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(54) **An internal protection device for an electrical plug and a plug incorporating it**

(57) An internal protection device for an electrical plug of the type including an insulating body (10), a cable (12) with at least two insulated conductors (14), a pair of pins (16) and an insert (18) for supporting the pins (16). The protection device is a cap-shaped element (20) with a base (22) and a side wall (24) which define

an internal cavity (26). The opening of the element (20) is intended to receive the pin-support insert (18). The base (22) has a hole (32) for the cable (12) to pass through, while a protection wall, substantially an extension of the rim of the hole (32), protrudes from the base (22) into the cavity (26) to a height which is less than that of the side wall (24).

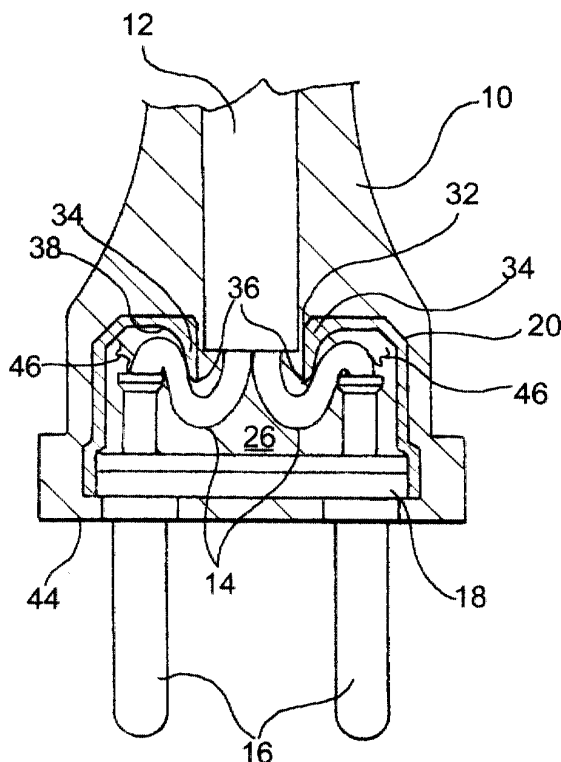


Fig.1

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Description

[0001] The present invention relates to an internal protection device for an electrical plug and to a plug incorporating it.

[0002] The object of the present invention is to provide a protection device against excessive mechanical forces of tension, flexion or torsion transmitted by the cable associated with the electrical connections inside the plug, as well as against accidents caused by possible incorrect positioning of electrical components of the plug.

[0003] This object is achieved according to the invention by providing a protection device, and a plug which incorporates it, having the characteristics claimed in the Claims which follow.

[0004] Advantages and characteristics of the present invention will become clear from the detailed description which follows, given with reference to the appended drawings which are provided purely by way of non-limitative example, and in which:

Figure 1 is a sectioned elevation of a plug which includes a device according to the invention;
Figure 2 is a sectioned front elevation of the protection device of the plug of Figure 1;
Figure 3 is a side view of the device of Figure 2; and
Figure 4 is a plan view of the device of Figures 2 and 3.

[0005] An electrical plug includes, in a manner known per se, (Figure 1) a body 10 of electrically insulating material which encloses a cable 12 with at least two insulated conductors or cores 14 which are connected electrically to respective pins 16 supported by an insert in the form of a plate 18. The characteristics of the plug components mentioned so far are substantially transparent in the context of the invention and, being well known to those skilled in the art, are not further described.

[0006] The plug also includes (Figures 2-4) a protection device constituted by an element shaped like a cap 20 with a base 22 and a side wall 24 which together define an internal cavity 26. The cap element 20 is substantially rectangular in plan, with the side wall 24 formed by a facing pair of long sides 28 and a facing pair of rounded short sides 30.

[0007] The base 22 has a centrally positioned hole 32 for the cable 12 to pass through, the rim of this hole 32 being extended by a protection wall which protrudes into the internal cavity 26, the height of this wall being less than that of the side wall 24. In particular, this protection wall includes a pair of transverse partitions 34 which connect the long sides 28 by respective opposite sides in relation to the hole 32. Each partition 34 has a cusp 36 which forms an acute angle and an arcuate side opposite the hole 32.

[0008] A plurality of teeth 40, provided to support the

pin-support insert 18, protrude transversely from the free end of the side wall 24 into the element 20, with the insert 18 arranged at the opening of the element 20.

[0009] In addition, one or more protuberances 42, two in this instance, project from the free end of the side wall 24 so as to extend it, the distal ends thereof remaining visible once the plug is assembled, since they are coplanar with the front surface 44 of the body 10. As a result, a user is able to check whether the cap element 20 is present without having to dismantle the plug.

[0010] The cap element 20 can be made of any electrically-insulating material having adequate mechanical strength: a thermoplastic resin for example.

