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2,390,790

RESISTANCE UNIT

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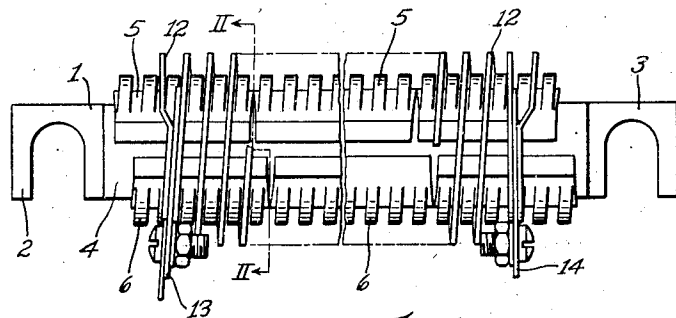


Fig. 1.

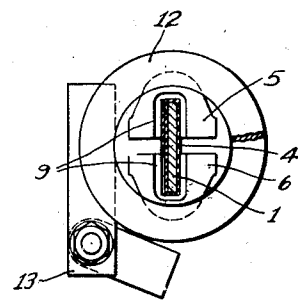


Fig. 2.

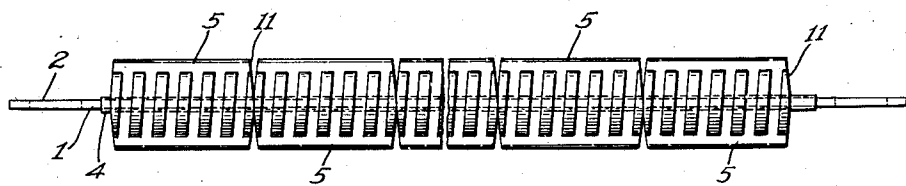


Fig. 3.

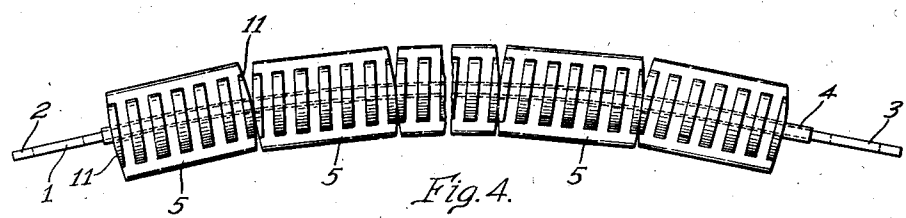


Fig. 4.

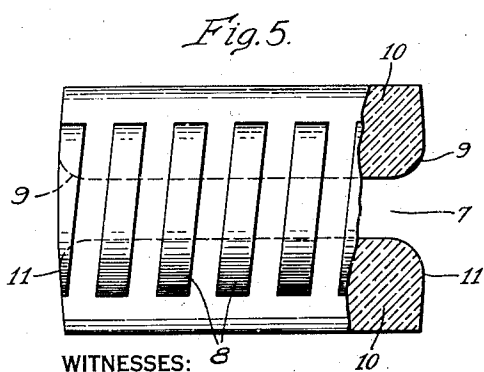


Fig. 5.

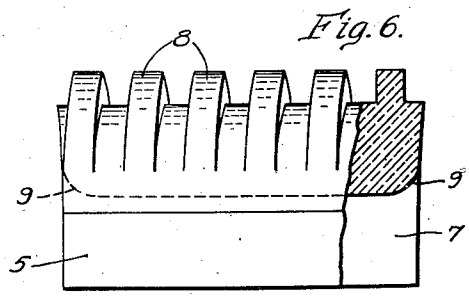


Fig. 6.

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RESISTANCE UNIT

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5 Claims. (Cl. 201-63)

The invention relates to resistance units especially for application in motor starters or other electric apparatus that, when in normal use, are apt to be exposed to heavy shock forces, for instance, on naval vessels.

