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(54) Fuse.

(57) The fuse for the protection of electrical circuits, in particular for cars, is given such a structure that, in the event that it had to perform its task -- and hence it blew out -- said fuse can be easily located.

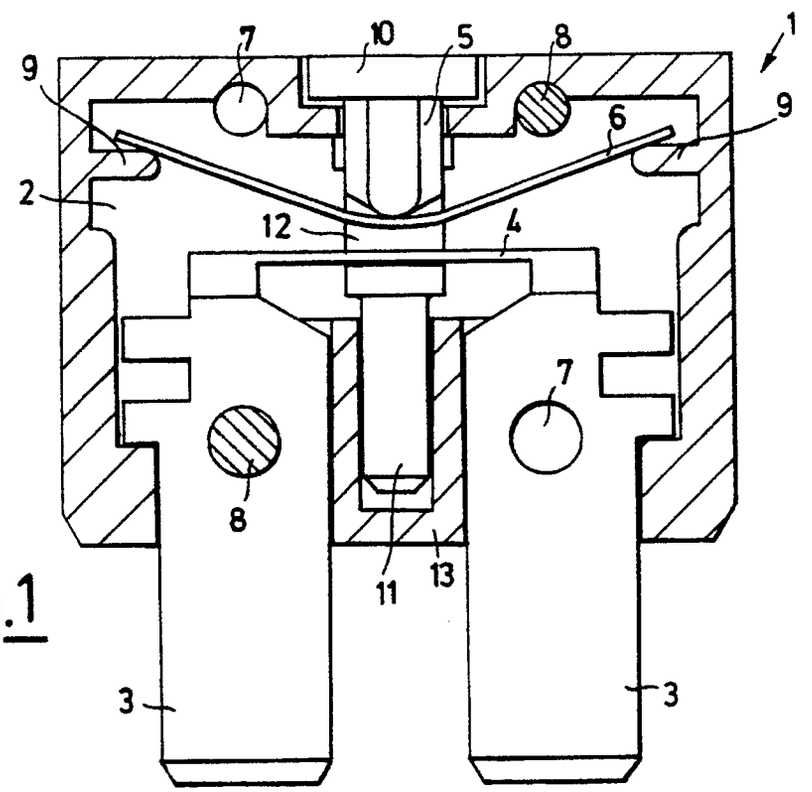

Fig.1

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FUSE

The present invention is concerned with a fuse for the protection of electrical circuits, in particular for cars.

It is well-known that the fuses constitute the weakest component in the circuit they are destined to protect.

In the event that the circuit gets heated, in most cases owing to a short-circuit, the fuse blows out, thus interrupting the circuit before the other components are damaged by the developed heat.

In the field of vehicles, each fuse, besides securing a correct interruption power, should additionally show reduced overall dimensions, which make it possible many units to be gathered in the small room available inside the purposely designed connector blocks.

In this regard, fuses of the herein disclosed type are already known, e.g., from U.S. patent N. 3,909,767 filed on January 14th, 1974.

Thanks to its limited thickness, such a type of fuse allows the room inside the connection blocks inside which it is housed -- usually side-by-side to other fuses and in narrow sequence with them -- to be exploited to the greatest extent.

The result is that, when it is housed together with the other fuses inside the relevant connection block, each fuse is difficulty accessed and moreover the fuse caused to blow out by the overcurrents is difficult, if not impossible, to be located among the many others. The situation is even worse if the connection block is housed -- as it happens often -- in a dark, difficultly accessed, area of the vehicle.

At present, in order to check the integrity of each fuse, one should usually remove it from the systems it makes a part of.

The purpose of the present invention consists of providing a fuse capable of obviating said drawbacks, by enabling said fuse to be easily located when it blew out owing to a protection intervention thereof.

