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(54) **Resistor device with fuse function, especially for vehicle applicatons**

(57) A resistor with controlled critical point is described, especially for vehicle applications, said resistor having the form of a Greek fret strip or strap, with a given

cross-section and length, in which a portion (2) thereof has a smaller cross-section in order to increase the specific power dissipated therein, acting as a fuse.

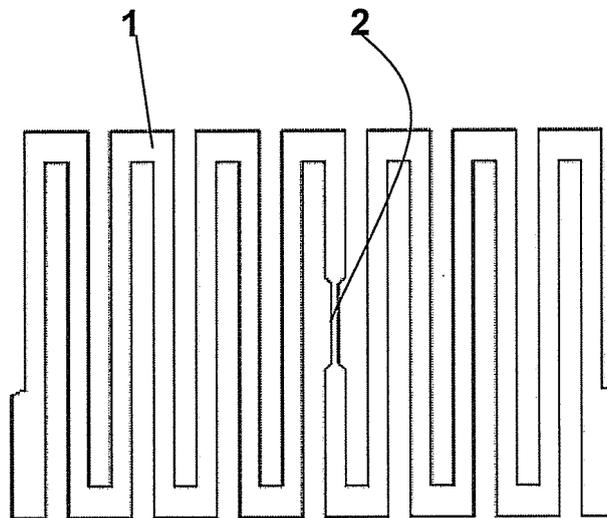


FIG. 1

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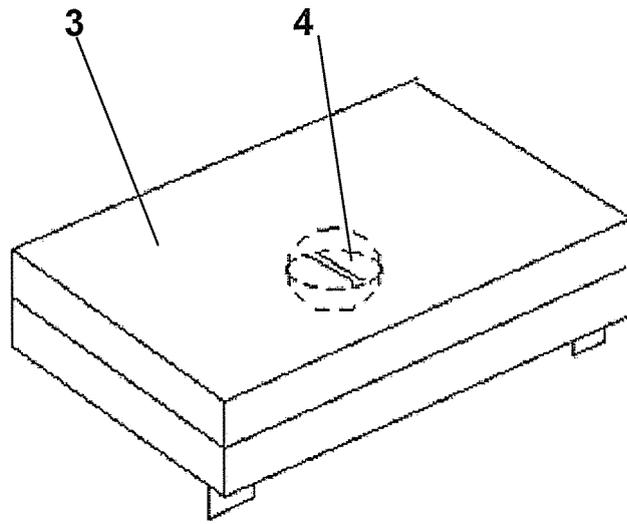


FIG. 2

Description

[0001] The present invention relates to a resistor with controlled critical point, especially for vehicle applications.

[0002] The rotational speed of the electrically controlled components installed onboard vehicles, in particular the heat-exchanger fans, is usually controlled by means of resistors connected in series to the motor.

[0003] In the event of the mechanical blocking of the motor of these components, there is a significant increase in the current absorbed thereby. In order to prevent them from reaching excessively high temperatures, the control resistor is used to monitor the current absorbed by the motor. The current is usually measured indirectly, by monitoring the reaction at the temperature reached by the resistor of a thermal fuse installed close to said resistor.

[0004] This type of arrangement is associated with a number of drawbacks, in terms of the number of components and of the checks and verifications that must be carried out on said components and on their anchoring devices.

[0005] Several welds must be performed on the assembly board (at least four, two to anchor the fuse and two to anchor the resistor). More welds (at least four) must also be performed during the actual assembly of a resistor of the conventional type.

[0006] Each of these welds must be carefully checked.

[0007] Said board has a complex geometry to allow the various components to be anchored in accessible positions, bearing in mind that they must necessarily be assembled very close together to enable the correct operation of the control function.

[0008] This results in high costs, both in terms of production and of maintenance.

[0009] Therefore the purpose of the present invention is to overcome all the drawbacks described above with a resistor with controlled critical point, especially for vehicle applications, the construction of which requires no welding nor the relative verification, that also acts as a fuse and thus entirely eliminates the fuse welds and simplifies the assembly and possibly also the actual geometry of the board.

[0010] The present invention relates in particular to a resistor with controlled critical point, especially for vehicle applications, as described more fully in the claims, which are an integral part of this description.

[0011] Further purposes and advantages of this invention will become apparent from the following detailed description of a preferred embodiment (and the relative alternative embodiments) and the drawings that are attached hereto, which are merely illustrative and not limitative, in which:

figure 1 is an outline drawing of the resistor according to the present invention;

figure 2 is an assembly drawing of the component

housing the resistor;

figures 3 and 4 show the two parts of the insulating casing inside which the resistor is placed.

5 **[0012]** In the figures the same reference numbers are used to indicate the same components.

