



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:  
**14.09.2005 Bulletin 2005/37**

(51) Int Cl.7: **H01R 4/20, H01R 24/08**

(21) Application number: **04100954.9**

(22) Date of filing: **09.03.2004**

(84) Designated Contracting States:  
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR  
HU IE IT LI LU MC NL PL PT RO SE SI SK TR**  
Designated Extension States:  
**AL LT LV MK**

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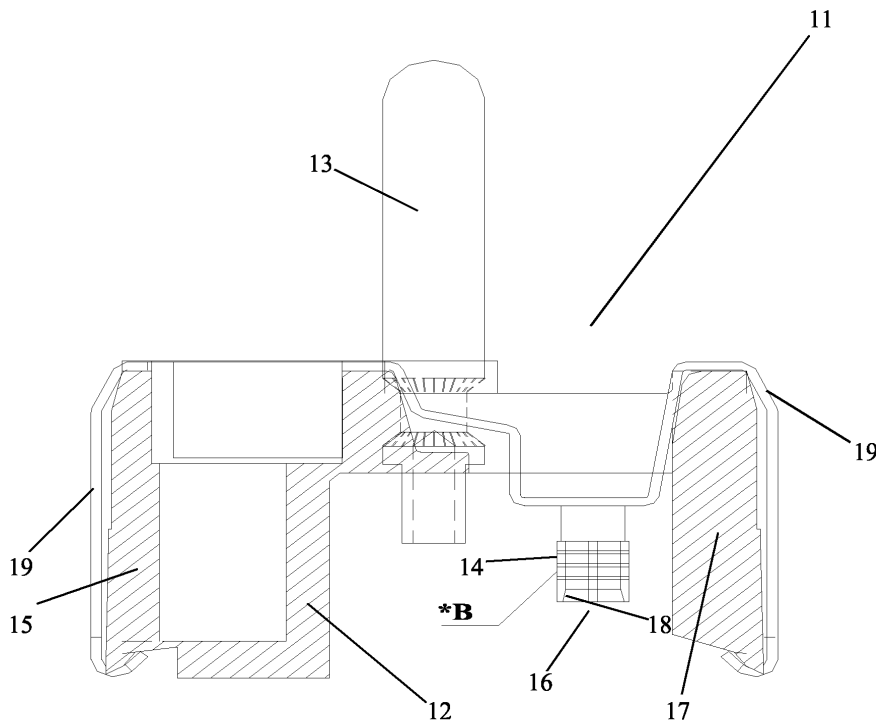
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(54) **Protective earthing conductor safety means for electrical appliance plug**

(57) The present invention relates to a safety contact plug for electrical appliances to be connected to a mains socket, with a moulding for receiving and fixing contact pins for the current conductors, comprising a connection portion for the protective conductor, which is provided with a shape in such that any individual small break-away wires disappear so as to form a safe module. Interconnection of the earthing wires with the earth-

ing conductor when inserted into the earthing conductor is achieved through a plurality of annular grooves positioned consecutively along the longitudinal axis of the earthing conductor. Those grooves, when the earthing wires are pressed together with the cylindrical body of the earthing conductor, prove to ensure safe connection so as to prevent the latter from sliding or moving outwardly in the longitudinal body of the earthing conductor.



**Fig.2**

## Description

### Technical Field of the Invention

[0001] The present invention relates to a safety contact plug for electrical appliances to be connected to a mains socket, with a moulding for receiving and fixing contact pins for the current conductors, comprising a connection portion for the earthing conductor, which is provided with a shape in such a way that any individual small break-away wires disappear so as to form a safe module. Once attached, the risk of conductor wires sliding or moving outwardly from away the earthing conductor is eliminated through use of a plurality of annular grooves provided along the longitudinal body of the earthing conductor in which earthing wires are firmly engaged when pressed together with the longitudinal body of the earthing conductor.