Such a purpose is achieved by a fuse for the protection of electrical circuits, in particular for cars, which comprises a pair of blade poles connected by a jumper capable of getting interrupted by melting due to the effect of short-circuit currents, and a shell which constitutes the bearing structure for said poles and said jumper, characterized in that it is provided with a signalling device, which signals the breakage of the jumper.

The present invention is illustrated, for merely exemplifying, non-limitative purposes, in the figures of the hereto attached drawing tables in which:

Figure 1 shows a sectional view of a fuse according to the present invention;

Figure 2 shows a sectional view of a fuse according to the present invention, accomplished according to a first alternative form of practical embodiment;

Figure 3 shows a sectional view of a fuse according to the present invention, accomplished according to a second alternative form of practical embodiment;

Figure 4 shows a sectional view of a fuse according to the present invention, accomplished according to a third alternative form of practical embodiment;

Figure 5 shows a sectional view of a fuse according to the present invention, accomplished according to a fourth alternative form of practical embodiment.

Referring to the above mentioned figures and, in particular, to figure 1, the fuse according to the present invention, generally indicated with the reference numeral 1, comprises a shell made from an insulating material 2, a pair of blade poles 3, a jumper 4 which establishes the mutual electrical connection of the two blade poles 3, and a signalling device, which signals the occurred interruption of the jumper.

The shell is formed by two substantially identical half-shells provided with male-female elements for mutual fastening. The male elements are constituted by a pair of pegs 8, and the female elements are constituted by a pair of through-bores 7. Also the blade poles 3 comprise through-bores suitable for being engaged by the pegs 8.

During the assembly, the pair of pegs 8 of the first half-shell 2 run through the blade poles 3 and the through-bores 7 of the other half-shell, giving the fuse a monolithic shape.

The jumper 4 constitutes the weakest -- and hence most heat-sensitive -- point of the circuit the fuse should protect; the cross-sections and the material it is constituted by are suitably selected by the designer.

The signalling device which performs the task of signalling the occurred interruption of the jumper comprises a pin 5 and a flat spring 6 and, implicitly, the same jumper 4. The pin 5 comprises an enlarged head 10, an opposite end 11 having a square cross-section and an intermediate hollow 12 The opposite end 11 is housed inside a seat 13 provided on the half-shells and through the intermediate hollow 12 the jumper 4 and the flat spring 6 run. The flat spring 6, whose ends lay on brackets 9 provided inside the interior of the half-shells 2, is pre-loaded by the pin 5, retained inside the shell 2, and by the jumper 4 which, as seen, runs, together with the flat spring 6, through the inter-

mediate hollow 12.

However, due to its reaction, the spring 6 tends to project the pin 5 out of the shell 2. When the jumper 4 melts owing to a short-circuit, the pin 5 is released and is projected (guided by the opposite end 11 sliding inside the purposely provided seat 13) out of the shell 2.

Inasmuch as the fuses 1 are aligned inside the box, one can immediately see by his eyes (and, in the absence of light, he can feel by his touch) which is the fuse whose pin 5 is projected outwards from the shell 2. The enlarged head 10 further contributes to facilitate the location of the blown out fuse.

Therefore, in order to locate said fuse, it is not necessary to resort to special aids, such as, e.g., to the use of an electric measurement instrument, or to the progressive extraction from the connection block of all of the fuses, and inspection thereof.

The device for signalling the interruption of the jumper can be also accomplished according to different forms of practical embodiment. In that way, the fuses illustrated in Figures 2-4 are obtained.

In such figures, the elements corresponding to those already described and illustrated in figure 1 are indicated by means of the same reference numerals, respectively integrated with the letters A, B and C.

With particular reference to Figure 2, the signalling device for signalling the interruption of the jumper comprises a pin 5A and a spiral spring 6A. The pin 5A comprises a hollow 12A engaged by the only jumper 4A.