[0013] A resistor is subject to a voltage difference which causes a current to flow through it. Due to the Joule effect along the resistor the electrical energy deposited on the resistor is converted into thermal energy. The latter is transferred to the surrounding environment by means of a series of physical phenomena that range from conduction to radiation.

10 **[0014]** The electrical energy and parallelly the thermal energy can be distributed unevenly along the resistive element of the resistor by controlling the cross-section along its path.

15 **[0015]** The thermal resistance towards the surrounding environment can be regulated locally along the resistor to keep specific parts of said resistor at a significantly different temperature with respect to other areas.

20 **[0016]** According to the invention, these two mechanisms are used together to produce a resistor that also acts as a fuse.

25 **[0017]** With reference to the drawings, a resistive element 1 has the form of a Greek fret strip or strap, extending essentially on one plane, with a given cross-section and length. In general the cross-section is small in relation to the length. A portion 2 of the resistive element 1 has a smaller cross-section in order to increase the specific energy dissipated in that part of the resistive element.

30 **[0018]** While the rest of the resistive element is in close contact with an electrically insulating material 3 with good heat conductivity, the part with the smaller cross-section is left floating in air inside a specific cavity 4 in the electrically insulating material 3, where heat is essentially dissipated by means of radiation.

35 **[0019]** In this way the heat dissipation in the two parts of the resistor differs greatly, with the fuse function being performed by the part with the smaller cross-section 2.

40 **[0020]** The radiation dissipation mechanism is extremely non-linear with respect to the temperature, which makes it possible to regulate the maximum current at which the part with the smaller cross-section is interrupted and the time required for the resistor to open after the blocking of the motor, by means of the appropriate dimensioning of the section of the resistive element with the smaller cross-section and the relative cavity 4.

45 **[0021]** The resistor can be produced cheaply, using a construction process based for example on that described in the Italian patent No. 1274441, the application for which was filed by the same applicant on 5 May 1995, describing a method for the production of resistors, particularly for use in the automotive sector, characterized in that it comprises a step in which at least one essentially flat body extending along an open path is cut from a strip of resistive material, a step in which the ends of the body are folded, a step in which said body, with the exception

of the ends, is housed in at least two half-sections made of electrically insulating material, with the interposing of an adhesive material.

[0022] The method is also characterized in that the body is arranged in a Greek fret design. 5

[0023] The method is also characterized in that several bodies are arranged in the two half-sections, said bodies being obtained by cutting a strip of resistive material, arranged so as to mutually overlap and between which a sheet of electrically insulating material is interposed, said bodies forming several resistive sections, which can be connected to one another by their ends which are arranged outside the half bearings. 10

[0024] According to the present invention, the strap 1 that constitutes the resistor is cut in an appropriate manner according to a given cross-section, and a section 2 is cut with a smaller cross-section. 15

[0025] The ceramic casing 3 is suitably shaped to form a cavity 4 in correspondence with the section with the smaller cross-section. 20

[0026] It will be apparent to the person skilled in the art that other alternative and equivalent embodiments of the invention can be conceived and reduced to practice without departing from the true spirit of the invention.

[0027] From the description set forth above it will be possible for the person skilled in the art to embody the invention without introducing any further construction details. 25

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Claims

1. Resistor, especially for vehicle applications, having the form of a Greek fret strip or strap, with a given cross-section and length, **characterized in that** a portion (2) thereof has a smaller cross-section in order to increase the specific power dissipated therein, acting as a fuse. 35
2. Resistor, especially for vehicle applications, according to claim 1, **characterized in that** it is covered with an electrically insulating material (3) that is in close contact with the part of the resistor with the cross-section that is not smaller, and that the portion (2) with the smaller cross-section is left floating in air inside a specific cavity (4) in the electrically insulating material (3). 40 45
3. Resistor, especially for vehicle applications, according to claim 1, **characterized in that** said Greek fret strip or strap extends essentially on one plane. 50

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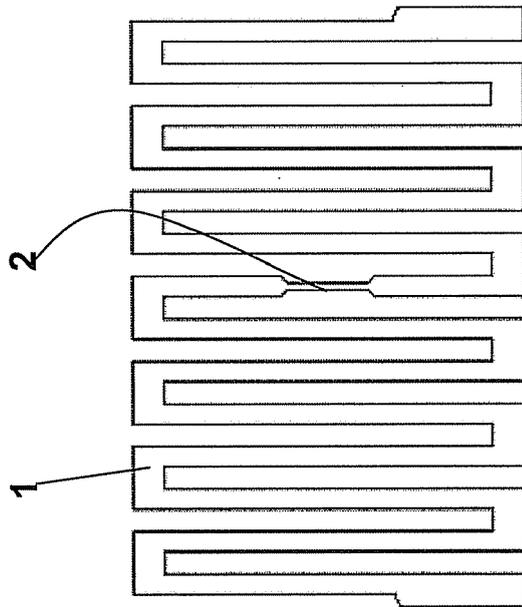


