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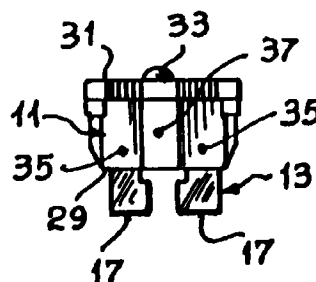
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(54) **Fusible unit with indicator of burnt fuse**

(57) A fusible unit with indicator of burnt fuse for electrical circuit and that includes: a cartridge (11) provided of a translucent wall, an electrical fusible element housed within the cartridge and provided of two terminal extremes (17) adapted to connect the fusible element serially in the circuit, the cartridge (11) having substantially reduced place in its interior to house the fusible element, and an illuminating means connected in parallel to the fusible element to produce a visual indication through the translucent wall in the event of the fusible element being burnt; wherein said illuminating means includes a miniature lamp of relatively low consumption housed within the cartridge (11) together with the fusible element and connected directly to said terminal extremes (17), the fusible element including a thin section of electro-conductor material of fusion low point, being both fusible element and lamp unable to generate excessive heat, when fusing and switching on, respectively, within the cartridge (11) when the fusible element is burnt by the pass of overcurrent through the fusible element.

FIG. 1



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Description

FIELD OF THE INVENTION

[0001] This invention is related to electrical fuses and it is referred to a device indicative of burnt fuses mounted within the unit of the fusible. The present invention has a particular application in electrical low voltage facilities, such as those fed by a source of 12 volts and, more particularly, in fusiliers and multiple fusible unit arrangements employed in cars.

BACKGROUND OF THE INVENTION:

[0002] A burnt fuse represents an open circuit so that the difference of voltage between the electric cords of the same almost corresponds to the totality of the supply voltage. On the contrary, an entire fuse represents a negligible resistance series in the circuit such that the fall of voltage through same is practically void. The state of the technique in the matter is full of proposals that take advantage of the great voltage swing between the electric cords of the fusible to provide a visual indication in the event that a fuse burnt in an electrical circuit under voltage. Figure 2 of the German patent N° 2.724.358 illustrates the principle of putting a lamp in parallel with the fuse. The lamp is switched off normally by virtue of the void or negligible voltage between its electric cords but would be switched on immediately after the fuse is burnt, for example on account of a short-circuit. The lamp remains switched on so as to supply an immediate visual indication of the state of the fusible yet after the end of the short-circuit that originated the destruction of the fusible element due to the fact that its resistance is generally greater than the load impedance.

[0003] The United States of America patent N° 3.457.535 describes a cylindrical fusible unit provided of an detachable indicative lamp of burnt fuses, disposed externally to the fusible and provided of elastic electric cords capable of being secured to the contacts of the fusible.

[0004] The United States of America patent N° 3.794.949 shows a burnt fuse indicator formed by a luminescent discharge lamp housed within a cartridge of the fusible. The branch of the circuit of the lamp includes a resistor of increased magnitude to limit the current of the lamp. The lamp and its associated resistor are contained within a separated housing to avoid accidental damage when replacing the fusible element.

[0005] The United States of America patent N° 4.527.143 puts the fusible element and the resistor within the same drill, which is filled with sand to attenuate the problem of the poor heat dissipation generated by the Joule effect.

[0006] The United States of America patent N° 4.641.120 proposes to eliminate the discreet resistor to have more space within the chamber of the fusible to

switch off the discharge arch generated when the fuse is burnt. The resistance series required by the lamp is formed by means of an electroresistive deposit on the internal surface of the wall of the chamber.

SUMMARY OF THE INVENTION:

[0007] In certain applications, such as in modern car units, it is convenient to try to accommodate the fuse units as compact as possible and without wasting space. Therefore, such fusible units must be designed so small as practical can be, minimizing the place intended for the housing of the fusible element, that is, the part of the unit that is burnt under current overintensity.

