Feb. 17, 1959 C. W. KUHN ET AL 2,874,257

ELECTRICAL RESISTOR UNITS

Filed Aug. 27, 1952 2 Sheets-Sheet 1

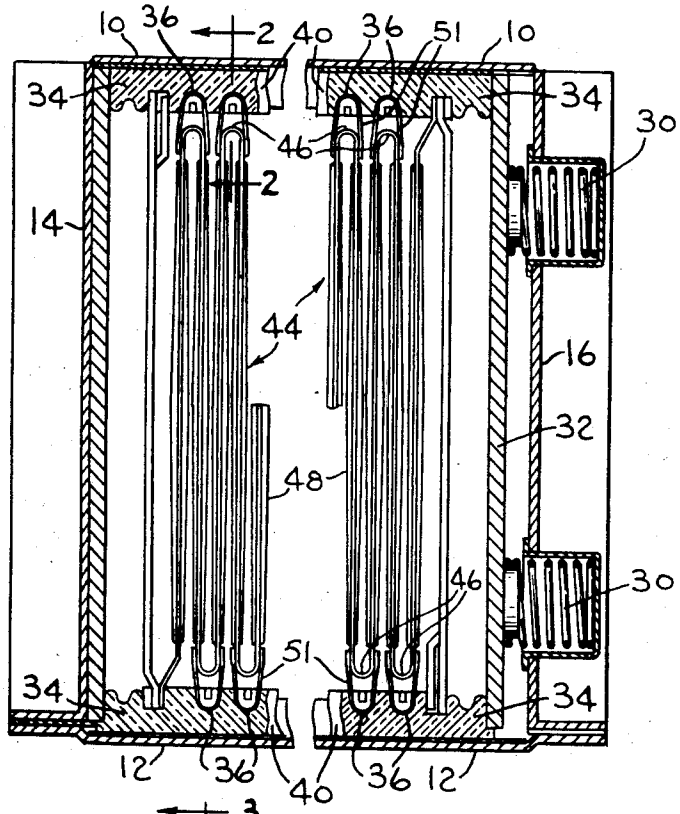


FIG. 1

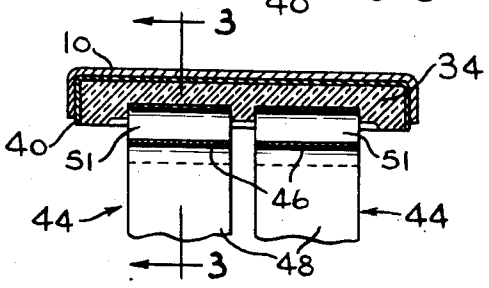


FIG. 2

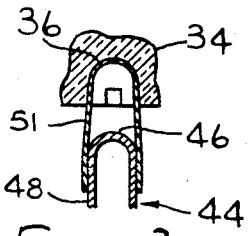


FIG. 3

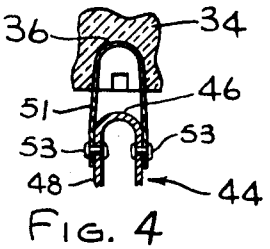


FIG. 4

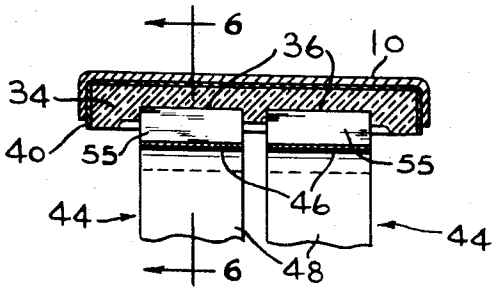


FIG. 5

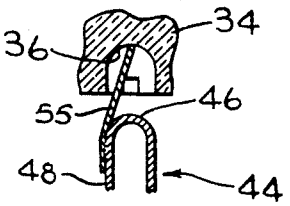


FIG. 6

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2 Sheets-Sheet 2

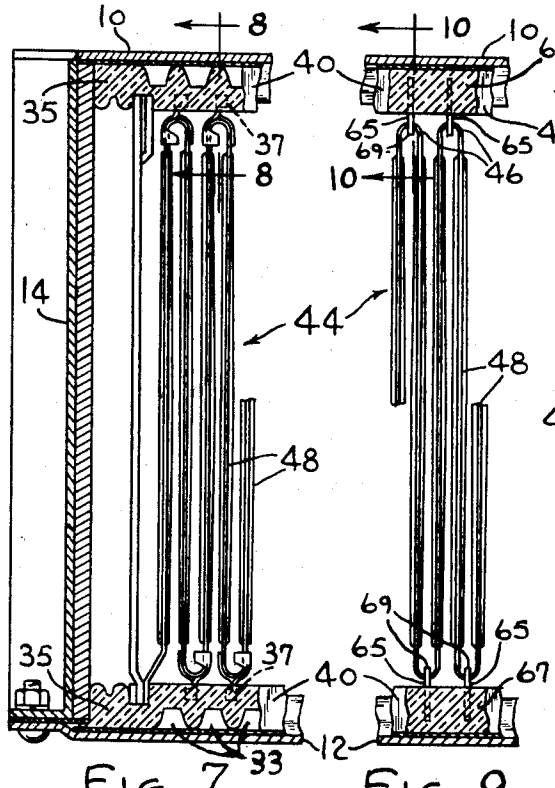


FIG. 7

FIG. 9

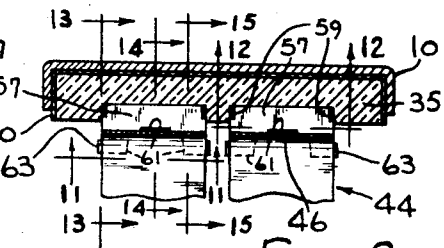


FIG. 8

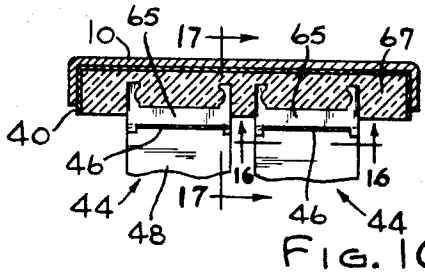


FIG. 10

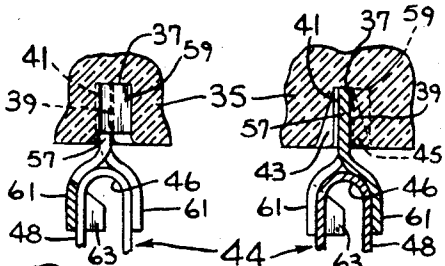


FIG. 13 FIG. 14

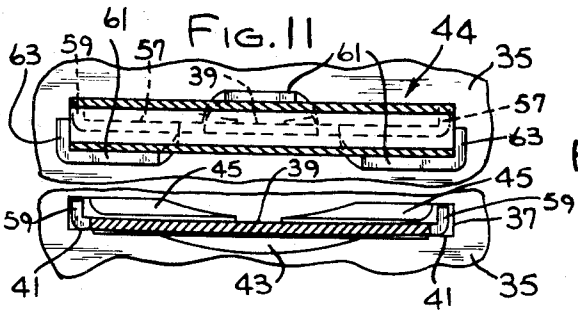


FIG. 11

FIG. 12

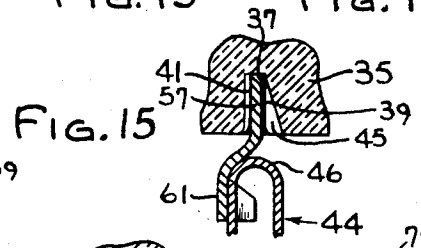


FIG. 15

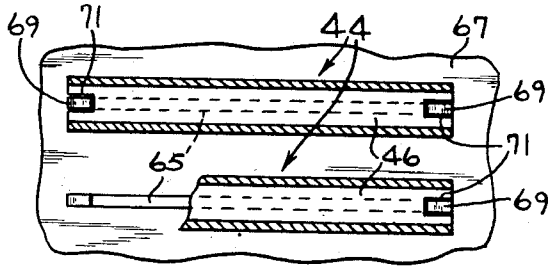


FIG. 16

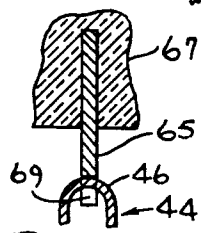


FIG. 17

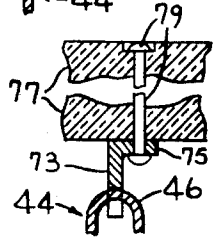


FIG. 18

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ELECTRICAL RESISTOR UNITS

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Application August 27, 1952, Serial No. 306,574

6 Claims. (Cl. 201—74)

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

Resistors of this type are described and claimed in the Kuhn and Welch Patent 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 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 supporting the grid by brackets which hold the loops away from the insulators and in the cooling air stream so that heat will be dissipated from the loops as readily as from the lengths between the loops 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 a first form of 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 a sectional view taken on the line 3—3 of Fig. 2;

