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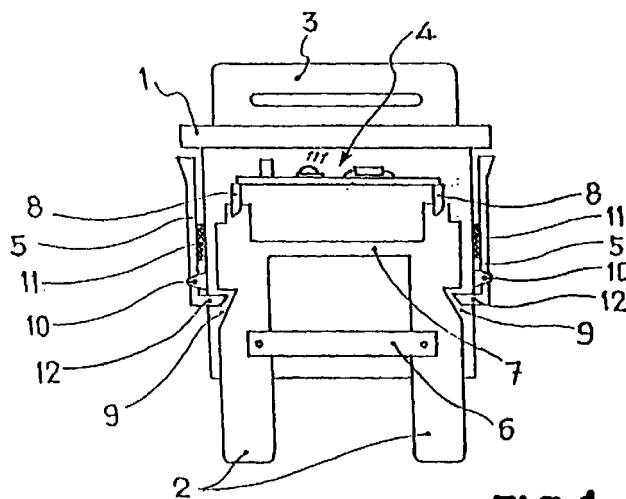
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(54) **Luminous indicator for blown fuses and their causes in electrical circuits of automobiles**

(57) Made up of a holder element (1) on which one or several detecting circuits (4) are assembled constituted by a lamp of LED diode connected in series to a Zener diode and a resistance, dimensioned in such a way that the LED turns on when the value of the impedance of the circuit to be protected is lower than a predetermined value. The detecting circuit (4) has two connecting tags (8) foreseen to hold the fuse element (2) itself, which being made up of a soft metal strip in the shape of an "H" is clamped by the holder (1) by means of a clamping mechanism made up of two stops (12) which are inserted into two slits (9) which the fuse element has and which can be released by pressing on the corresponding levers (5).



**FIG.1**

**EP 1 003 194 A1**

## Description

**[0001]** The invention refers to a luminous indicator for blown fuses in electrical circuits of automobiles, whose purpose is that the user to be able to visually detect when there is a blown fuse, in those used for protection of the diverse components fed via the electrical circuit of a vehicle. The invention also allows to know whether the fuse has acted due to a permanent short-circuit, and in this latter case, the insertion of a new fuse is avoided until the anomaly is fixed.

**[0002]** The invention is preferably applied to fuses of the UNE-26-416 type which corresponds to the most usual standard of fuses for automobiles.

**[0003]** In automobiles, when a fuse blows, is it slow and sometimes dangerous to change said useless fuse by another one in proper condition. Said inconveniences are increased in the cases when the accident happens in the dark, reaching a maximum difficulty when it is the user himself the one who has to do the replacement of the fuse, and all the above also partly due to the difficult access that there is to the area of the fuses, the high number of the same, the little empty room between them and the great force which must be exerted to overcome the pressure of the insertion contact.

**[0004]** It is evident therefore, that for the average user, substituting a fuse, is a problem, in particular if this is done at night. For professionals, although it will be least problematic, it is a slow operation which, no doubt, shall have repercussions in the cost of the overhauls and/or repairs of the vehicle.

**[0005]** The luminous indicator subject matter of the present invention allows to resolve these problems since, in the first place it allows the rapid identification of the blown fuse, in the second place it detects the possible presence of a permanent short-circuit and finally it makes tremendously easier the extraction of the fuse by hand.

**[0006]** More concretely, the luminous indicator of the invention has the particularity of being assembled onto a fuse, in such a way that it stays off as long as a current larger than a pre-established value is not applied to it.

**[0007]** Since the electrical circuit of an automobile works at a sensitively constant voltage, the above condition is equivalent to saying that the luminous indicator will be activated or not as a function of the impedance of the circuit protected by the blown fuse as experienced at the tags of the fuse holder base.

**[0008]** In this way we will be able to obtain a first luminous signal which will be activated by an impedance in the circuit of a predetermined value, all the high it is wished, and as long as the fuse element has been melted. This first signal constitutes the blown fuse indication.

**[0009]** A second luminous indication can be obtained for a low enough impedance of the circuit,

close to zero, which would indicate a permanent short-circuit in the electrical system. This second signal constitutes the indication of the presence of a permanent type short-circuit.

**[0010]** The luminous indicators can be constituted by conventional lamps, diodes of the LED type or any other light emitting device.

**[0011]** The detection of the impedance value of the circuit can be done preferably by means of the connection in series to the luminous indicator of a ZENER diode of the adequate voltage and a resistance which restricts the intensity of the electrical current which goes through the luminous indicator at the adequate value for the correct working of the same. Two sets such as the one described, connected in parallel, and of course with the adequate values for the different components, will constitute the luminous indicators of a blown fuse, and of the presence of a permanent short-circuit.