### Background of the Invention / Prior Art

[0002] There are various patents/patent applications present in the technical field of this invention (for instance European and German patents/patent applications EP 0391298 A2, EP 0773606 A2, DE 19628725 C1, DE 3807716 C3, DE 3911316 C2, DE 3915852 C2 and EP 0332034 A2 may be cited among others). The goal primarily adopted by those disclosures is to provide a safe and closed module to the protective conductor ends, which are stripped at one end and plugged into the earthing conductors or to the earthing conductor by means of a connection structure between the earthing conductor and the protective conductor ends such that when the stripped conductor ends are inserted, any deflector individual wires lie safely within said structure. For the reason that any individual wire being not secured to said connection structure can lead to undesired results, any possibility to generate earthing leakages should be given major importance and is to be seriously dealt with as earthing leakages may cause damage not only in terms of the damage done to electrical appliances but also in terms of the risks human beings may be subject to.

[0003] The technical field of the present invention is still subject to improvements in order for researchers to render the earthing line free of risks to the extent that no human being gets electric shock and no appliance is damaged by a leakage current caused by the earthing line and explicitly by the connection structure provided in between the earthing conductor and the conductor ends. Accordingly, the present invention concerns elimination of such risks, mainly those posed by earthing connection within an electrical plug and is intended to bring further measures over prior art to ensure safe connection of the protective conductor ends to the earthing conductor.

[0004] Prior art disclosures widely focused on removing risk of separation of individual wires from the earth-

ing wire bundle in the outermost region of the earthing conductors. This is achieved through use of an insertion funnel having a conical through bore aligned with the connection bush. The connection bush may be formed integrally for example so as to comprise a bridge leg into which the conductor ends are inserted. Accordingly, the insertion section is mostly constructed as a head part, aligned coaxially with respect to the connection bush and is provided as a common bridge element, supported by one arm of the body of the plug bridge.

[0005] On the contrary of the prior art, which has widely focused upon safety measures through use of additional material, particularly in the region of the insertion section to guide protective conductor ends, the present invention brings extra measures to encage earthing wires not only in the region of the insertion section, but also within the earthing conductor into which earthing wires are extending. Accordingly, the present invention is advantageous over prior art in the sense that the head portion of the earthing conductor both reflects a simpler design making use of less material to be more suitable to automated production and brings extra measures to encage earthing wires not only in the region of the insertion section, but also along the internal part of the earthing conductor in which earthing wires lie.

[0006] It is known to those skilled in the art that safely guiding conductor wires into the earthing conductor is necessary but not sufficient to obtain a safe plug as it is very important to keep the wires exactly within the head part of the earthing conductor. In practice, it has been found out that the wires tend to leave the head part of the earthing conductor during the manufacturing process. In such cases, the wires may contact earthing conductors and pose high risk of leakage. Once manufacturing process is complete, the wires are still viable to come out of the head part of the earthing conductor and pose risk of malfunction. If a user holding the cable strongly pulls the plug apart from a socket, the earthing wire fixed in the head part of the earthing conductor in the plug may displace and slide out of the earthing conductor with the result that earthing in the plug will no longer function.

### Objects of the Invention

[0007] One of the objects of the present invention is to ensure safe connection of the conductor ends to the hollow cylindrical earthing conductor so as to render the earthing line free of disconnection risks.

[0008] Another object of the present invention is to improve operation safety of the earthing line not only in terms of the measures taken on the head portion of the earthing conductor where the conductor ends are fixed with the earthing element but also in terms of the measures taken along the longitudinal body of the earthing conductor itself.

### Summary of the Invention

[0009] The objects of the present invention are achieved through use of a set arrangements, each concerning different portions of the earthing conductor into which protective conductor ends are inserted. Fixation of the earthing wires within the earthing conductor, is supported through a plurality of annular grooves positioned parallel along the body of the earthing conductor. These grooves, when the earthing wires are pressed together with the cylindrical body of the earthing conductor, prove to ensure safe connection so as to prevent the latter from sliding or moving outwardly in the longitudinal body of the earthing conductor. On the other hand, the present invention presents a very simple approach to eliminate disconnection risks in the head portion of the earthing conductor without making use of extra material in the same region. To do this, there is provided a certain amount of countersinking to the head portion of the hollow cylindrical earthing conductor, which is both more suitable to automated production and more advantageous in that it makes use of less material compared to prior art arrangements. In consequence, the production of the plugs can be simplified and the electrical safety can be improved at the same time.

