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Description

This invention relates to an electric power resistor structure particularly intended for use with generic resistive applications.

AS is known, resistors, i.e. electric circuit components representing a dissipative obstacle or resistance to the flowing current to originate a voltage drop and degrade the electric power they absorb into heat, are utilised in many fields for such different applications as starting and braking electric motors, grounding the star centre of transformers, and dissipative type generic electric loads.

With a wide range of power resistors the resistive electric element, referred to as the grid herein below, is characterised by a metal sheet comprising a plurality of coils which increase the length of the resistive path for a given size and, accordingly, determine the value of its electric resistance.

In order to attain the ohmic value range required by the design of the involved systems by the electric resistors it is necessary to increase the number of the coils considerably, the cross-sectional areas whereof decreases proportionately, for a given thickness this makes the metal sheet progressively weaker mechanically and virtually unusable unless suitably strengthened.

A further problem encountered is that in some operating conditions the resistors are liable to attain very high temperatures because the equality of the amount of heat generated per second to the amount of heat concurrently delivered by the resistor surface to the environment ceases to exist, and the temperature rise results in the material comprising the resistor expanding, with the consequence that the coils in their expanding movement, may contact one another and short out. This would put the entire circuit including the resistor out of operation.

In attempt to solve the problem of the grid stiffening and deformation-proofing, several solutions have been tried such as stiffening the coils by ribbing, or encapsulating same in strengthening elements which strengthen the grid mechanically and attenuate the deformative phenomenon reaching high temperature levels.

These and other prior expedients, while improving the resistor operation, have failed to thoroughly solve the problem deriving from the deformation ensuing from expansion of the coils thereof, especially with high ohmic value grids.

DE-C-939 461 discloses an electric power resistor structure as defined in the pre-characterizing part of claim 1. The power resistor structure does not have a reed passed between one pair of windings and the next so as to prevent them, during deformation of the material when subjected to a high temperature, from contacting one another and cause a short circuit situation.

The aim of this invention is to obviate such prior drawbacks by providing a structure of an electric power resistor (grid), which can operate

in a troublefree manner even at high temperatures and high ohmic values, without undergoing shorts that would lead to discontinuing the operation of the electric circuit comprising it.

Within the above aim, it is an important object of this invention to provide a grid adapted to faultlessly withstand electric power overloads in the course of its operation.

A further object of the invention is to provide a grid which affords optimum operational features even where subjected to any vibrations from external factors.

It is another object of this invention to provide a grid which can be readily formed from commercially available materials and of low cost, to thereby favour its extensive application to a variety of fields.

A not least object of the invention is to provide a grid which has the peculiarity that it can be quickly removed from its housing for replacement or for any required maintenance or servicing operations.

The above aim, and these and other objects, are achieved by an electric power resistor structure as defined in claim 1.

Further features and advantages will be more clearly apparent from the following detailed description of a grid according to the invention, shown by way of illustration in the accompanying drawings, where:

- Figure 1 is a cutaway plan view of the inventive grid;
- Figure 2 is a fragmentary, exploded perspective view of the grid according to this invention; and
- Figure 3 is a sectional view taken along the line III-III in Figure 1, showing the inventive grid.

With particular reference to the drawing figures, the grid of this invention, comprehensively designated 1, comprises a plate generally indicated at 2 and provided with several coils each indicated at 3 and formed by providing partial cross spacings 4 across the plate 2 at equal distances from one another.

The plate 2 is advantageously provided, on each of its opposing longitudinal sides, with a stiffening element 5 extending along said two sides and being isolated electrically from each of the coils 3 and the plate 2.

More precisely, the stiffening element 5 is "U-shaped" and connected rigidly at its ends to the juxtaposed peripheral portions of the plate 2 by a double punching formation advantageously performed on either faces of the plate 2 to provide for a more secure attachment between the plate 2 and the two stiffening elements 5 while accommodating any unrestricted and uniform expansion of the coils 3 when the resistor is subjected to a high temperature.

In order to prevent mechanical deflection of the plate 2 and/or constrain the material expan-

sion on reaching a high temperature, which situations could result in a short-out, the stiffening element 5 is provided with a strengthening fin 6 extending parallel along the axis of the stiffening element 5.

Between each stiffening element 5 and each coil 3 and over the entire length of the plate 2, there extend respectively a first reed 7 and two second reeds 8 and 9, one for each face of the coils 3 and the plate 2, to electrically isolate the stiffening element 5 from the plate and the coils.

More specifically, the first reed 7 is advantageously passed, as shown in Figures 2 and 3, between one pair of coils 3 and the next, so as to prevent them, during deformation of the material when subjected to a high temperature, from contacting one another and cause a short circuit situation which would put the resistor out of operation.