Fig. 4 is an enlarged sectional view similar to Fig. 3 of a second form of resistor embodying the present invention;

Fig. 5 is an enlarged sectional view similar to Fig. 2 of a third form of resistor embodying the present invention;

Fig. 6 is a sectional view taken on the line 6—6 of Fig. 5;

Fig. 7 is a fragmentary horizontal plane sectional view of a fourth form of resistor embodying the present invention;

Fig. 8 is an enlarged fragmentary sectional view taken on the line 8—8 of Fig. 7;

Fig. 9 is a fragmentary horizontal plane sectional view of a fifth form of resistor embodying the present invention;

Fig. 10 is an enlarged fragmentary sectional view taken on the line 10—10 of Fig. 9;

Fig. 11 is an enlarged fragmentary sectional view taken on the line 11—11 of Fig. 8;

Fig. 12 is an enlarged fragmentary sectional view taken on the line 12—12 of Fig. 8;

Fig. 13 is an enlarged fragmentary sectional view taken on the line 13—13 of Fig. 8;

Fig. 14 is an enlarged fragmentary sectional view taken on the line 14—14 of Fig. 8;

Fig. 15 is an enlarged fragmentary sectional view taken on the line 15—15 of Fig. 8;

Fig. 16 is an enlarged fragmentary sectional view taken on the line 16—16 of Fig. 10, part being broken away for clarity;

Fig. 17 is an enlarged fragmentary sectional view taken on the line 17—17 of Fig. 10; and

Fig. 18 is an enlarged fragmentary sectional view similar to Fig. 17 of a sixth form of 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 aforementioned Patent No. 2,680,178. The grid 44 is of the same construction as that described and claimed in said Patent No. 2,680,178. In the first three forms (Figs. 1 to 6, 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 brackets of the grid 44. As in said patent a sheet of mica 40 or other like insulating material is placed between the metal frame and the insulators.

In order to prevent overheating of the loops or reflexes 46 and of the insulators, the loops 46 are supported by metal clips, brackets or hangers extending between the insulators and loops. These brackets are long enough to keep the loops 46 out of heat conducting contact with the insulators and to place such loops in the same cooling air stream as the lengths 48. This avoids the heat insulation of the loops by the insulator and enables the loops to lose heat as rapidly as the remainder of the grid. It also prevents direct transfer of heat from the highly heated loops to the insulators at the place of support. Such heat as is transferred to the insulators is the result of direct radiation from the loop and by conduction through such brackets. The heat so transferred is not, however, sufficient to injure the insulation.

In the first, second and third forms aforementioned 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 first form (Figs. 1, 2 and 3) 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. Substantially no current is carried by the bracket 51 and hence the only heat generated therein is that caused by conduction from the loop 46. Hence 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 second form (Fig. 4) is the same as the first 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 and also decreases the conduction of heat from the grid to the bracket.

The bracket 55 of the third form (Figs. 5 and 6) consists of a strip of metal having only one leg spot welded or riveted to one side of the loop 46. Such strip is offset as shown so that its outer end is substantially in alinement with the center of the loop 46. With such outer end positioned in a groove 36 the loop 46 will be positioned in proper alinement with such groove and the loop 46 will be held in the same cooling air stream as the re-

mainder of the grid. The only heat in the bracket 55 will be that received by conduction from the grid 44; there being no current flow in such bracket.

In the fourth, fifth and sixth forms the insulators are not of the same design as those of Patent No. 2,680,178. However, the peripheral shape is substantially the same so that the insulators of these forms of the invention will fit in the same frame as the other forms herein disclosed. In these last three forms, like the first, second and third forms, the loops 46 are held spaced from the insulator and are in the cooling air stream. The common characteristic of the fourth, fifth and sixth forms is the use of a bracket in which the loop 46 of the grid removably fits and is held in place by pressure rather than by riveting or spot welding. This cuts down assembly cost without sacrifice of efficiency.