**[0012]** Structurally, a possible fused fitted with the referred indicator, is constituted by a body which acts as a holder, which can be made up in any type of adequate material and with the most adequate shape in order to adapt it, depending on the case, to the characteristics of the wiring on to which it is applied. Said holding body includes inside a printed circuit with the luminous indicator described, which has two connecting tags in order to hold the fuse element itself. In this manner the fuse element can be replaced with no need to change the printed circuit board which constitutes the costliest part of the luminous indicator device.

**[0013]** The set, as is evident, shall be connected in series to the circuit to be protected, and the indicator shall stay off as long as a current above the rated current of the fuse is not applied to the soft melting metal strip, in such a way that when an excessive intensity current, caused by a breakdown, circulates through the latter said soft metal strip shall melt and the supply to the circuit will be interrupted, thus creating a potential difference between the connecting strips which shall give rise to the turning on of the luminous indicator, which shall facilitate the location of this fuse, thus increasing its efficiency in low visibility conditions, specially at night.

**[0014]** The indicator applied to a fuse constitutes a device which acts in static and dynamic situations of the vehicle, when an excessive intensity current occurs, staying interrupted and lighted for its instantaneous location.

**[0015]** Among the advantages which can be mentioned are the following:

- It makes much easier the handling of the fuses,
- Repair time decrease in after sale servicing.
- Reduction of the hazard under dim light conditions
- Reduction in repair costs for the user.
- Quick location of the affected fuse.
- Elimination of repeated fuse consume in case of permanent short-circuits.

- Possibility of applying or installing it in any vehicle with no alteration of the characteristics of the same.
- Reduced dimensions and low energy consumption of the detection device.
- It does not entail a considerable increase in the installation or maintenance costs.

**[0016]** In order to complement the description which will be carried out next and to help to a better understanding of the characteristics of the invention, a sheet of planes is attached to this descriptive report, being an integrating part of the same, and where with a merely descriptive and not limiting character the following has been represented:

**[0017]** Figure 1 shows a schematic view of the set of a fuse onto which the luminous indicator of the invention can be applied.

**[0018]** Figure 2 shows the electrical diagram of the printed circuit which shall hold the detection device included in the luminous indicator of the invention.

**[0019]** In said figures, the number references correspond to:

- 1.- Base element.
- 2.- Connecting strips.
- 3.- Extracting tongue.
- 4.- Printed circuit board.
- 5.- Clamping levers.
- 6.- Insulating reinforcement.
- 7.- Fuse strip.
- 8.- Connecting tag.
- 9.- Slit for the clamping of the fuse strip.
- 10.- Joint.
- 11.- Elastic element.
- 12.- Stop.

**[0020]** As can be seen in figure 1, which represents a preferred embodiment of the invention, the luminous indicator for the blown fuse and its cause is constituted by a body 1 which acts as the holder, which incorporates an extracting tongue 3 in order to facilitate its handling. Inside, it has a small printed circuit board 4 which groups the different elements which make up the electronic circuit which allows the performance of the desired function, and which has two connecting tags 8 foreseen to receive the fuse element itself. The latter, made up of a soft metal strip with a general "H" shape whose horizontal finer branch, constitutes the melting part, has an insulating reinforcement 6 in order to prevent the untimely breaking of the horizontal melting branch during the handling of the fuse element.

**[0021]** An electrical circuit contained on the printed circuit board 4 has been represented in figure 2. As can be seen, joined to the two connecting tags 8 there is a diode bridge whose purpose is to make possible the insertion of the luminous indicator subject matter of the present invention onto the fuse holding base, not worrying about the polarity of the same and which is exceed-

ingly well known for any expert in the matter. Between the two tags of the diode bridge, two circuits are connected in parallel, corresponding to each of the two luminous signalling functions foreseen in the invention: detection of blown fuse and detection of permanent short-circuits. In both cases, the specific circuit is made up of a ZENER diode, a light emitting LED and a resistance, connected in series, choosing the cut-off voltage of the ZENER diode and the resistance value as a function of the impedance range of the circuit of the vehicle which is being tagged. In a first embodiment example, the values are the following:

$$\begin{aligned} Z_1 &= 6.2 \text{ V} \\ \text{LED}_1 &= \text{Red} \\ R_1 &= 470 \, \Omega \\ Z_2 &= 3.3 \text{ V} \\ \text{LED}_2 &= \text{Green} \\ R_2 &= 220 \, \Omega \end{aligned}$$

**[0022]** In a second embodiment example the two resistances  $R_1$  and  $R_2$  are replaced by one only resistance  $R_3 = 1 \text{ k}\Omega$ , increasing the cut-off voltage of the ZENER  $Z_2$  diode up to 4.7 V.