The pin 5A is guided by a seat provided with protrusions 13A, which cooperate with the pin end 11A opposite to the enlarged head 10A The spiral spring 6A rests at one of its ends on brackets 14A and the opposite end thereof acts on the enlarged head 10A. The outermost turns of said end of the spring 6A are constrained to the pin 5A in order to retain it in the event that said pin 5A is projected out of the shell 2 by the same spring 6A.

The fuse 1A is endowed with the characteristic of being easier to assemble than the fuse 1.

With particular reference to Figure 3, which shows the fuse 1B, the signalling device for signalling the interruption of the jumper comprises, in this case too, a pin 5B and a spiral spring 6B.

The pin 5B comprises a hollow 12B engaged by the only jumper 4B.

The opposite end 11B of the pin 5B is contained inside the spiral spring 6B which adheres to it by means of some end turns opposite to the turns which rest on the bracket 14B. Between the spring 6B and the blade poles 3B insulating walls 15B are interposed, such as to prevent possible electrical discharges to take place between the poles 3 through the same spring 6B.

Also the fuse 1B shows the feature of being easier to assemble than the fuse 1, whilst as compared to fuse 1A, the device for signalling the interruption of the jumper is best protected against possible damaging caused by to the projection of overheated material emitted by the jumper 6B during the blowing out of said jumper.

With particular reference to Figure 4, the signalling device for signalling the interruption of the jumper comprises, in this case too, a pin 5C and a spring 6C.

The pin 5C comprises a hollow 12C engaged by the only jumper 4C.

The pin 5C is at all similar to pin 5A except for the fact that the spring 6C is directly obtained as one enbloc piece together with the pin 5C during the moulding operation and comprises two blades of elastic material (e.g., plastic material) situated on opposite sides of the pin 5C. The two blades of the spring 6C, of elastic material, rest on brackets 14C due to the moulding of the bores 7C and of the pegs 8C. The fuse 1C is easy to assemble as compared to fuse 1, and cheaper than this, in that the spring 6C is directly provided on the pin 5C.

With particular reference to figure 5, the fuse illustrated in said figure is provided with a device for signalling the interruption of the jumper comprising an electrical circuit arranged in parallel to the jumper 4D.

Said electrical circuit comprises a LED 16D, a resistor 17D connected in series to said LED 16D and a lead 19D whose ends are constrained to each blade pole 3D, e.g., by means of tabs 18D.

The value of resistance of resistor 17D is considerably higher than as offered by the jumper 4D. As a consequence, way, owing to the well-known electrotechnical laws, substantially all of the electrical current flowing through the circuit flows through the jumper 4D, thus bypassing the electrical circuit of the signalling device.

The small amount of current which anyway still flows through the LED 16D is not large enough in order to light it.

In the event that the jumper 4D blows out, the electrical current flowing through the resistor 17D increases by a very limited amount, which is however enough for causing the LED 16D to be lit. LED lighting signals that the fuse blew out. However, the amount of electrical current flowing through the fuse in which the jumper 4D is interrupted is so limited, as to avert the effects of the short-circuit.

In the event that the fuse 1D is used in order to protect direct-current circuits, it is necessary that the LED 16D is of the type operating independently from its polarization, in order to prevent the LED 16D from not being lit when the jumper has blown out, owing to a wrong connection of the poles 3D.

The fuse 1D is more expensive to manufacture than all of the other fuses as illustrated hereinabove; however, it offers the considerable advantage that it is particularly easy to locate.

Claims

1. Fuse for the protection of electrical circuits, in particular for cars, which comprises a pair of blade poles (3, 3A-3D) connected by a jumper (4, 4A-4D) capable of getting interrupted by melting due to the effect of short-circuits currents, and a shell (2, 2A-2B)which constitutes the bearing structure for said poles (3, 3A-3D) and said jumper (4, 4A-4D), characterized in that it is provided with a signalling device, which signals the occurred breakage of the jumper (5, 5A-5D, 6, 6A-6D).