The two second reeds 8 and 9 are interposed respectively to the stiffening element and those portions of the first reed 7 which face alternately the two faces of the plate 2.

It is clear that instead of the two reeds 8 and 9, it is possible to use just one reed also it "U-shaped" so as to cover entirely the inner surface of the element 5 advantageously preventing an eventual short circuit situation in case the element 5 is inserted by force on the plate 2.

It is further pointed out that the stiffening element 5 has a width substantially equal to or larger than the width of the first reed 7 and of the two second reeds 8 and 9, and a shorter length than the two second reeds 8 and 9.

The plate 2 is also provided on each of its short sides with a seat 10 adapted for releasable retention in its housing and to enable its positioning either individually or with other plates.

It has been found in practice that the resistor structure of this invention is particularly advantageous in that it allows uniform sliding of the coils as the material comprising the resistor expands when subjected to high temperatures, while preventing, however, the occurrence of deformations resulting in the coils contacting one another and shorting out to cut the resistor out of operation.

In practicing the invention, the materials used and the dimensions may be any ones contingent on requirements and the state of the art.

Claims

1. An electric power resistor structure comprising: a metal plate (2) constituting a plurality of windings (3) laid side-by-side in parallel relationship, stiffening elements (5) extending on two opposite sides of said plate and being electrically isolated from said windings (3) and said plate (2), said stiffening elements (5) being connected rigidly at their ends to juxtaposed peripheral portions of said plate (2) and having at least one strengthening fin (6) extending parallel to their

axis, characterised in that it comprises at least one first reed (7) of an insulating material extending over the entire length of said plate (2) and intervening between one of said windings (3) and the next.

2. An electric power resistor structure according to claim 1 characterised in that it comprises at least two second reeds (8, 9) of an insulated material interposed respectively to said stiffening element (5) and those portions of said first reed (7) which confront alternately the two faces of said plate (2).

3. An electric power resistor structure according to claims 1 and 2, characterised in that said stiffening element (5) has a U-like conformation of substantially the same width as the width of said at least one first and two second reeds (7, 8, 9) and a shorter length than said two second reeds (8, 9).

4. A electric power resistor structure according to one or more of the preceding claims, characterised in that said plate (2) has, on the two orthogonal sides to said opposed sides, seats (10) for its releasable retention either singly or with other plates.

Patentansprüche

1. Struktur eines elektrischen Leistungswiderstands, enthaltend: Eine eine Vielzahl von Seite an Seite parallel zueinander angeordneten Windungen (3) bildende Metallplatte (2), sich an zwei gegenüberliegenden Seiten dieser Platte erstreckende und gegenüber den Windungen (3) und der Platte (2) elektrisch isolierte Versteifungselemente (5), wobei diese Versteifungselemente (5) an ihren Enden mit angrenzenden, peripheren Bereichen der Platte (2) starr verbunden sind und wenigstens eine parallel zu ihren Achsen verlaufende Verstärkungsrippe (6) aufweisen, dadurch gekennzeichnet, daß wenigstens ein erstes Blatt (7) aus isolierendem Material vorgesehen ist, das sich über die gesamte Länge der Platte erstreckt und zwischen einer der Windungen (3) und der nächsten liegt.

2. Struktur eines elektrischen Leistungswiderstands nach Anspruch 1, dadurch gekennzeichnet, daß wenigstens zwei weitere Blätter (8, 9) aus isolierendem Material vorgesehen sind, die jeweils zwischen den Versteifungselementen (5) und denjenigen Bereichen des ersten Blattes (7) angeordnet sind, die alternativ den beiden Seitenflächen der Platte (2) gegenüberstehen.

3. Struktur eines elektrischen Leistungswiderstands nach den Ansprüchen 1 und 2, dadurch gekennzeichnet, daß das Versteifungselement (5) eine U-ähnliche Gestalt mit im wesentlichen derselben Breite wie die Breite des wenigstens ersten oder der beiden weiteren Blätter (7, 8, 9) und mit einer geringeren Länge wie die der beiden weiteren Blätter (8, 9) aufweist.