[0011] The cap element 20 can be fixed to the insert 18 for supporting the pins 16 by the teeth 40. The plastics material constituting the body 10 is then injection-moulded onto this assembly to form the finished plug. This injected material also fills the free portions of the internal cavity 26 of the cap element 20.

[0012] As shown in Figure 1, the presence of the protection device forces the end portion of each of the two cores 14, arranged between the cable exit 12 and the connection to a respective pin 16, into an S-shaped configuration about a respective partition 34 inside the cavity 26. The acute-angle cusp 36, which is engaged against the insulating covering of the cores 14, and the arcuate shape of the sides 38 of the partitions 34 opposite the hole 32 induce the cores 14 to assume this position.

[0013] Thanks to this configuration, the electrical connections are protected from stresses of tension, flexion and torsion acting externally on the cable 12, since these are discharged along the portions of the cores 14 bent around the cusps 36 and do not affect the electrical connections.

[0014] These thus remain intact, with no danger of being pulled loose. This eliminates any risk of a short circuit, which occurs when a core 14 loose inside a plug accidentally comes into contact with a connection of the opposite polarity. Furthermore, should a core 14 come loose, it would remain confined within the cavity 26 of the element and thus be prevented from emerging at the surface of the plug, where it would constitute a serious risk of electrocution if it were touched by a user while live.

[0015] The S-shaped configuration of the terminal portions of the cores 14 also allows for a reduction in the gripping force exerted on the conductor so that it can support additional traction on the electrical connection, with the advantage of not excessively reducing the cross-section of the conductor and thus weakening it.

[0016] The cap element 20 also acts as an additional electrical insulation screen between live parts and the body 10 of the plug, thus preventing a user from coming into contact with live components, even in the case of missing insulating material or of incomplete bonding of the material injected to constitute the body 10 of the plug.

[0017] Such protection is also effective against loose strands 46 of the conductors 14 which may have escaped from the connection to the relative pin 16. Any loose strands 46 remain confined inside the cavity 26 of the cap element 20 and cannot be pushed to the surface of the plug when the insulating material constituting the body 10 is injected, where they would constitute an electrocution risk should they come into contact with a user.

[0018] The two partitions 34 also fully insulate any loose wires 46 from the electrical connection of opposite polarity, thus avoiding a risk of short circuits.

[0019] In addition, as emphasized earlier, the terminal portions of the cores 14 which are not protected by the sheath of the cable 12 are contained inside the cavity 26 of the cap 20. They are thus held in their central position and are not affected, during the injection of the insulating material constituting the body 10, by asymmetrical forces which could force them into off-centre positions, where they would be covered by a thinner layer of insulating material. Should such a thing occur, portions of the ends of the cores 14 could appear at the surface of the body 10 and constitute an electrocution risk.

[0020] At the same time, the terminal portion of the cable 12 penetrates deeply inside the body 10, reaching the hole 32 in the cap element 20. This increases the contact and adhesion surface between the cable 12 and the body 10, thereby reducing the risk of it becoming loose and also reducing the traction transmitted to the cores 14.

[0021] More generally, besides offering the advantages described above with regard to electrical and mechanical safety, the presence of the cap element 20 does not interfere with the satisfaction of regulations regulating the manufacture, performance and testing of the associated plug but, on the contrary, offers an improvement in results relative to the prescribed threshold values.

[0022] The plug with the cap element 20 of the invention is therefore suited to any application and, in particular, to the more onerous applications in equipment for industrial use on building sites, factories and, in general, on sites where it may be subject to strong tensions or violent jerks.

[0023] Naturally, the principle of the invention remaining unchanged, manufacturing details and embodiments may vary widely from those described here purely by way of non-limitative example, without departing thereby from the scope of the invention. In particular, the protection device of the invention can be adapted to any shape or type of electrical plug, whether this can be dismantled or not and manufactured either by assembly or by forming all moulded parts together.

which includes an insulating body (10), a cable (12) with at least two insulated conductors (14), a pair of pins (16) and a support insert (18) for the said pins (16), the said protection device being **characterised in that** it is a cap-shaped element (20) with a base (22) and a side wall (24) which together define an internal cavity (26), the opening of the element (20) being able to receive the said insert (18), the base (22) having an opening (32) for the passage of the said cable (12), and in that a protection wall, substantially an extension of the rim of the hole (32), protrudes into the internal cavity (26), to a height which is less than that of the side wall (24).

2. A device according to Claim 1, **characterised in that** the said cap element (20) is substantially rectangular in plan, with the side wall (24) formed by a facing pair of long sides (28) and a facing pair of short sides (30), the said protection wall including a pair of transverse partitions (34) which connect the long sides (28) by respective opposite sides relative to the centrally positioned hole (32).
3. A device according to Claim 2, **characterised in that** the said partitions (34) have cusps (36) forming acute angles and arcuate sides opposite the hole (32).
4. A device according to any preceding Claim, **characterised in that** a plurality of teeth (40) protrude transversely from the free end of the side wall (24) into the element (20) for supporting the insert (18) which supports the pins (16).
5. A device according to any of the preceding Claims, **characterised in that** at least one protuberance (42) projects from the free end of the side wall (24) so as to extend the latter, the distal end thereof remaining visible once the plug is assembled.
6. An electrical plug which includes a protection device according to any preceding Claim.