**[0023]** The working of the device subject matter of the invention is the following one: Once the subject matter of the invention has been inserted onto a fuse holding base of the vehicle replacing the normal fuse, the LED diodes shall remain off since the current is shunted to the horizontal branch of the "H" of the fuse element, and thus the voltage which is observed between the tags of the circuit 4 is null. If a fuse blows due to an overload of the protected device, due to a transitory short-circuit or simply due to the mechanical stress because of the vibration of the fuse strip itself 7 a voltage shall appear between the tags of the circuit 4, if the impedance of the circuit to be protected, experienced at the tags of the printed circuit 4 is lower than a determinate value. If the latter impedance is  $500 \, \Omega$  the voltage drop which shall appear between the tags of the printed circuit 4 will be 6 V, while the second detecting circuit stays off. If, by contrast, there is an opened short-circuit, the voltage between the tags of the circuit 4 shall be larger, and also the red  $\text{LED}_2$  of the permanent short-circuit indicator shall light up in this case.

**[0024]** In order to change a fuse, the holding body 1 is taken by the extraction tongue 3 in order to be able to extract the connecting strips 2 of the corresponding contacts on the fuse holding base fixed onto the vehicle. Pressing the clamping levers 5 inwards, against the action of elastic elements 11 the latter shall turn around its joints 10, withdrawing the stops 12 from the clamping slits 9 of the fuse element and allowing, therefore, the withdrawal and replacing of the same.

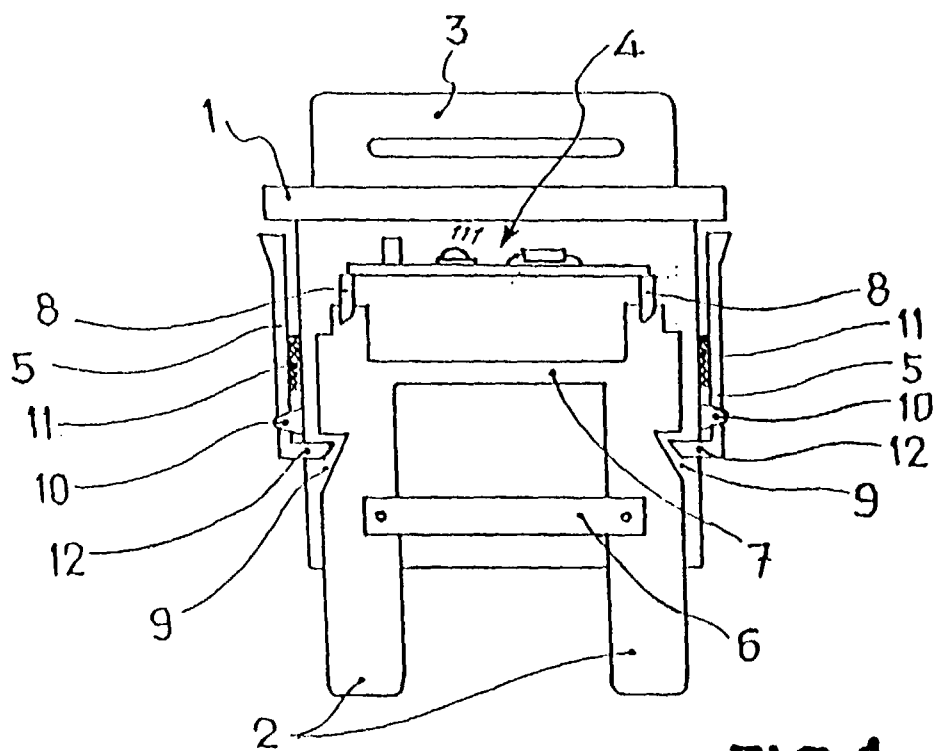
**[0025]** A series of variations shall be evident for an expert in the matter which, not affecting the basic characteristics of the invention allow to adapt it to different uses or to optimise the costs. Thus, the detecting cir-

cuits in parallel, and as a consequence, the different signals may be more than two, which would allow to discriminate several impedance stretches, the clamping device for the fuse element can vary and the electronic components can be arranged imbedded into the holding body 1 instead of being mounted onto a printed circuit board. 5