FIG. 1

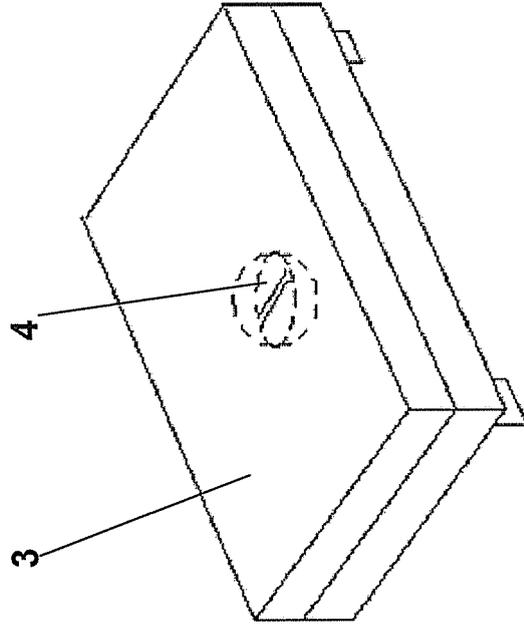


FIG. 2

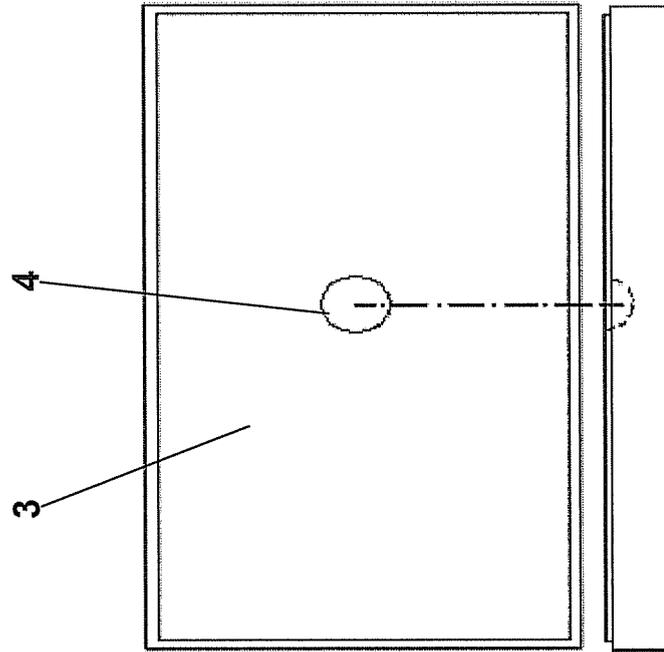


FIG. 4

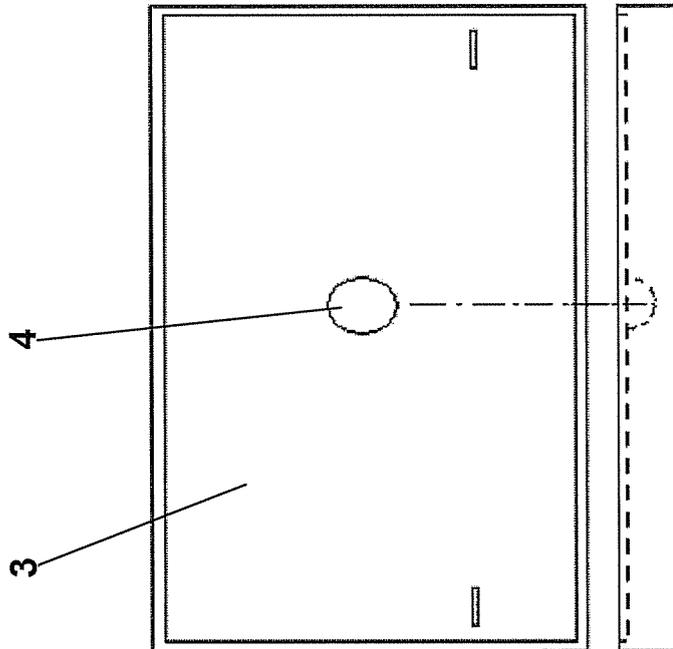


FIG. 3



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	FR 2 778 057 A (SOFEDIT [FR]) 29 October 1999 (1999-10-29) * figure 1 *	1-3	INV. H01C7/22 H01H85/048
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A	US 2003/142453 A1 (PARKER ROBERT [US] ET AL) 31 July 2003 (2003-07-31) * figure 2 *	2	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			H01H H01C
Place of search		Date of completion of the search	Examiner
Munich		17 August 2007	Plützer, Stefan
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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17-08-2007

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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- IT 1274441 [0021]