### Brief Description of the Figures

[0010] Accompanying drawings are given solely for the purpose of exemplifying an electrical plug earthing terminal whose advantages over prior art were outlined above;

Fig. 1 demonstrates a plane view of an electrical plug as the two contact pins and the bore for earthing spring are shown from the top.

Fig. 2 demonstrates a plane view of the A-A cross-section defined in Fig. 1.

Fig. 3 demonstrates a plane view of the plug bridge in which the connection structure of the earthing conductor (referred as "B" in Fig. 2) is shown from the top.

Fig. 4a demonstrates a plane view of the lateral surface of the earthing conductor,

Fig. 4b demonstrates a plane view of a radial cross-section of the earthing conductor so as to demonstrate longitudinal details.

### Detailed Description of the Invention

[0011] According to the present invention, there is provided a safety plug for electrical devices, having a pair of metallic contact pins (13), which can be plugged into a mains socket, with a plug body having a moulded part with a bridge leg (15) and the main sections (12, 17). The plug-in contact bridge has a reverse "U" shaped body (Fig. 2, 11) receiving line conductors for the current leads and the earthing lead with a hollow cy-

lindrical earthing conductor (14). The ends of the earthing wires are stripped at one end and electrically coupled to the earthing conductor (14) for the protection lead, which is coupled to an earthing spring (19) fitted around the plug body, with the contact bridge and the end of the supply line enclosed in a plastics moulding.

[0012] According to the present invention, the conductor ends of the earthing wires are plugged into the earthing conductor (14) and firmly connected thereto by means of a connection structure between the earthing conductor (14) and the wire ends such that once the wire ends are inserted into the bore surrounded by the body (11) of the earthing conductor (14), the earthing conductor (14) is mashed and the wires are fixedly attached to the conductor (14) as they protrude towards the cavities (20) in the pressed form.

[0013] The earthing conductor (14) is designed to have a small amount of taper (18), which assist in guiding the ends of the earthing wires into the same. The taper (18) is applied to the outermost part (18) of the hollow cylindrical earthing conductor (14), which is made of sheet material being bent around a roller. The edge parts of the sheet material, which form cylindrical earthing conductor (14) body, are tapered so as to guide earthing wires into the earthing conductor (14). Accordingly, the outermost part of the erthing conductor (14), which forms the aperture (16) into which earthing wires are inserted, is provided with a semi-conical insertion structure or a connecting socket for the earthing wires. Since said semi-conical aperture (16) is constructed as a head part being aligned coaxially with respect to the earthing conductor (14), small individual wires of the earthing bundle are securely guided in and held in the earthing conductor (14).

[0014] The present invention therefore presents a very simple approach to eliminate disconnection risks in the head portion of the earthing conductor (14) without making use of extra material in the same region. Since this approach is more suitable to automated production and more advantageous in that it requires less material to have the same technical effect compared to prior art arrangements, the production of the plugs can be simplified and the electrical safety can be improved at the same time.

[0015] Another measure to ensure safe connection of the earthing wires to the earthing conductor (14) is taken along the longitudinal body of the earthing conductor (14) in the upper part of the conical aperture (16). The hollow cylindrical conductor (14), which is made of sheet material and bent around a roller, is first provided with a plurality of consecutive grooves (20) prior to bending operation, with the grooves (20) being set one above another along the longitudinal axis of the earthing conductor (14). When the earthing wires is pressed together with the cylindrical body of the earthing conductor (14), these annular grooves (20) prove to ensure safe connection so as to prevent the latter from sliding or moving outwardly in the longitudinal body of the earthing con-

ductor (14) for the reason that the earthing wires being pressed in the cylindrical body of the earthing conductor (14) engage in the grooves (20) and provide an extra retention force and improved electrical safety within said body.

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**Claims**

1. A safety contact plug for electrical appliances to be connected to a mains socket, with a moulding for receiving and fixing contact pins (13) for the current conductors and an earthing conductor (14) for the protective conductor **characterized in that** said earthing conductor (14) comprises;
  - at least one annular groove (20) which is not parallel to the earthing wire, whereby upon pressing earthing wires together with the cylindrical body of the earthing conductor (14), the wires are secured so as to not slide or move outwardly in the longitudinal body of said earthing conductor.
  
