbon type grid resistor having loops mounted in said grooves to hold said grid resistor, said loops having a larger cross sectional area than the other portions of said grid resistor whereby resistance generated heat in said loops is less than that generated in said other portions of said grid resistor.

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