2. Fuse according to claim 1, characterized in that the signalling device which signals the occurred breakage of the jumper comprises a pin (5, 5A-5C) preloaded by an elastic element (6, 6A-6C) and kept in its position by the same jumper (4, 4A-4C), which pin (5, 5A-5C) comprises at a first end thereof an enlarged head (10, 10A-10C) and an opposite end (11, 11A-11C) guided during the step of expulsion of the pin (5, 5A-5C) and an intermediate hollow (12, 12A-12C) through which the jumper (4, 4A-4C) runs.

3. Fuse according to claim 2, characterized in that the intermediate hollow (12) is also crossed by elastic means constituted by one flat spring (6), with said flat spring (6) having its ends supportes by brackets 9 provided inside the shell (2).

4. Fuse according to claim 2, characterized in that the elastic means comprise a helical spring (6A) housed in correspondence of the first end of the pin (5A) and pre-loaded thanks to brackets (14A) provided inside the shell (2A), with the second, opposite end (11A) being guided by guide teeth (13A).

5. Fuse according to claim 2, characterized in that the elastic means comprise a helical spring (16B) coaxially housed on the opposite end (11B) of the pin (5B), with said pin (5B) being guided by protrusions (13B), and with insulating walls (15B) being interposed between said helical spring (6B) and the blade poles (3B)

6. Fuse according to claim 2, characterized in that the elastic means comprise a spring (6C) constituted by two blades of an elastic material provided on two, opposite sides of the pin (5C) and resting on brackets (14C), with said pin (5C) being guided by a seat provided with guide protrusions (13C).

7. Fuse according to claim 1, characterized in that the signalling devices which signals the occurred interruption of the jumper comprises an electrical circuit arranged in parallel to the jumper (4D), with said electrical circuit comprising a LED (16D) and a resistor (17D) in series to said LED (16D).

8. Fuse according to claim 7, characterized in that said LED (16D) is of the type which operates independently from the direction according to which the electrical current flows through it.

9. Fuse according to claim 8, characterized in that the ends of the leads (19D) connected with the poles (3D) are pinched by means of small tabs (18D) provided on the same pole (3D).

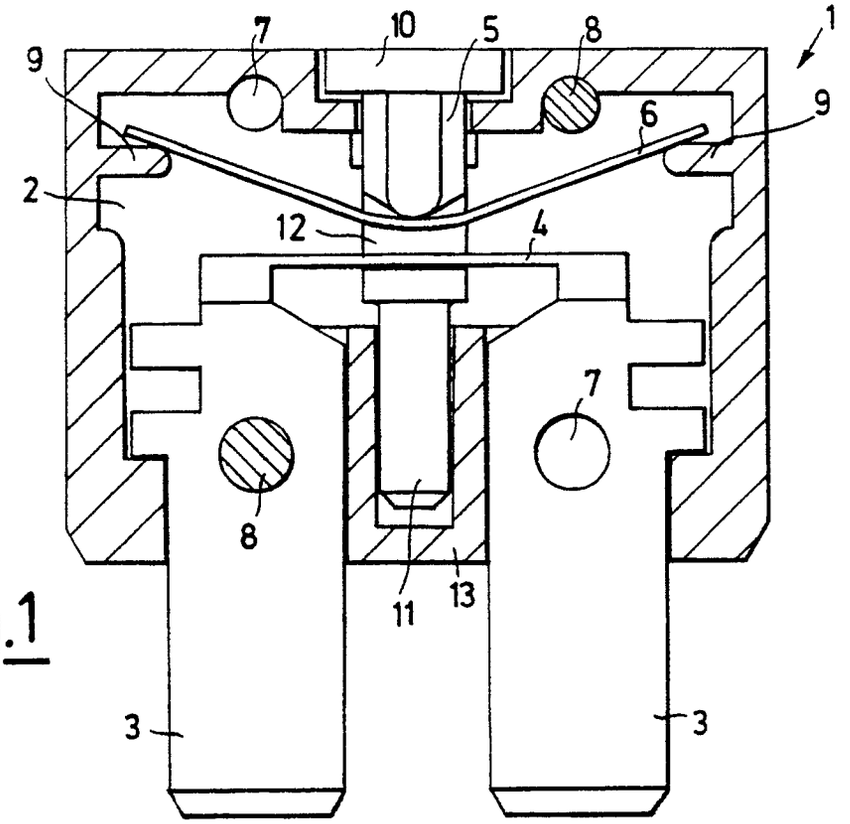
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Fig.1