In the fourth form (Figs. 7, 8, and 11 to 15, inclusive) the insulators 35 have spaced pockets 37 for frictionally holding the loop supporting brackets. Each of these pockets as is seen at Fig. 12 has a central vertical ridge 39 which projects inwardly of the pocket from one side and two end abutments 41 projecting inwardly of the pocket from the side opposite the ridge 39. To facilitate the assembly of the bracket in the pocket the central part of the side opposite ridge 39 may be cut away as shown at 43 (Fig. 15), and on each side of ridge 39 the pocket may be cut away as indicated at 45. All these cutaway portions slope inwardly and downwardly so that at the top of the pocket the opening is bow shaped to permit the bracket to readily enter the pocket when flexed. The back of insulators 35 may have slots 33 positioned midway of the pockets 37 to provide a more uniform cross section with consequent even heat dissipation and better circulation of air around the back of such insulators.

The loop supporting bracket has a mounting bar 57 with lateral feet 59. This bar is flexed or bowed in order to fit it into the opening of the pocket. As the bracket is pressed down into the pocket the ridge 39 and the abutments 41 will keep such bar sprung against its inherent resiliency and thus provide a frictional force holding the bracket in place. The bracket has three loop supporting arms 61, the outer two of which are bent to one side and the center one of which is bent to the other side of the bracket to engage the loop from opposite sides. The outer arms have inwardly laterally projecting tabs 63 which engage the opposite edges of the loop 46 to prevent edgewise displacement thereof.

To assemble this modification the brackets are preferably first inserted and press fitted into the pockets of the insulator and then the grid is assembled in the same manner as set forth in said Patent No. 2,680,178.

In the fifth form (Figs. 9, 10, 16 and 17) loop holding brackets 65 have portions molded into the insulators 67 and are not removable therefrom. Such portions may be shaped as shown in Fig. 10 or have any other irregular shape which provides good gripping engagement between the insulating material and the metal bracket. The brackets 65 have projecting ears 69 which fit in notches 71 on the loops 46 to properly anchor the grid in place. Assembly may be accomplished in the same way as the fourth form aforementioned.

Instead of molding the loop holding bracket into the insulator, the sixth form (Fig. 18) uses a bracket 73 which has a mounting leg 75 resting flatly against the inner face of an insulator 77 and held in place by rivets 79. In other respects the bracket 73 is the same as bracket 65 and holds the loop 46 in the same way.

As will be apparent from the drawings, in each of the six forms of the invention, the bracket supports the resistor bend in a diametrically opposite position spaced from the insulator. That is, in the first, second, third and fourth forms, the resistor bend is supported in a position diametrically opposite the associated bracket-

receiving groove in the insulator. In the fifth form, the resistor bend is supported diametrically opposite the portion of the bracket molded in the insulator. In the sixth form, the resistor bend is supported substantially opposite rivet 79. It will be further apparent that in each form of the invention, the bracket affords a laterally fixed (or horizontally fixed as seen in Figs. 1, 7 and 9) support for the resistor bend.

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 resistor grid including an insulator support, an electrical resistor band having a bend therein forming an inner concave surface at said bend, and supporting means to allow all portions of said inner concave surface to be uniformly exposed to cooling media, said means being connected to said insulator support to support said bend in a diametrically opposite position removed from said insulator support.

2. The invention defined in claim 1, wherein said supporting means comprises a member having a first portion for securely supporting said resistor band at said bend, and a second portion integral with and spaced from said first portion for fastening said member to said insulator support, said member extending substantially in alinement with the center line of said bent resistor band.

3. The invention defined in claim 2, together with a slot in said insulator support substantially in alinement with the center line of said bent resistor band for receiving said second portion of said member to prevent lateral movement of said resistor band under shock.

4. A resistor unit adapted for use with forced ventilation, said resistor unit having oppositely positioned grooved insulators respectively adapted to receive brackets for supporting the loops of a ribbon type grid resistor, a ribbon type grid resistor having loops, and brackets positioned in said grooves and engaging said loops, said brackets consisting of strips of metal each having one end secured to one side of its associated loop and the other end offset to be in alinement with the central part of said associated loop and seated in the respective groove, said brackets being long enough to maintain said loops out of contact with said insulators and in the same cooling air stream as the remainder of said grid resistor.

5. In combination with an insulator support and an electrical resistor having a bend therein, a member having a preformed structure which engages and supports said bend, said member being provided with means for anchoring the member to said insulator support so that said bend is supported in a diametrically oppposite position remote from said insulator support.

6. A resistor support for a serpentine resistor having bends formed on either side of its longitudinal axis comprising oppositely disposed insulators on either side of and more remote from said longitudinal axis than said bends, and a plurality of resistor supports anchored to each of said insulators and interposed between said insulators and said bends, said supports having a bend engaging structure formed at one end thereof remote from said insulators, said structure forming a laterally fixed support for said bends.

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