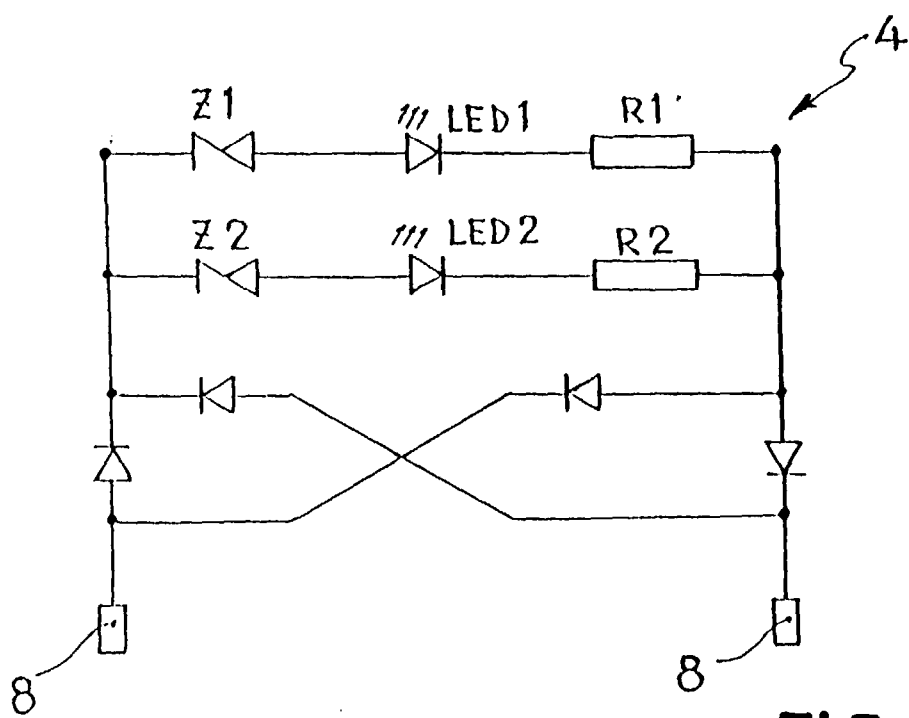
## Claims

1. Luminous indicator for blown fuses and their causes for electric circuits in automobiles, characterised in that it comprises: 10
  - detection means for the value of the impedance of the electric circuit of a vehicle, 15
  - an extracting tongue (3) as constituting part of the body (1) of the holder of the luminous indicator
  - clamping means of the fuse element itself. 20
2. Luminous indicator for blown fuses and their causes for electric circuits in automobiles, according to claim 1, characterised in that the detection means for the impedance value of the electrical circuit are constituted by a detecting circuit made up of a Zener diode, a luminous diode or LED and a resistance connected in series, dimensioned in such a way that the LED lights on for impedance values below a determinate value. 25 30
3. Luminous indicator for blown fuses and their causes for electric circuits in automobiles, according to claim 2, characterised in that several detecting circuits may exist in parallel, dimensioned in order to discriminate different impedances. 35
4. Luminous indicator for blown fuses and their causes for electric circuits in automobiles, according to claim 3, characterised in that the detecting circuits are two, one which detects the blowing of the fuse and another one which detects the presence of a permanent short-circuit. 40
5. Luminous indicator for blown fuses and their causes for electric circuits in automobiles, according to claim 1, characterised in that the clamping means are constituted by two clamping levers (5) which, articulated at a site (10) introduce a stop (12) into a slit (9) which the connecting tags (2) of the fuse element have, by means of the action of elastic elements (11). 45 50

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**FIG. 1**



**FIG. 2**



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# EUROPEAN SEARCH REPORT

Application Number  
EP 98 50 0257

DOCUMENTS CONSIDERED TO BE RELEVANT				
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)	
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The present search report has been drawn up for all claims				
Place of search <b>THE HAGUE</b>		Date of completion of the search <b>14 February 2000</b>	Examiner <b>Desmet, W</b>	
<p><b>CATEGORY OF CITED DOCUMENTS</b></p> <p>X : particularly relevant if taken alone  Y : particularly relevant if combined with another document of the same category  A : technological background  O : non-written disclosure  P : intermediate document</p> <p>T : theory or principle underlying the invention  E : earlier patent document, but published on, or after the filing date  D : document cited in the application  L : document cited for other reasons  &amp; : member of the same patent family, corresponding document</p>				

EPO FORM 1503 03/82 (P04001)

**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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