There are resistor assemblies now used in naval control equipment which contain an edgewound resistance winding mounted on ceramic insulators which, in turn, are arranged on a mounting strap. When these assemblies are subjected to high impact shock, the strap tends to bend and the ceramic insulators are apt to crack and shatter.

It is an object of the invention to provide resistor units of the above-mentioned type that are highly resistant to impact forces and whose insulating parts are protected from being damaged by bending of the mounting strap.

According to the invention, a mounting strap, preferably of steel, is enveloped by fibrous layer of refractory material such as asbestos and provided with a multiplicity of individual insulators for accommodating a continuous resistance, and their insulators are beveled at their axial ends so as to bulge toward the adjacent insulators and of relatively small axial length, the width-to-length ratio being at most about one-half or preferably larger than one-half.

According to another feature of the invention, the groove provided in each insulator for engaging the mounting strap is wide enough to permit the insulator an axial movement relative to the enveloped mounting strap and has rounded or flaring axial ends.

In a preferred embodiment of the invention, the wall thickness of the insulators adjacent the just-mentioned groove is larger than the width of the groove.

By virtue of these features, the individual insulators are free to perform an angular motion relative to one another when the mounting strap is subjected to bending forces. As a result, such forces are prevented from imposing compressive stresses on the insulator material so that the insulators and thereby the entire assembly are protected from being damaged by high impact shocks.

The drawing illustrates a resistance unit for panel mounting designed in accordance with the invention.

Figure 1 is a lateral view of the complete resistance unit;

Fig. 2 is a view in cross section through the same unit taken along the plane denoted in Fig. 1 by the dot and dash line marked II—II;

Fig. 3 is a top view of the unit with the resistance conductor removed from the insulators;

Fig. 4 shows a similar top view in bent condition of the mounting strap;

Figs. 5 and 6 are part sectional top and side views respectively of one of the insulators of the unit.

According to the drawing, a mounting strap 1 is at both ends provided with terminals 2 and 3 for panel mounting. The strap has an elongated rectangular cross section and hence has a preferred flexing direction in parallel to the edges of its cross section, i. e., towards and away from the panel when in mounted condition. A plurality of insulating bodies 5 and 6 are seated on the mounting strap so as to straddle the short edge sides of the strap cross section. Each insulator 5 or 6 forms a half shell of such dimensions that the strap is substantially surrounded by the pairs of insulators, with the exception of two opposite gaps extending along the strap. A heat insulating layer 4 surrounds the strap along the entire portion covered by the insulators. The layer 4 consists of a fibrous refractory material such as asbestos and forms a cushion between the strap and the insulators.

Each insulator has a groove 7 whose width is slightly larger than that of the enveloped mounting strap in order to permit movements of the insulator along the strap. A number of projections 8 are provided at the peripheral surface of each insulator so that this surface portion has a rack-shaped appearance. The axial ends 9 of the groove 7 are rounded or flared and the side walls 10 of the insulator have a width larger than that of the groove 7 (Fig. 5). The axial length of the insulator is small as compared to its total width so that the ratio of width to length is at most about one-half and preferably larger than one-half. Due to these dimensions, the individual insulators are very short and sturdy as compared with the total length of the strap portion covered by the insulators. The axial ends 11 of each insulator are beveled so that they bulge somewhat towards the adjacent insulator. The bulge extends substantially in parallel to the short edges of the strap cross section.

The resistance conductor proper consists of a winding 12 which is edgewound over the rack-shaped surface portions of the insulators so as to be held in position by the projections 8. The resistance winding extends continuously over a plurality or all of the insulator pairs and thus holds them in proper position relative to the mounting strap. The ends of the resistance

winding 12 are provided with terminals 13 and 14, respectively, for connecting current leads thereto.

