July 17, 1951 M. W. GRIFFES ET AL 2,560,690

EDGEWOUND RESISTOR

Filed Oct. 19, 1949 2 Sheets-Sheet 1

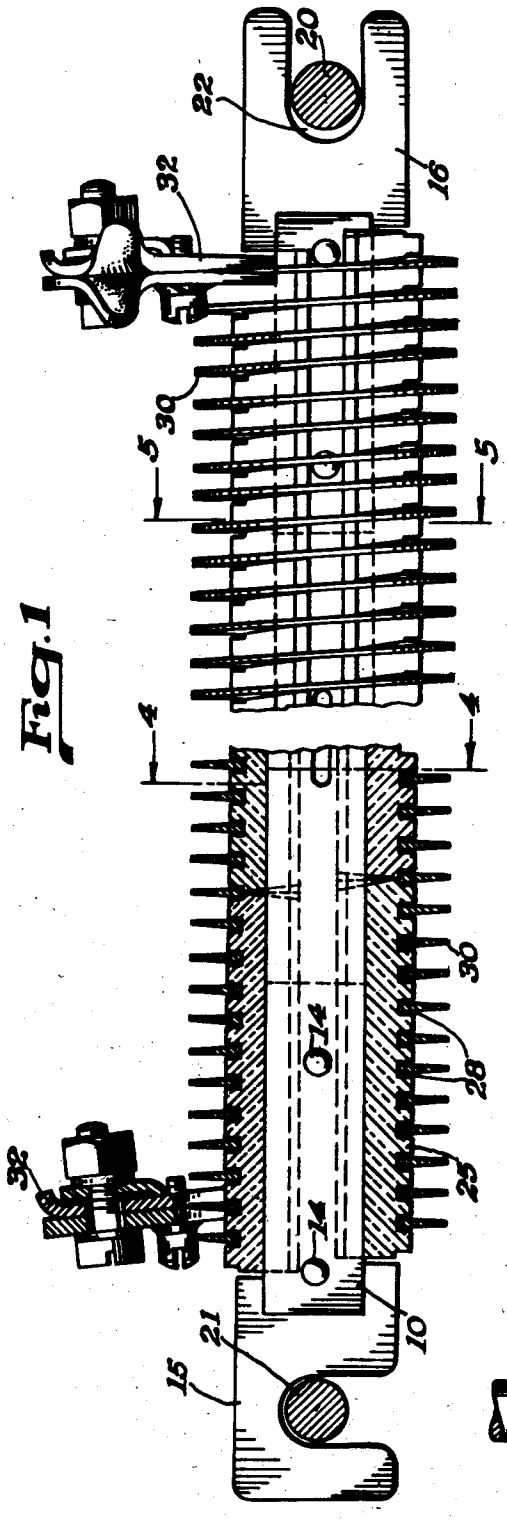


Fig. 1

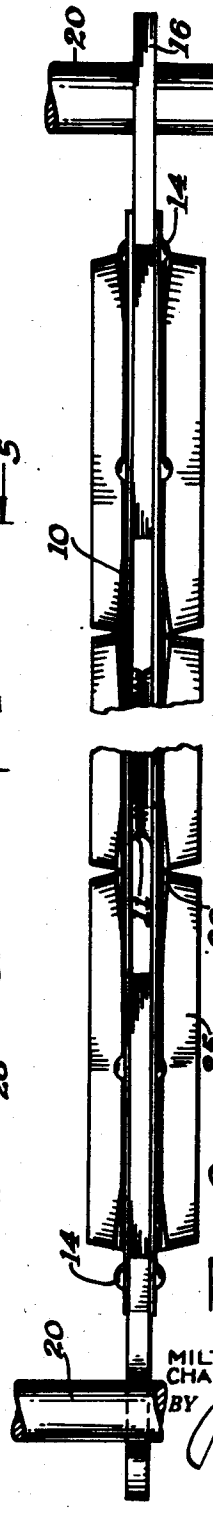


Fig. 2

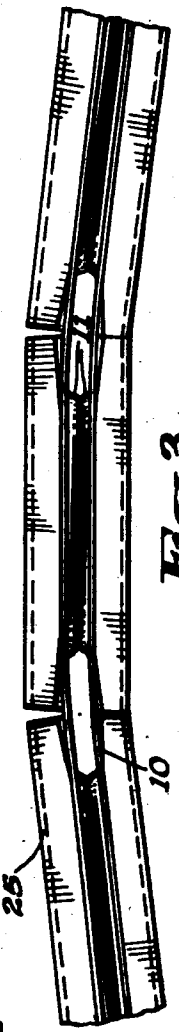


Fig. 3

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EDGEWOUND RESISTOR

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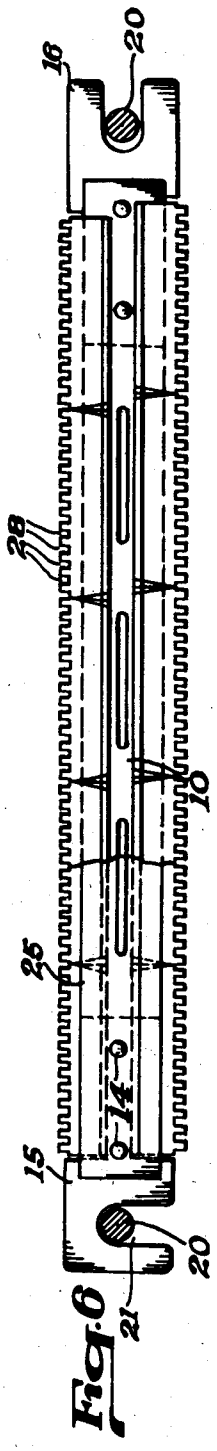


Fig. 6

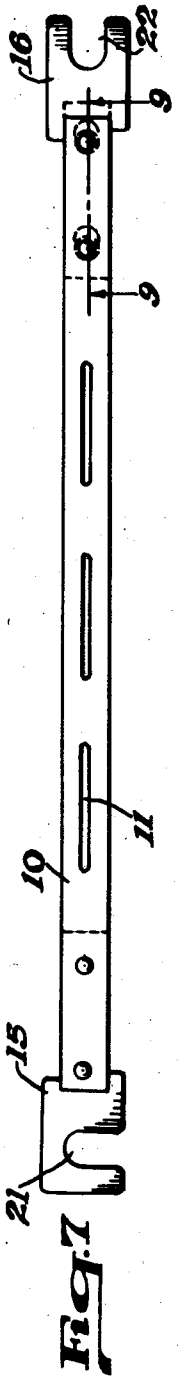


Fig. 7

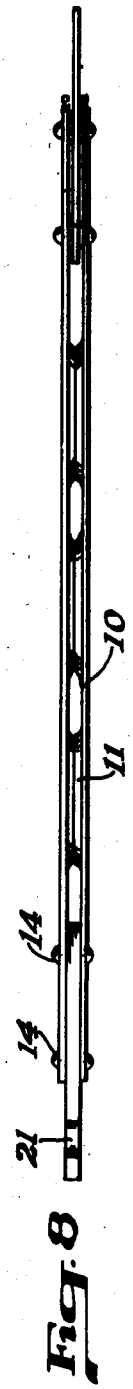


Fig. 8

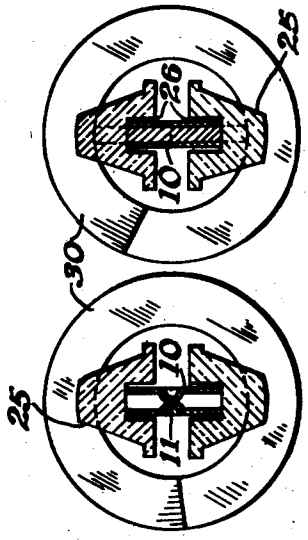


Fig. 4

Fig. 5

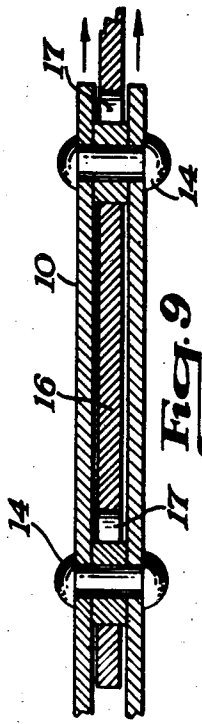


Fig. 9

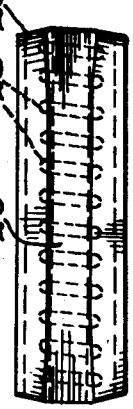


Fig. 10

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Patented July 17, 1951

2,560,690

UNITED STATES PATENT OFFICE

2,560,690

EDGE WOUND RESISTOR

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Application October 19, 1949, Serial No. 122,335

10 Claims. (Cl. 201—74)

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The present invention relates generally to electric resistors and is more particularly concerned with a novel core to support the coils and insulators of edgewound type resistors, and with novel supporting structure for such resistors including said core.

