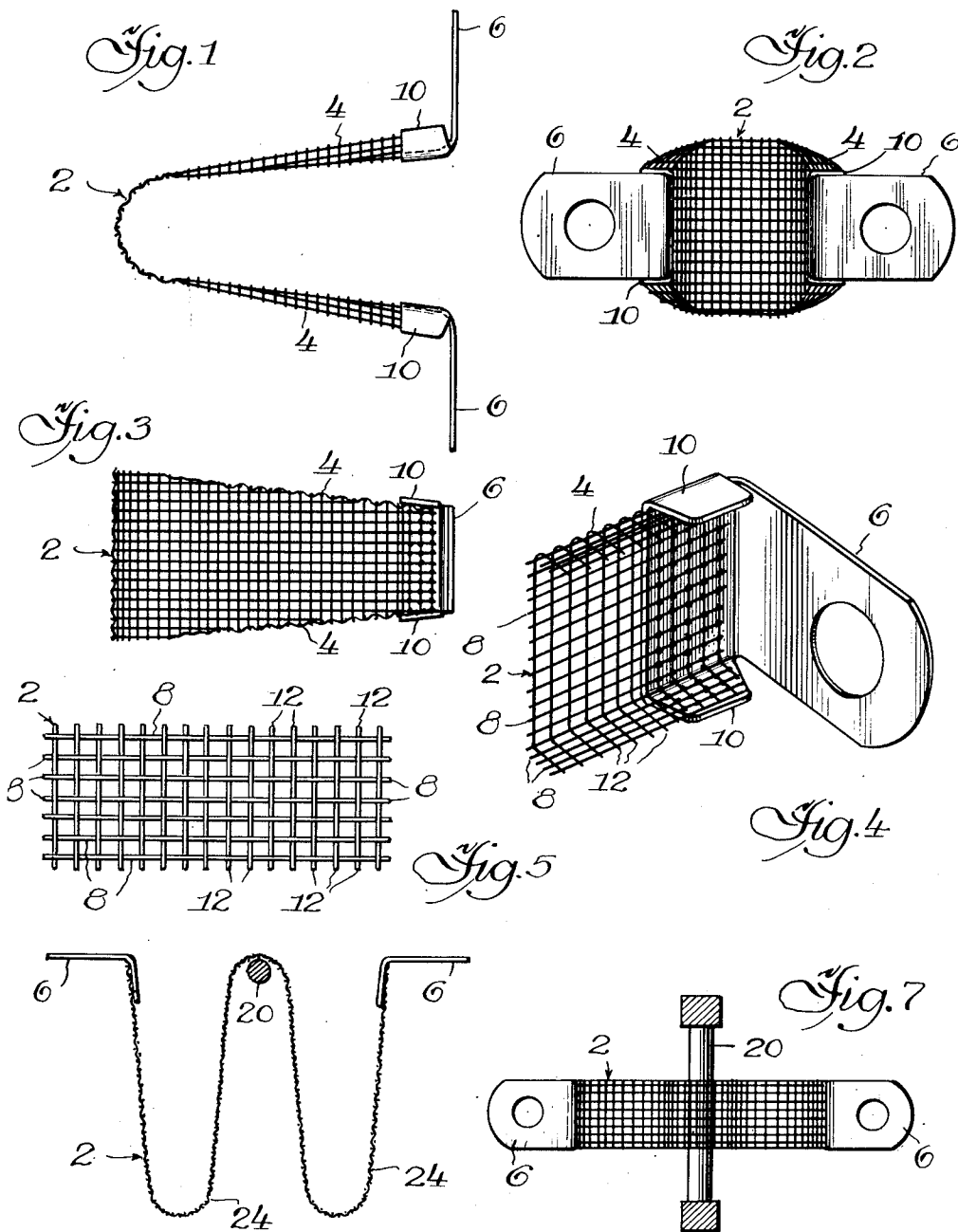


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HEAVY CURRENT RESISTOR

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HEAVY CURRENT RESISTOR

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This invention relates to resistors and more particularly to a heavy current, grid type resistor for use in resistance units, such as are commonly employed in electric motor control systems and battery charging equipment.

A general object of the invention is to devise a heavy current grid type resistor of economical construction, having long life in service and capable of maximum heat dissipation.

As is well known in the art, grid resistors of this type are frequently formed of cast iron and are thus rigid and subject to damage by vibration and are frequently cracked by internal stresses due to thermal expansion and contraction.

Various efforts have been made to replace the cast grid by expanded metal grids; however these have not only been expensive but have failed to solve the problem of internal stresses due to thermal expansion and contraction, inasmuch as such a grid is a rigid structure. Furthermore, it has been found that heat dissipation from such grids is not entirely satisfactory, inasmuch as the surface area of the grid segments per volume of metal is relatively small.

Accordingly, a primary object of the present invention is to devise a grid resistor in which internal stresses due to thermal expansion and contraction are eliminated.

Another object of the invention is to provide a maximum surface area for heat dissipation per volume of grid metal.

Still another object of the invention is to devise a resistor such as above described wherein the grid may be rigidly supported by terminals at its ends without subjecting the structure to mechanical stresses due to expansion and contraction of the entire grid with respect to its supports.