[0008] An objective of the present invention is to accommodate a luminous indicator of burnt fuses within the cartridge of a fusible unit, in particular in the case of a plastic cartridge or one made of low heat-resistant material.

[0009] Another objective of the invention is to minimize the place required within the cartridge of a fusible unit to tolerate and dissipate sufficiently the heat generated in situations where there may be a failure of the electrical circuit when the fusible element melts and the indicators switched on, to avoid damages to the cartridge or to the indicator during the time that the same stays ignited.

[0010] Another objective is a fusible unit containing some indicative means to indicator lamp and the same being relatively simple and economic to manufacture, in particular, that it may be discardable once the fuse is burnt.

[0011] Still another objective is a fusible unit of the previously specified type and its dimensions and electrical characteristics being adjusted to the generally employed procedures in the automotive industry, such that they may be directly interchangeable with conventional units.

[0012] These and other objectives and advantages that will be evident in the course of the description that follow are achieved by the fusible unit of the present invention, where it includes: a cartridge that includes a transparent wall, or at least translucent, as part of the same; a fusible electrical element housed within the cartridge between two terminal connection ends to the circuit, having in the interior of the cartridge a place limited to house the fusible element; and a luminous indicator in parallel with the fusible element to provide a visual indication through the translucent wall of the cartridge in the event of the fusible element being burnt. According to the invention, the luminous indicator includes a miniature and relatively cold lamp, housed in a compact way within the cartridge together with the fusible element and connected directly to the terminal ends of the fusible element, the latter including, at the same time, a thin strip of electro-conductor material of a low fusion point, such as zinc or some alloy or metallic compound mainly

containing the same, so that the fusible element and the lamp do not generate excessive heat when fusing and switching on, respectively, in the small free space within the cartridge, after the fusible element being burnt as a result of the overcurrent step through the same. In particular the internal volume within the cartridge can be hardly greater than the sum of volumes occupied by the fusible element and the lamp.

[0013] In the preferred embodiment, the fusible element and the terminals can be integrated in a same metallic piece in the form of "H", with two feet that terminate each in terminal extremes that project below of the cartridge and a transom or bridge that joins the feet, and of a transverse section smaller than those, that forms the fusible element.

[0014] According to another particularity of the preferred embodiment, the terminal extremes include each, flat metal electro-conductor strips, each one of which has a passant orifice. The lamp has two conducting wires their extremes wedged in the respective holes. The location of the lamp can be next to the bridge, and the cartridge can be substantially completely transparent, and to include an outstanding protuberance upward, above the location of the lamp, to punctually concentrate the light irradiated by the lamp and to comparatively reduce the light dispersed in the rest of the cartridge, facilitating the identification of the burnt fusible within a multiple fusilier

DRAWINGS

[0015] These and other novel characteristics of this invention and the way in which same can be carried into practice will be able to be understood better after analyzing the detailed description of the preferred embodiment represented in the annexed drawings, in which:

Figure 1 is an elevated front view of a fusible unit according to a preferred embodiment of the invention.

Figure 2 is a an elevated side view of the unit of the figure.

Figure 3 is a top view of the unit of figures 1 and 2.

Figure 4 is a division of component parts that shows the three sole components of the unit of the aforementioned figures.

Figure 5 is a transverse section of the unit according to plane V-V indicated in figures 2 and 3.

Finally, figure 6 is a view of a fusible unit according to an alternative embodiment of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0016] The embodiment represented in the figures 1 to 5, refers to a fusible unit to protect electrical facilities of 12 volts in cars. It includes a flat cartridge 11 made as a flat-nosed piece of normalized dimensions and of some malleable plastic material, that is to say not fragile, injected by dies for plastic and employing techniques of thermostabilization to avoid deformation. This type of cartridges is about 12 mm of height, 19 mm of width and 5 mm thick, normalized dimensions for some automotive industries. The interior of the cartridge 11 presents a housing sized to house an electrical element 13.