The conventional edgewound resistors, of the type disclosed in U. S. Patent 2,061,516 granted November 17, 1936, to Joseph F. Frese, are as fragile and frail as their heat refractory insulators and this fragility is magnified by the stresses imposed upon the insulators as a result of the heating of the parts of the resistor during use and the differences between the coefficiencies of thermal expansion of the various materials of these parts. Consequently, in ordinary use involving severe mechanical shocks the insulators of these resistors are frequently fractured, rendering the devices unsuitable for use. Accordingly, there have been many serious efforts exerted by others skilled in the art to eliminate or at least minimize this difficulty. One of the developments coming out of these efforts is the detachment of the supporting rod or core from the insulators of these resistors to allow for differential expansion and contraction of the parts, as disclosed in U. S Reissue Patent No. 22,313, granted May 18, 1943, to Kenneth L. Britton et al. However, the problem of overcoming the tendency of the insulators to crack under stresses attributable to warping of the supporting structure was not eliminated or even appreciably relieved by this development.

In accordance with the present invention, it is now possible, for the first time to our knowledge, to eliminate the destructive stress conditions in insulators of edgewound-type resistors and similar devices wherein insulators are carried on supporting cores or bars fixed in position at their ends and subjected to elevated temperatures in use. Moreover, this new and useful result can be obtained without incurring an economic disadvantage relative to the prior art devices so far as manufacturing and insulation costs are concerned. Actually, the economy of the device of the present invention is substantially more favorable than that of any of the prior art devices, especially in operations covering long periods. Still further, the present devices are generally easier to assemble and disassemble than the prior art devices.

These foregoing advantages are attributable not only to the independence of several elements in the supporting structure and insulators from each other to permit relative expansion and contraction, but also to an entirely new feature in this art. Whereas in prior devices some relative expansion and contraction of certain parts could occur without the imposition of stresses on other parts, it has never been possible for major elements, such as the supporting rods or cores, to move or flex laterally in different portions relative to the insulators which it carries. Any tendency of the supporting structure to warp consequently has always heretofore been a threat to the continued usefulness of these insulators and resistors. The new flexibility of our devices has eliminated this threat in ordinary use.

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Those skilled in the art to which this invention pertains will gain a better understanding of this invention upon consideration of the following detailed description, reference being had to the drawings accompanying and forming a part of this specification, in which:

Fig. 1 is a fragmentary, side elevational view, partly in section, of an edgewound resistor embodying this invention in a preferred form;

Fig. 2 is a fragmentary, horizontal sectional view of the device in Fig. 1 taken approximately through its mid-section, the resistor helix being removed in the interest of clarity;

Fig. 3 is a fragmentary, sectional view similar to Fig. 2, but showing the supporting core of the assembly bent sharply along this longitudinal axis;

Fig. 4 is a vertical, sectional view taken on line 4—4 of Fig. 1;

Fig. 5 is a vertical, sectional view taken on line 5—5 of Fig. 1;

Fig. 6 is a side elevation view, partly in section of the Fig. 1 device with the resistor helix removed;

Fig. 7 is a side elevational view of the supporting structure of the Fig. 1 device, indicating possible relative endwise motion of the parts;

Fig. 8 is a bottom plan view of Fig. 7 structure;

Fig. 9 is a horizontal sectional view of a portion of the Fig. 7 structure taken on line 9—9 thereof, and;

Fig. 10 is a plan view of one of the insulator elements of the Fig. 1 device.