Claims

1. An internal protection device for an electrical plug

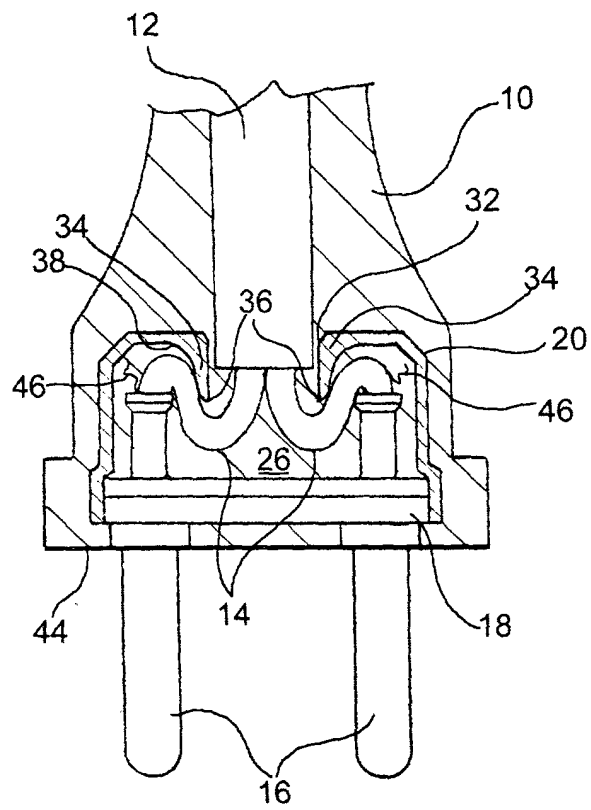


Fig.1

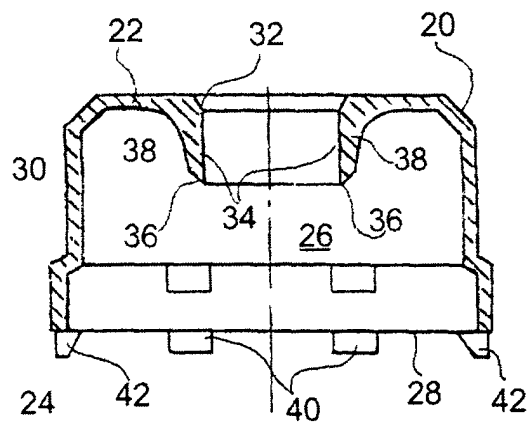


Fig.2

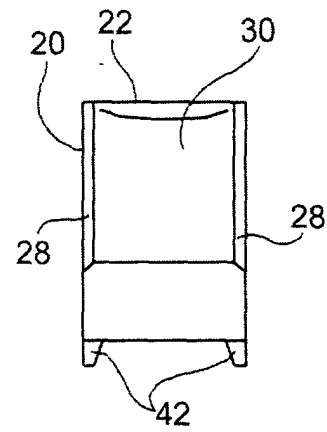


Fig.3

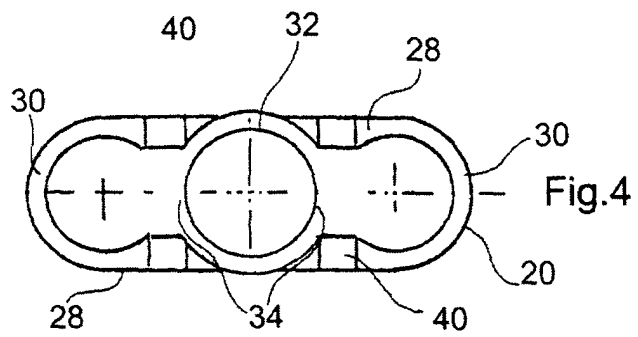


Fig.4



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EUROPEAN SEARCH REPORT

Application Number
EP 00 83 0206

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)
Y	US 2 553 371 A (W.HUPPERT) 15 May 1951 (1951-05-15) * column 2, line 13 - line 46; figures 2-4,7,9,10 *	1,2,6	H01R13/58
Y	FR 2 449 343 A (INOVAC) 12 September 1980 (1980-09-12) * page 6, line 36 - page 7, line 23 * * page 3, line 3 - line 21; figures 1,6 *	1,2,6	
A	DE 24 47 367 A (F.TÄFLER) 15 April 1976 (1976-04-15) * the whole document *	1,6	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			H01R
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
BERLIN		17 July 2000	Alexatos, G
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 00 83 0206

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The members are as contained in the European Patent Office EDP file on
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17-07-2000

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