4. Struktur eines elektrischen Leistungswiderstands nach einem oder mehreren der vor-

hergehenden Ansprüche, dadurch gekennzeichnet, daß die Platte (2) an den beiden orthogonal zu den beiden gegenüberliegenden Seiten verlaufenden Seiten Befestigungsmittel (10) zum lösbaren Festhalten entweder allein oder mit anderen Platten aufweist. 5

Revendications

1. Structure de résistance électrique de puissance comprenant: une plaque métallique (2) constituant un certain nombre d'enroulements (3) disposés côte à côte en parallèle, des éléments de raidissement (5) disposés des deux côtés opposés de la plaque et se trouvant isolés électriquement des enroulements (3) et de la plaque (2), ces éléments de raidissement (5) étant reliés rigidement par leurs extrémités à des parties périphériques juxtaposées de la plaque (2) et comportant au moins une ailette de renforcement (6) disposée parallèlement à leur axe, structure caractérisée en ce qu'elle comprend au moins un premier jonc en matériau isolant (7) s'étendant sur toute la longueur de la plaque (2) et s'interposant entre l'un des enroulements (3) et le suivant. 10
2. Structure de résistance électrique de puissance selon la revendication 1, caractérisée en ce qu'elle comprend au moins deux seconds joncs (8, 9) en matériau isolant interposés respectivement entre l'élément de raidissement (5) et les parties du premier jonc (7) qui viennent respectivement en face des deux faces de la plaque (2). 15
3. Structure de résistance électrique de puissance selon l'une quelconque des revendications 1 et 2, caractérisée en ce que l'élément de raidissement (5) présente une configuration en forme de U exactement de la même largeur que celle, au moins, des premier et des deux seconds joncs (7, 8, 9), et de longueur plus courte que celle des deux seconds joncs (8, 9). 20
4. Structure de résistance électrique de puissance selon l'une ou plusieurs des revendications précédentes, caractérisée en ce que la plaque (2) comporte, sur les deux côtés perpendiculaires aux côtés opposés, des sièges (10) permettant de la retenir de manière amovible soit seule, soit avec d'autres plaques. 25