In general, the apparatus of our invention for carrying an edgewound resistor coil comprises a plurality of opposed channel-shaped electrical insulators to be disposed within the coil and hold the turns of the coil in predetermined relative position. These insulators are provided with tapered end portions to ride on each other to facilitate relative lateral motion of adjacent elements. In addition, a flexible metal core is pro-

vided and disposed between the assembled insulators, extending through the channel recesses thereof and holding the insulators in predetermined relative position. This core comprises a pair of substantially coextensive, parallel, elongated, thin metal strips. Means are provided to engage and secure these strips together at their ends.

More particularly, and with reference to the drawings, the present novel cores comprise, typically, a pair of spring steel bands or strips 10 of approximately the same length each of which is provided with three aligned projecting ribs 11 spaced longitudinally for engagement with opposed ribs as shown in Figs. 4 and 8, to space the strips apart uniformly throughout their intermediate portions. Adjacent to their end portions, each of the strips is provided with a pair of transverse apertures for registry with apertures in the companion strips to receive rivets 14 constituting the means for securing the strips together in fixed predetermined relation.

A pair of brackets 15 and 16 of thin sheet metal, suitably of about $\frac{3}{32}$ inch thickness, are provided to support strips 10. Each of these brackets has an end portion to be disposed between the end portions of said strips and are provided with transverse apertures for registry with the apertures in the strips. Bracket 16 at the right end of the device illustrated in Fig. 1 is provided with larger apertures 17 in the form of longitudinally extending slots to permit relative longitudinal motion within certain predetermined limits of the strips and bracket 16. Brackets 15 and 16 are provided with notches 21 and 22, respectively, for receipt of and engagement with a stationary supporting frame indicated fragmentarily at 20. While notch 22 extends longitudinally, notch 21 extends transversely of the brackets and core to facilitate engagement and disengagement of the core with supporting frame 20.

Insulator elements 25 of the Fig. 1 device are of generally A-shape in transverse cross-section (Figs. 4 and 5) and have longitudinal channel recesses 26 in which the upper or lower edges of the core are received. The channel recess in each insulator is relatively narrow in its intermediate portion but is flared at its ends to permit substantial warping or bending of the core of the assembly without resultant stresses being produced in the fragile structure. Opposed insulators are spaced apart so that the mid-section of the core is opposed along each side of the assembly. These elements have relatively long, shallow grooves 28 in their top portions to receive and hold in predetermined relative position the turns of resistor coil 30. In order that the coil will not bind on the insulators, these grooves are disposed at a slight angle to the longitudinal axis of these insulators and the various grooves are all parallel to each other, as indicated in Fig. 10. The ends of insulators 25 are tapered or beveled so that adjacent insulators abutting each other may roll on each other during lateral flexing of warping of the core, as shown in Fig. 3.

The assembly of the several parts of the core and the insulators in making the structure shown in Figs. 2 and 6 is carried out in any desired manner as will be apparent from the foregoing description, the insulators being mounted loosely on the core assembly just prior to engaging the resistor coil with the insulators. This last step may be carried out in the conventional manner and as a final step, two terminals 32 of any suitable type will be connected to the coil.

Having thus described the present invention so that those skilled in the art may be able to understand and practice the same, we state that what we desire to secure by Letters Patent is defined in what is claimed.

What is claimed is:

1. A fabricated flexible metal core to support an edgewound electric resistor comprising a pair of substantially coextensive, elongated, parallel, thin metal strips to extend through the coil of said resistor, and means engaging and securing said strips together near their ends, said strips having a plurality of opposed longitudinally spaced ribs engaging each other and spacing portions of the strips apart and stiffening the core.

2. Apparatus for carrying an edgewound resistor coil comprising a plurality of opposed, channel-shaped, electric insulators within the coil and holding the turns of the coil in predetermined relative position, said insulators having side walls diverging at their ends and describing flaring channel recesses, and a fabricated flexible metal core between said opposed insulators and extending through said channel recesses and holding the insulators in predetermined relative position, said core comprising a pair of substantially co-extensive, parallel, elongated, thin metal strips, said strips being spaced apart and having their wide sides opposed, spacing means associated with the strips and disposed between said opposed sides to maintain the strips in spaced relation between their ends, and means engaging and securing said strips together near their ends.