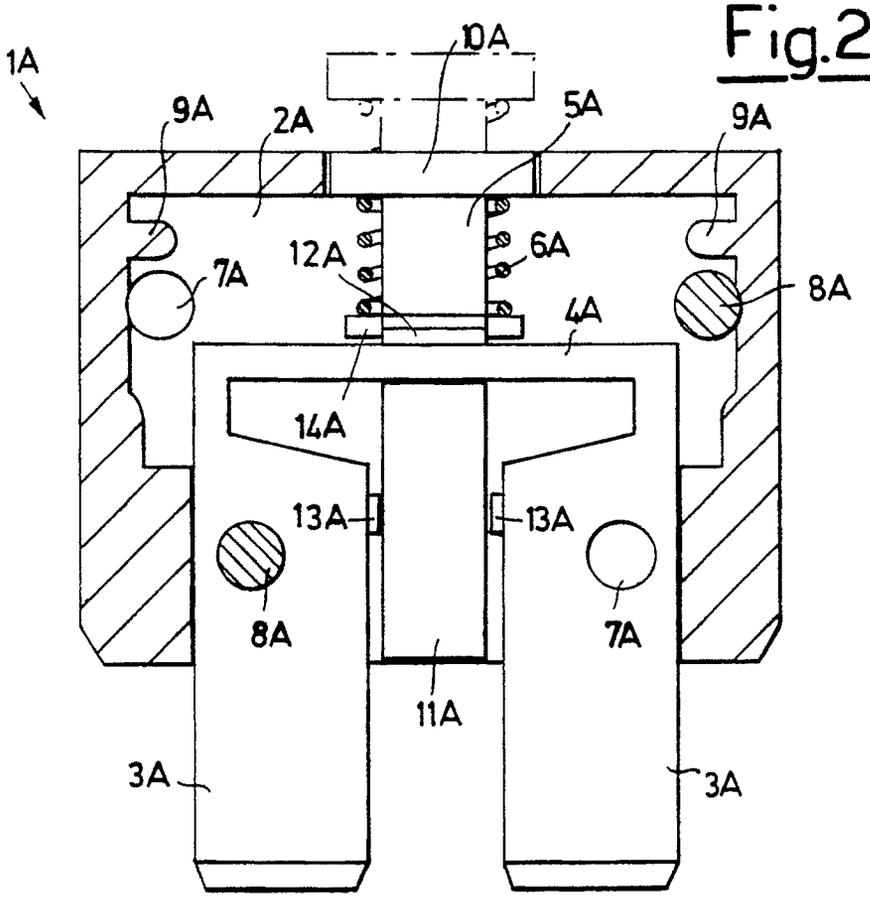
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Fig.2