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Fig. 1

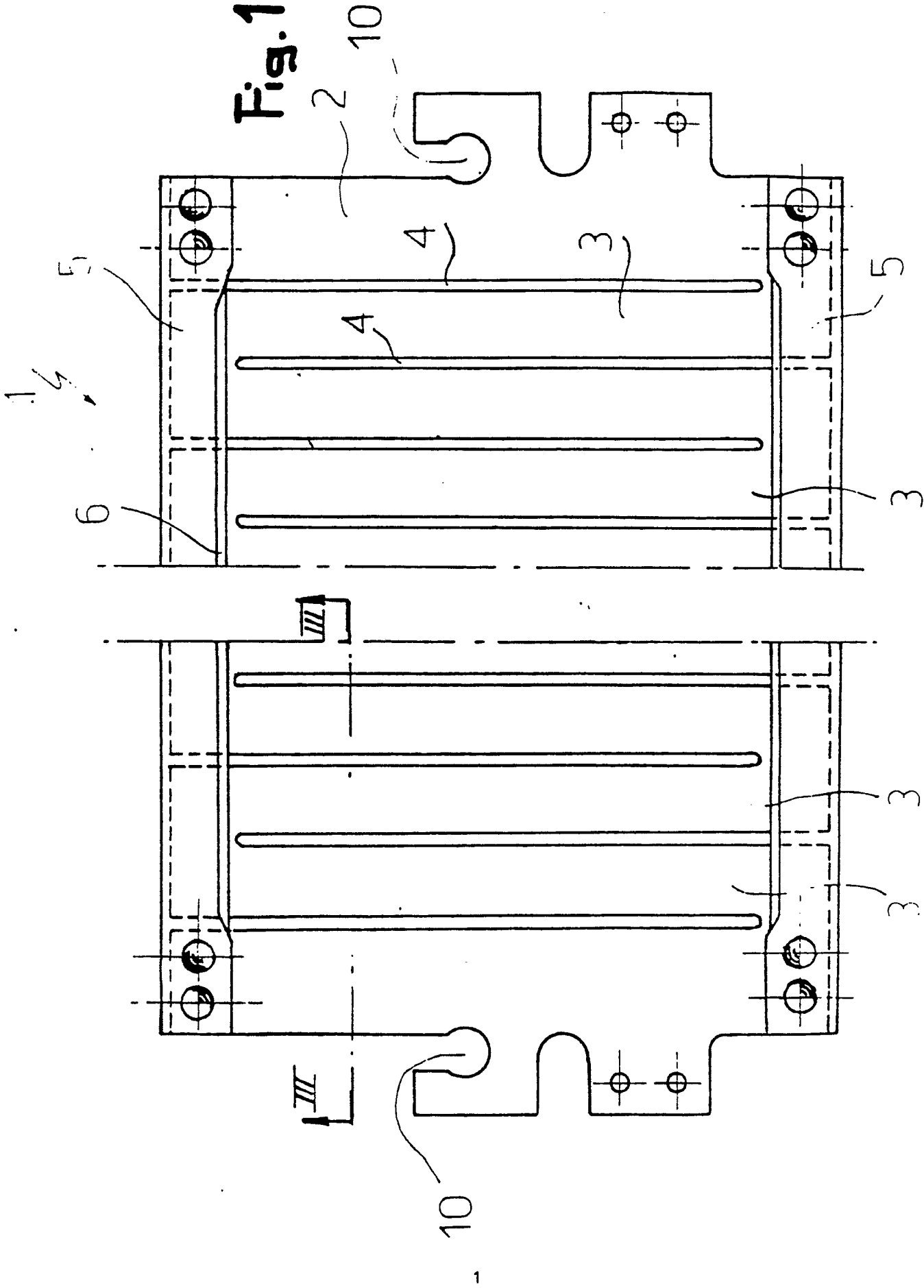


Fig. 2

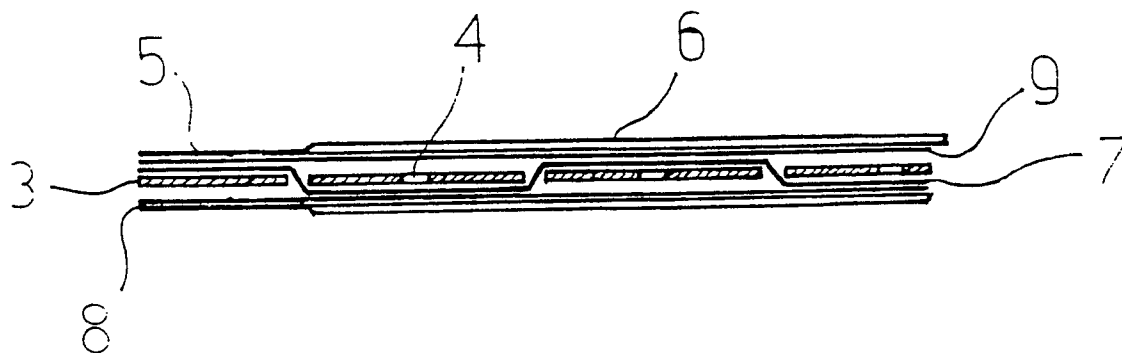
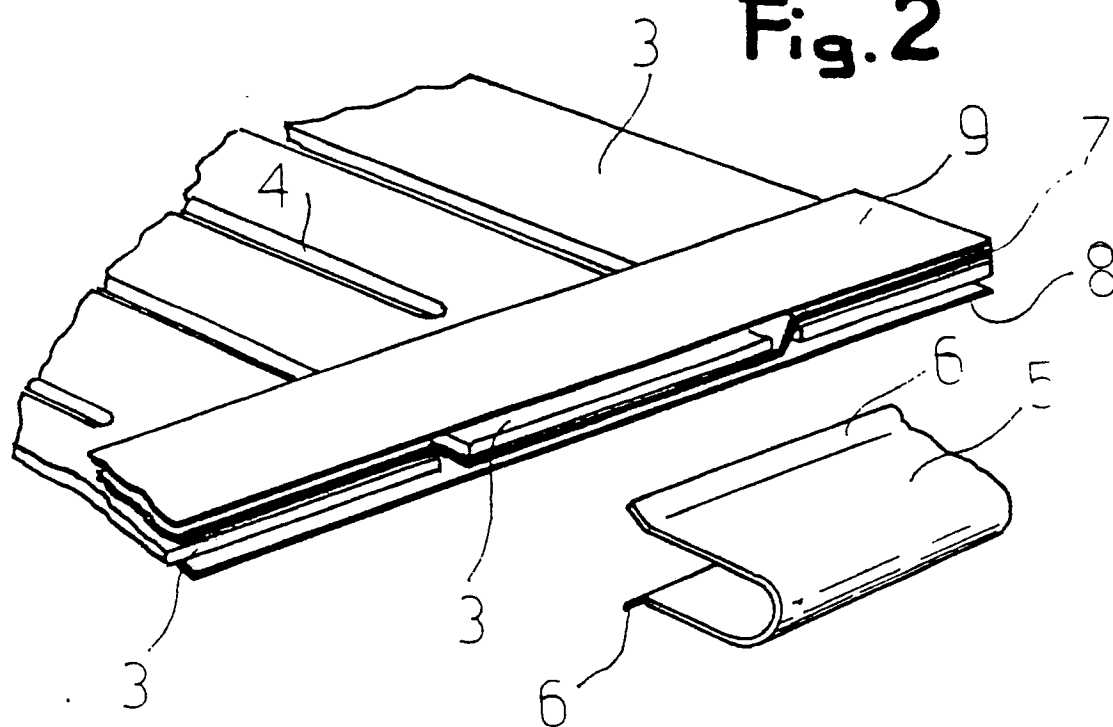


Fig. 3