3. Apparatus for carrying an edgewound resistor coil comprising a plurality of opposed, channel-shaped, electric insulators within the coil and holding the turns of the coil in predetermined relative position, said insulators having diverging side walls and having tapered end portions to ride on each other for relative lateral motion of adjacent insulators, and a fabricated flexible metal core between said opposed insulators and extending through said channel recesses and holding the insulators in predetermined relative position, said core comprising a pair of substantially co-extensive, parallel, elongated, thin metal strips, said strips being spaced apart and having their wide sides opposed, spacing means associated with the strips and disposed between said opposed sides to maintain the strips in spaced relation between their ends, and means engaging and securing said strips together near their ends.

4. Apparatus for carrying an edgewound resistor coil comprising a plurality of opposed, channel-shaped, electric insulators within the coil and holding the turns of the coil in predetermined relative position, said insulators having side walls diverging at their ends and describing flaring channel recesses, and having tapered end portions to ride on each other for relative lateral motion of adjacent insulators, and a fabricated flexible metal core between said opposed insulators and extending through said channel recesses and holding the insulators in predetermined relative position, said core comprising a pair of substantially co-extensive, parallel, elongated, thin metal strips, said strips being spaced apart and having their wide sides opposed, spacing means associated with the strips and disposed between

said opposed sides to maintain the strips in spaced relation between their ends, and means engaging and securing said strips together near their ends.

5. A fabricated flexible metal core to support an edgewound electric resistor comprising a pair of substantially co-extensive, elongated, parallel, thin metal strips to extend through the coil of said resistor, said strips being spaced apart and having their wide sides opposed, spacing means associated with the strips and disposed between said opposed sides to maintain the strips in spaced relation between their ends, and means engaging and securing said strips together.

6. A fabricated flexible metal core to support an edgewound electric resistor comprising a pair of substantially co-extensive, elongated, parallel, thin metal strips to extend through the coil of said resistor, said strips being spaced apart and having their wide sides opposed, spacing means comprising projections formed on the strips to bear against opposing strip side portions to maintain said strips in spaced relation between their ends, and means engaging and securing the said strips together near their ends.

7. A fabricated flexible metal core to support an edgewound electric resistor comprising a pair of substantially co-extensive, elongated, parallel, spring steel strips to extend through the coil of said resistor, said strips being spaced apart and having their wide sides opposed, spacing means comprising projections formed on each strip to bear against registered projections on the other strip to maintain said strips in spaced relation between their ends, and means engaging and securing said strips together.

8. A fabricated flexible metal core to support an edgewound electric resistor comprising a pair of substantially co-extensive, elongated, parallel, thin metal strips to extend through the coil of said resistor, said strips being spaced apart and having their wide sides opposed, spacing means associated with the strips and disposed between said opposed sides to maintain the strips in spaced relation between their ends, bracket means comprising a pair of notched thin metal elements having flat portions disposed between end portions of said opposed sides of the metal strips to support the core, and means engaging and securing said strips together and retaining said brackets in assembled relation with the core.

9. A fabricated flexible metal core to support an edgewound electric resistor comprising a pair of substantially co-extensive, elongated, parallel, spring steel strips to extend through the coil of said resistor, said strips being spaced apart and having their wide sides opposed, spacing means associated with the strips and disposed between said opposed sides to maintain the strips in spaced relation between their ends, bracket means comprising a pair of notched thin metal elements projecting from the ends of the core and having flat portions disposed between end portions of said opposed sides of the metal strips to support the core, and means engaging and securing said strips together near their ends, said securing means comprising rivets extending through registerd apertures in the spring steel strips and the metal bracket elements.

10. Apparatus for carrying an edgewound resistor coil comprising a plurality of opposed, channel-shaped, electric insulators within the coil and holding the turns of the coil in predetermined relative position, said insulators having side walls diverging at their ends and describing flaring channel recesses, and a fabricated flexible metal core between said opposed insulators and extending through said channel recesses and holding the insulators in predetermined relative position, said core comprising a pair of substantially co-extensive, parallel, elongated, thin metal strips, said strips being spaced apart and having their wide sides opposed, spacing and stiffening means comprising projections formed on each strip to bear against registered projections on the other strip to render the core rigid over the major portion of the length of each insulator and to maintain the strips in spaced relation between their ends, and means engaging and securing said strips together near their ends, said projections extending longitudinally of the core and being disposed within the insulators and spaced apart longitudinally in the regions of the ends of the insulators whereby the core may be flexed in these regions.

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