[0017] The fusible element 13 is a flat piece in the form of "H" given by means of a barbed die. It includes two parallel columns or feet 15 each terminating in terminal extremes 17 that project 6,4 mm, approximately, below the cartridge 11 and that are plugged in a fuseholder (not illustrated) that intercalates it in the electrical circuit to be protected. As is known, the car fuseholder is generally integrated in a multiple fusilier that accommodates normalized fusible collocated one beside the other to protect individually different circuits of electrical accessories of the car.

[0018] The feet 15 are joined by a bridge 19 to provide electrical continuity between the terminals 17 and whose section is calibrated to the nominal current of the fusible unit to allow the interruptoin of a short-circuit or other dangerous situation in the electrical circuit. Only the feet 15 touch the cartridge 11 since the central part of this presents a vaulting that permits the bridge 19 to remain housed in the air.

[0019] The mentioned flat-nosed plastic cartridge 11 and the fusible element 13 belong to a fusible unit of known type for 3; 4; 5; 7,5; 10; 15; 20; 25 and 30 amperes. The plastic cartridge 11 is transparent, preferably of a predetermined color according to normalized codes of nominal amperages. This amperage is defined by norm as half of the maximum current that the fusible element 19 can sustain during two minutes without fusing. The nominal amperage can be also recorded on the external part of the cartridge by hot stamping or molded on one of the terminal extremes 17.

[0020] According to the present invention, the conductive element 13 is made of a material of low fusion point such as zinc, even though it can be employed alternatively, for example, an alloy or metallic compound formed mainly by zinc, such as a brass. By low fusion point it is understood that the electro-conductor material of said fusible element 19 will be unable to generate excessive heat to thermically distort the plastic material of the cartridge 11. For this purpose zinc is convenient because it has a fusion point of less than 420°C, very much less than aluminum, for example, that fuses at more than 650°C, and its electrical conductivity is almost half that that of the latter.

[0021] The fusible unit incorporates a lamp indicative

of burnt fusible 23, of reduced size enough to fit within the available place in the interior of the cartridge 11.

[0022] The lamp 23 includes a bulb 25, of 19 volts and of about 3 mm diameter, and two wire electric cords 27 of 7 to 10 mm length, that connect the bulb 25 directly to the feet 15, that is to say without interposition of a discreet resistor element. In addition to its miniature size, the lamp 23 is relatively cold due to the fact that it is of low consumption, preferably of no more than 1 watt and, more particularly, of approximately 600 mW.

[0023] In each foot 15 a passant hole 21 has been practiced to introduce the free extreme of a corresponding electrical cord 27. Although tin weld can be added in each hole 21, is preferred not to apply any material of union in this point. Both fusible element 13 and lamp 23 are pushed jointly by an inferior opening 29 in the cartridge 11 and pressed to the definitive position there inside. The lamp 23 fits above of the fusible bridge 19, within the central vaulting and against the superior wall 31 of the cartridge 11, taking into account the fact that the place within the cartridge 11 is not larger than the combined volumes of the fusible element 13 and the lamp 23.

[0024] Then, the tops of two hot rods are pressed against the cartridge 11 in respective points 35 in correspondence to the holes 21, to sink a little of the plastic material within the holes 21, to retain the set of fusible element 13 and indicator 23 and, furthermore, to contribute to hold the electric cords firmly and to assure the electrical connection. It is very convenient to sink in the same way a third point 37 between the bulb 25 and the bridge 19 with the purposes of immobilizing the same and to protecting it of an eventual bombardment of molten metal splinters when the fusible bridge 19 is burnt, that would be capable of damaging the bulb 25 or to bridge the wires 27 where they project from the bulb 25, interfering with the unit.

[0025] In the event of a fuse of the type already described being burnt in an energized electrical circuit, there will be a difference of potential of 12 volts between the terminals 17 that will switch on the bulb 25. The conductor or any other seeing person will be able to identify immediately which one of the fusible units is illuminated and must be replaced or well to verify the state of the protected circuit. It is appreciated that the present invention is even more useful in the darkness.