The foregoing and other objects and advantages of the invention will become apparent from a consideration of the following specification and the accompanying drawings, wherein:

Figure 1 is a top plan view of a resistor embodying the invention;

Figure 2 is a front elevational view of the resistor;

Figure 3 is a side elevational view of the resistor;

Figure 4 is an enlarged fragmentary perspective of the resistor showing the attachment of one terminal to the grid;

Figure 5 is an enlarged fragmentary side elevational view of the grid showing the woven construction thereof; and

Figures 6 and 7 show a modified form of the resistor, Figure 6 being a side elevational view, and Figure 7 being a top plan view.

Describing the invention in detail and referring first to the embodiment shown in Figures 1 to 5, the novel resistor comprises a flexible grid 2 in

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the form of a segment of wire screen woven on a conventional screen loom.

The grid 2 is adapted to be supported in a horizontal position as shown in Figure 3 and for this reason, the grid is bent into approximately a U shape and is flanged at 4 to afford a stiff yet flexible structure capable of expansion and contraction due to thermal changes.

At each end of the grid 2 is a terminal 6 formed of copper or any other suitable electrically conductive material. The terminals 6 are secured to the ends of the grid 2, as by soldering, and are flanged as at 10 to contact the strands in the flange 4 of the grid.

The woven construction of the grid 2 is shown in detail in Figure 5, wherein it will be seen that the grid comprises longitudinal strands 8 and also comprises transverse strands 12 in woven relationship with the strands 8 to form a substantially square mesh screen or grid. In this connection, it may be noted that the strands 8 conduct electric current between the terminals 6, as above-mentioned, and for this reason are formed of resistance metal wire such as, for example, any one of the well-known nickel chromium alloys. The transverse strands 12 between the terminals 6, as seen in Figures 4 and 5, are free at their ends and carry substantially no electric current, inasmuch as the transverse strands 12 intersect the longitudinal strands 8 at points of equal electrical potential. The strands 12 thus function as heat conductors to conduct heat from the strands 8 and to dissipate heat from the grid 2. For this reason, the strands 12 are preferably formed of a relatively economical metal such as stainless steel which is an effective heat conductor and is capable of dissipating a great amount of heat without melting or oxidizing. If desired, however, the strands 12 may be formed of the same resistance metal as the strands 8 which carry the electrical current.

As clearly seen in Figure 5, the strands 8 and 12 are woven in such a manner that the strands are in intimate heat conductive contact but are capable of relative movement to accommodate expansion and contraction of the strands due to thermal changes, thereby relieving internal stresses in the grid. This action is facilitated by providing the strands 12 between the terminals 6 with free extremities to afford expansion and contraction of these strands.

As will be understood by reference to Figures 1 to 3, the resistor, in its illustrated form, is particularly adapted to a horizontal mounting in the position shown in Figure 3 with the terminals attached to a suitable electric insulating material by bolts or other connectors that provide a means for connecting wire leads (not shown) to the grid terminals. In this form, the flanges 4 afford stiffness to prevent sagging of the grid 2 in service

without interfering with the expansion and contraction of the grid strands 8 and 12. Furthermore, it will be understood that the U shape of the grid accommodates expansion and contraction thereof as a unit between the terminals, without imposing mechanical stresses on either the grid 2 or the terminals 6.

Figures 6 and 7 show a modification of the invention wherein the grid 2 is formed of a square mesh wire screen woven in the same manner as in the previous embodiment but adapted for vertical mounting as shown in Figure 6. For this reason, the flanges 4 of the grid 2 and the flanges 10 of the terminals 6 have been eliminated, and the grid is provided with one or more vertically disposed U-shaped segments 24 (Figure 6) with a support 20 between each pair of segments.

Thus it will be understood that I have devised a novel heavy current resistor having a grid capable of operating at temperatures of 350° C. or higher, without melting or oxidizing and capable of expansion and contraction between the supporting terminals without imposition of mechanical stresses on either the terminals or the grid. The novel grid is also capable of relieving internal stresses by relative movement of the grid strands without impairing heat conductivity therebetween.

It will be understood that I do not wish to be limited by the exact embodiments of the device shown which are merely by way of illustration and not limitation, as various and other forms of the device will, of course, be apparent to those skilled in the art, without departing from the spirit of the invention or the scope of the claims.

I claim:

1. A heavy current resistor comprising a grid formed of a woven wire screen having longitudinal strands of resistance wire and having transverse strands of heat conductive wire, the transverse strands being in intimate heat conductive contact with the longitudinal strands and said transverse strands being capable of relative move-

ment with respect to the longitudinal strands in response to thermal expansion and contraction of the longitudinal and the transverse strands, the ends of the transverse strands being entirely free and unsupported to accommodate independent expansion and contraction thereof, and a pair of terminals at respective ends of the grid having electrically conductive connection with said longitudinal strands, whereby during flow of electric current between said terminals, the transverse strands intersect the longitudinal strands at corresponding points of substantially equal electrical potential, thereby substantially eliminating flow of electric current along the transverse strands disposed between the terminals.

2. A resistor according to claim 1 wherein the distance between the terminals is less than the length of the longitudinal strands to substantially eliminate mechanical stresses on the grid and terminals during expansion and contraction of the longitudinal strands.

3. A resistor according to claim 1, wherein the strands are substantially round in cross-section to afford maximum heat dissipation.

4. A resistor according to claim 1 wherein the transverse strands are formed of heat conducting material and the longitudinal strands are formed of other material having greater resistance to conduction of electricity.

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