Fig.3

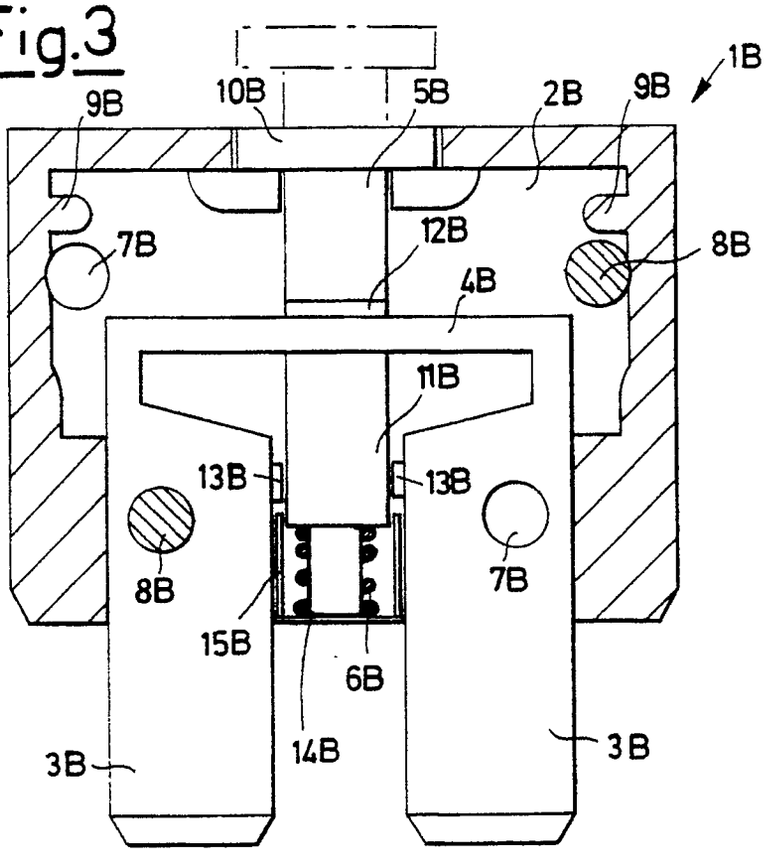
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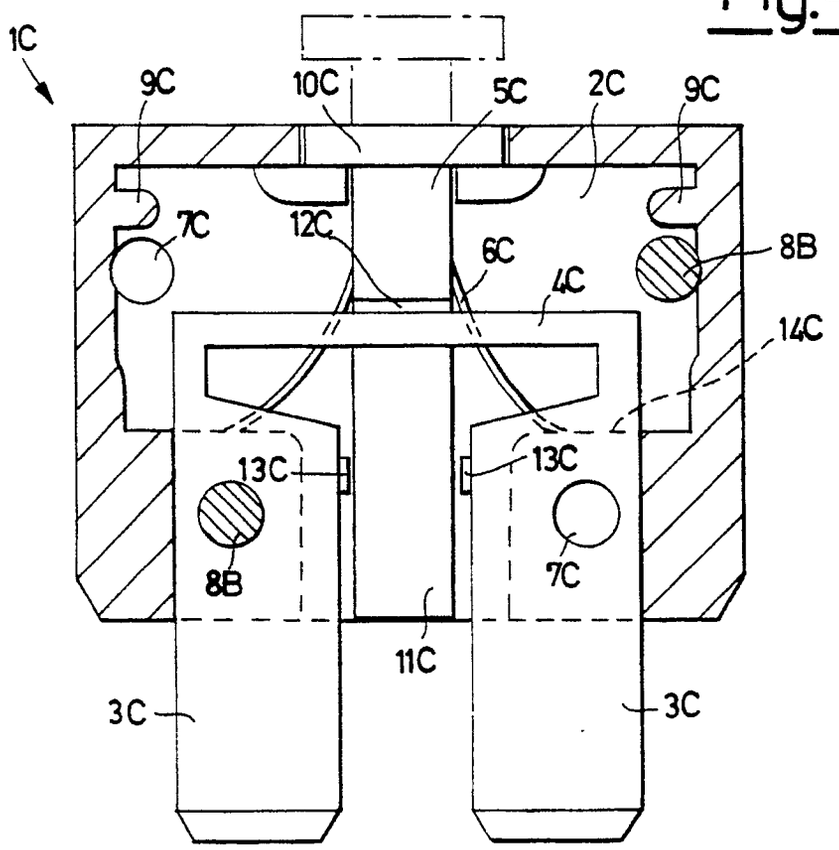
Fig.4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11C
3C
3C

Fig.5