[0026] In order to facilitate the identification of a burnt fusible unit even more, it is convenient to mold on the cartridge 11 a semiesférica protuberance 33 that projects from the superior wall 31, just above of where the bulb 25 is housed, to focus, as a lens would do, the light irradiated by the lamp 23 as a luminous point and to comparatively reduce the light dispersed by the rest of the cartridge 11 and toward adjacent fusible units on the fusilier.

[0027] Figure 6 shows another possible embodiment of the invention, which includes a lengthened glass or translucent hard plastic tubular cartridge 41 whose ter-

minal extremes are closed by metallic caps 43 that form the electrical terminal extremes of the unit. Within pipe 41 a fusible element is extended formed by a wire 45 or by a thin metallic strip wires whose extreme are connected to the respective caps 43. According to the present invention, it also has a lamp 23' in parallel to the fusible wire 45, capable of being illuminated when a voltage of 12 volts between the caps 43 is present. The lamp 23' can be the same than that of the previous embodiment, accommodated to the form of the pipe 41, or to include a lengthened bulb 25' from which the two conducting wires 27 emerge by the opposite extreme, which are jointly connected to the respective caps 43 and in parallel with the thin metallic filament.

[0028] The previously shown and described embodiments are an only example, to allow that anyone knowing the art could understand the invention and to carry it into practice. It is certain that there can be modifications made and added in the construction, material, arrangement and form of the object and their components, without being separated of the spirit and scope of the invention.

Claims

1. A fusible unit with indicator of burnt fuse for electrical circuit and that includes: a cartridge provided of a translucent wall, an electrical fusible element housed within the cartridge and provided of two terminal extremes adapted to connect the fusible element serially in the circuit, the cartridge having substantially reduced place in its interior to house the fusible element, and an illuminating means connected in parallel to the fusible element to produce a visual indication through the translucent wall in the event of the fusible element being burnt; wherein said illuminating means includes a miniature lamp of relatively low consumption housed within the cartridge together with the fusible element and connected directly to said terminal extremes, the fusible element including a thin section of electro-conductor material of fusion low point, being both fusible element and lamp unable to generate excessive heat, when fusing and switching on, respectively, within the cartridge when the fusible element is burnt by the pass of overcurrent through the fusible element.
2. The fusible unit of claim 1, wherein said electro-conductor material is zinc or an alloy or metallic compound constituted by mainly zinc.
3. The fusible unit of claim 1 or 2 for an electrical circuit of 12 volts, wherein such low consumption lamp is specified for a rated voltage greater than 12 volts and a consumption of less than 1 watt.
4. The fusible unit of claim 3, wherein such miniature

lamp includes a bulb of approximately 3 mm diameter, it specified for a rated voltage of 18 volts and a consumption of approximately 600 mW.

and of a predetermined color by the minimal transverse section of the thin section of electro-conductive material.