The illustrated resistance unit is especially suitable for application in motor starters or other control equipment to be used on board of ship or in other places where high impact shock forces are to be expected. Under the effect of such an impact force, the mounting strap 1 has the tendency to bend and may assume a shape similar to the one represented in an exaggerated manner by Fig. 4. Due to the above-mentioned features of the individual insulators and in particular by virtue of the beveled ends, a clearance is provided between each pair of adjacent insulators which permits them to assume an angular position relative to each other in the flexing plane of the mounting strap. Consequently, the deflection of the mounting strap does not impart forces to the individual insulators tending to shatter and break the insulating bodies. The increased width of the groove 7, in conjunction with the flaring ends 9 of the groove and the short length of the individual insulators also contribute in preventing damaging effects of impacts.

The mounting strap 1 is preferably made of steel. Case hardened steel has proved especially favorable because the hardening treatment reduces the strap deflection and prevents the strap from assuming a permanent deflection upon the occurrence of high impact shocks. The individual insulators consist preferably of refractory ceramic material, for instance a porcelain-type fired material containing zirconium which is available on the market for similar purposes.

In view of the fact that the shape and design of resistance units according to the invention may be modified by those skilled in the art upon knowledge of the present disclosure, without departing from the essential features of the invention, we wish this specification to be understood as illustrative and not in a limiting sense.

We claim as our invention:

1. An electric resistance unit comprising a mounting strap of metal having an elongated cross section so as to have a preferred flexing direction, a plurality of insulating refractory bodies arranged on said strap so as to substantially surround said strap, each of said bodies being of small length as compared with that of said strap and having a beveled end so as to provide a clearance between adjacent bodies transverse to said flexing direction, and a continuous resistance winding mounted on and surrounding said plurality of bodies.

2. An electric resistance unit comprising a mounting strap of metal having an elongated cross section so as to have a preferred flexing direction, a plurality of pairs of half-shell shaped refractory insulators surrounding said strap and having each a rack-shaped outer surface por-

tion and a groove dimensioned to loosely straddle less than half of said strap cross section, each of said insulators having flaring groove edges at the two axial ends and a bulge at each end projecting toward the adjacent body so as to provide clearance for angular relative motion of said bodies in said flexing direction, and a resistance conductor engaging said rack-shaped portions and extending continuously around said plurality of insulators.

3. An electric resistance unit comprising a mounting strap of metal having an elongated cross section so as to have a preferred flexing direction, a layer of refractory soft material enveloping said strap, a plurality of pairs of half-shell shaped insulators seated on said enveloped strap so as to substantially surround said strap, each of said insulators having a width-to-length ratio above one-half and having its ends bulging toward the adjacent body to permit angular motion between said bodies in said flexing direction, and a continuous resistance winding mounted on said plurality of bodies and surrounding said bodies.

4. An electric resistance unit comprising a mounting strap of case-hardened steel having an elongated rectangular cross section and terminals at both ends respectively for panel mounting, an envelope of refractory fiber material enclosing said strap between said terminals, a plurality of pairs of half-shell shaped ceramic insulators seated on the short-edge sides of said strap cross section and substantially enclosing said strap between said terminal, each of said insulators having a width-to-length ratio of more than one-half and having bulges extending at its axial ends transverse to the long edges of said cross section, and a resistance conductor mounted on said insulators and extending continuously around said plurality of insulators.

5. An electric resistance unit comprising a mounting strap of metal having an elongated rectangular cross section and terminals at both ends respectively for panel mounting, an envelope of refractory fiber material enclosing said strap between said terminal, a plurality of pairs of half-shell shaped ceramic insulators seated on the short-edge sides of said strap cross section and substantially enclosing said strap between said terminals, each of said insulators having a groove dimensioned to loosely engage said enveloped strap and having flaring axial ends, said insulators having a rack-shaped surface portion and a bulge at each axial end extending transverse to the long edges of said cross section, the width-to-length ratio of said insulators being at least about one-half, and an edge wound resistance winding extending continuously around said plurality of insulator pairs and engaging said rack-shaped surface portions.

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