2. A safety contact plug according to Claim 1 wherein said annular grooves (20) being set consecutively one above another in regular distances in a direction perpendicular to the earthing wires.
  
3. A safety contact plug according to Claim 1 wherein the edge parts (18) of the sheet material forming cylindrical earthing conductor (14) body are tapered so as to guide protective conductor ends into the earthing conductor (14).

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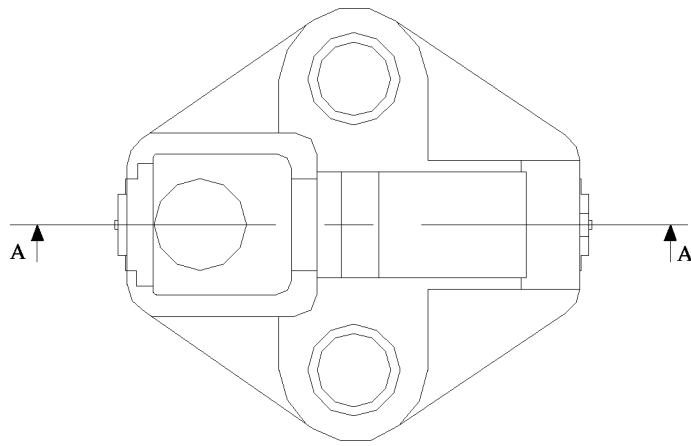
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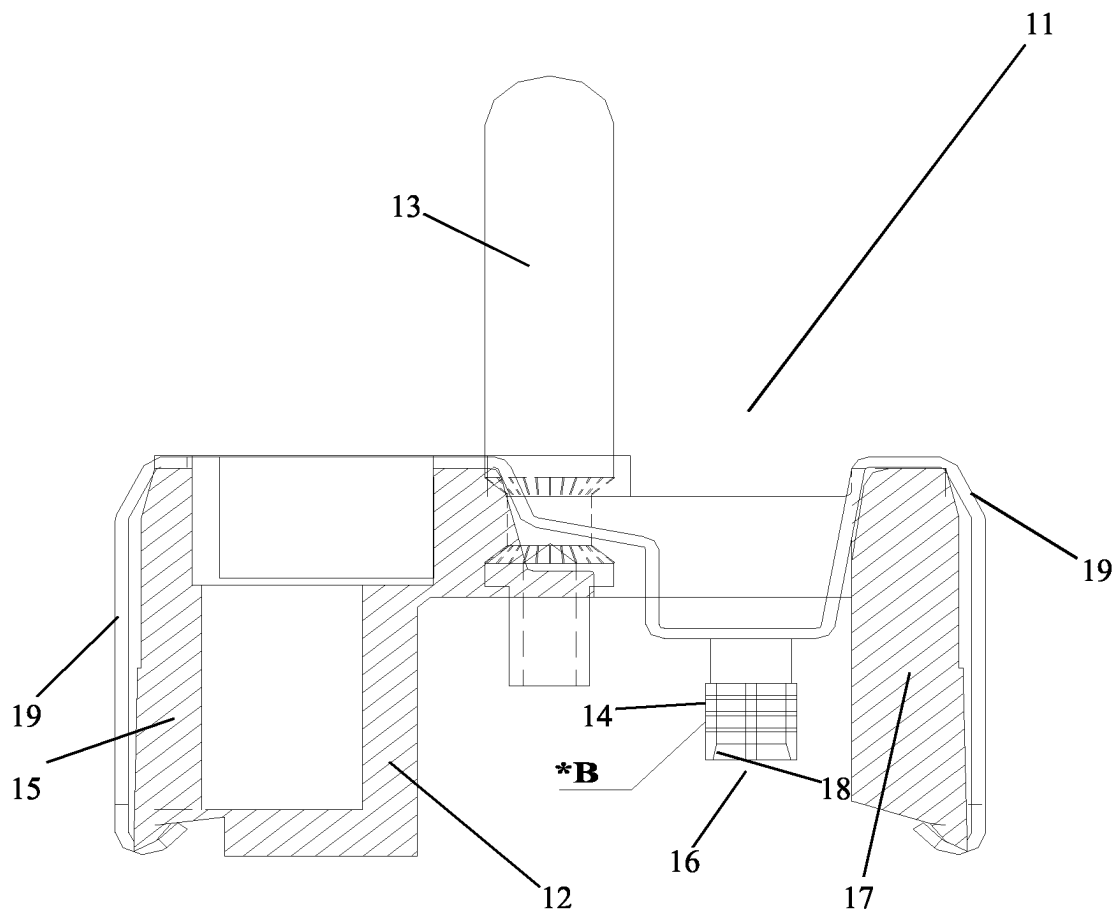