5. The fusible unit of any of the preceding claims, wherein all the cartridge is substantially transparent and includes a semiesferical protuberance that projects above the lamp, to punctually concentrate, in the manner of a lens, light originating from the lamp and to reduce the dispersion of that light through rest of the cartridge 5
10
6. The fusible unit of any of the preceding claims, wherein the housing place within the cartridge is hardly bigger than the sum of volumes of the fusible element and the lamp. 15
7. The fusible unit of any of the preceding claims, wherein said terminal extremes each include plane sections of electro-conductive metal each crossed by passant holes and such lamp includes two conducting wires whose extremes are respectively wedged in the holes. 20
8. The fusible unit of claim 7, wherein said fusible element includes a single piece of metal made of by two feet mutually joined by a bridge its transverse section being less than that of the feet, terminating the feet in said terminal extremes that project below the cartridge. 25
30
9. The fusible unit of claim 8, wherein said cartridge is made of plastic and said fusible element and said lamp have been pressed jointly within the cartridge, said lamp being maintained within the cartridge above the bridge and separate of this last by a small sunk portion of the plastic material of the cartridge. 35
10. The fusible unit of claims 7; 8 or 9, wherein said wire extremes penetrate within the holes together with part of the plastic material of the cartridge to contribute to maintain the lamp in place and connected electrically to the terminal extremes. 40
11. The fusible unit of any of the claims 1 to 4 wherein said cartridge includes a translucent lengthened pipe; said terminal extremes including a pair of caps made of an electro-conductive material that close the opposite extremes of the pipe; said fusible element includes a lengthened and thin metallic element its extremes are connected to the respective extreme lids of the cartridge; and such lamp includes a bulb within the pipe and two conducting wires connected to the respective lids jointly and in parallel with the thin metallic element. 45
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55
12. The fusible unit of any of the preceding claims, wherein the cartridge is substantially transparent

FIG. 1

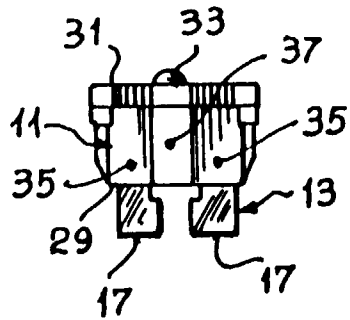


FIG. 2

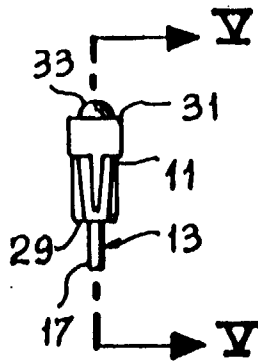


FIG. 3

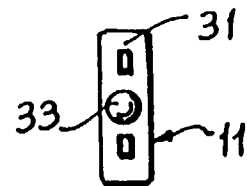


FIG. 4

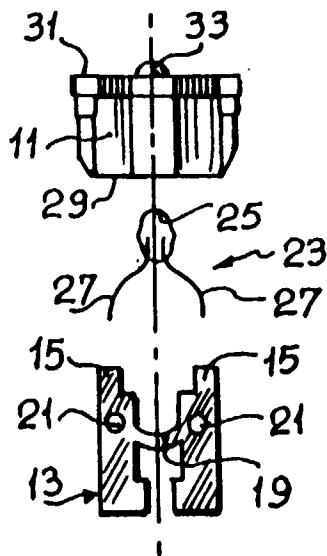


FIG. 5

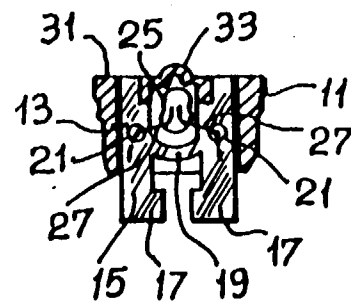
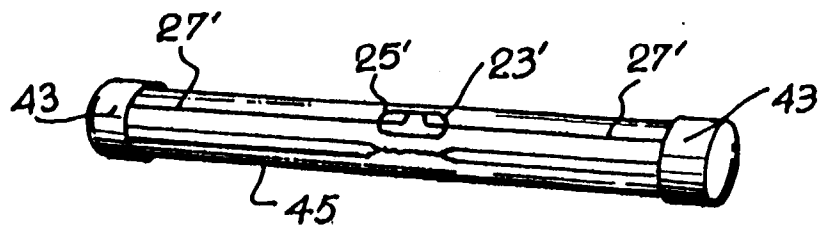


FIG. 6





European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 97 50 0175

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
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The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 16 March 1998	Examiner Desmet, W
CATEGORY OF CITED DOCUMENTS 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 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 & : member of the same patent family, corresponding document			

EPO FORM 1503 03 82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 97 50 0175

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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