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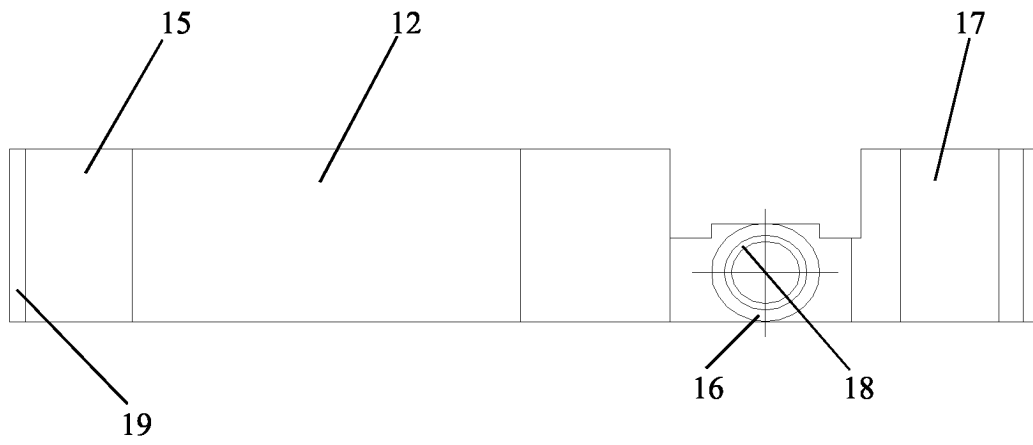
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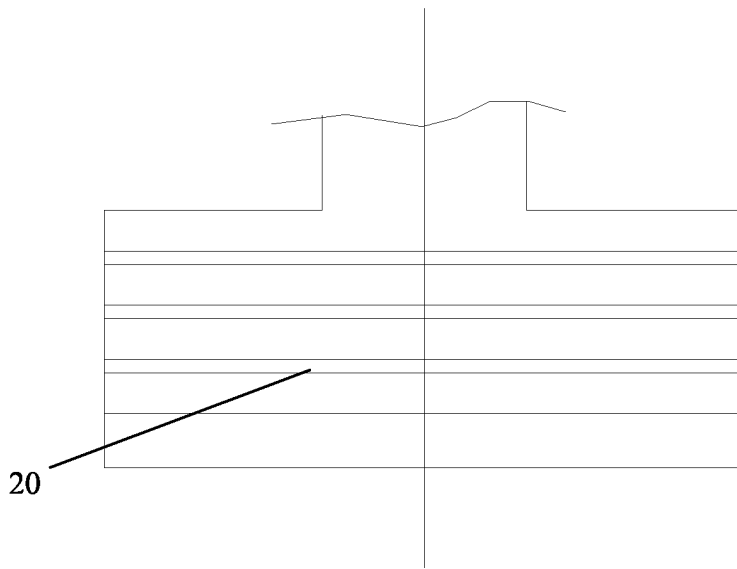
**Fig.1**



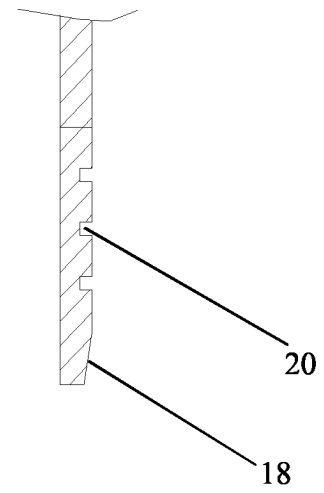
**Fig.2**



**Fig.3**



**Fig.4a**



**Fig.4b**



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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 13 August 2004	Examiner Arenz, R
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EPO FORM 1503 03.82 (P04C01)

**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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