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(54) **Electrical Connector with Earth Wire**

(57) The invention relates to an electrical connector with earth wire. The connector has a first substantially U-shaped connector body adapted to engage over the

edge of a section of metal sheet, whereby opposing inner faces of the body abut opposing outer faces of the section of metal sheet. A wire has a first end bonded to the U-shaped connector body.

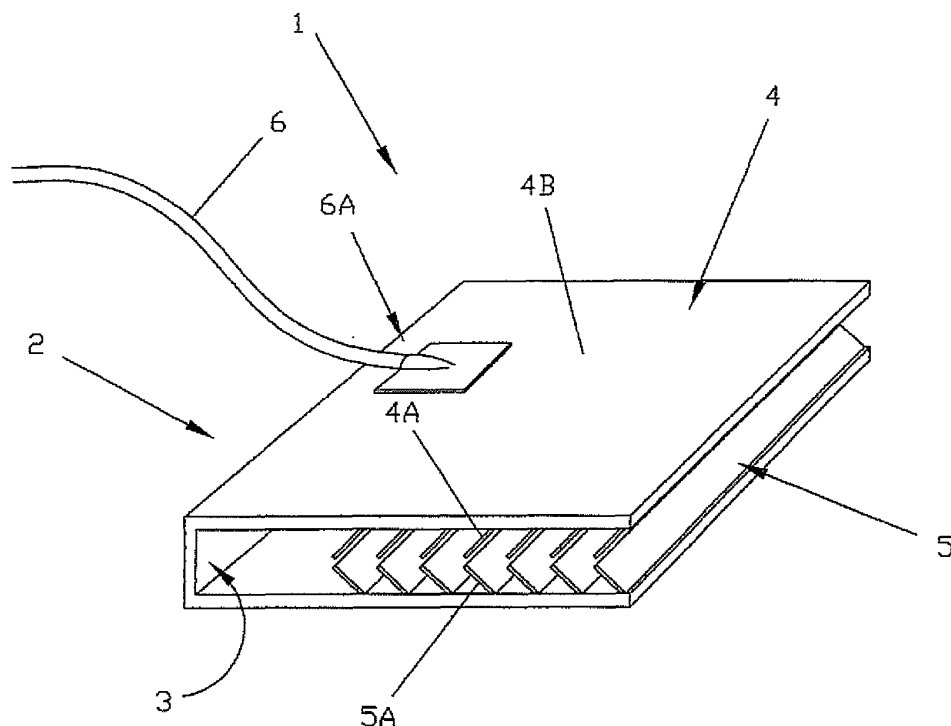


Figure 1

Description

[0001] The present invention relates to an electrical connector with earth wire, especially for use with metal capping.

[0002] Under health and safety regulations applying in a number of countries (for example British standard 7671 in the UK) any electrical wiring installed within 50mm of the surface of a wall must be enclosed in an earthed metal container. Given the difficulty of installing wires at depths of 50mm or greater, the use of earthed containers is generally preferable, and two common forms of containers are pipe conduits and metal capping. Pipe conduits are lengths of circular crosssection piping, generally manufactured in 3 metre lengths with a circumference of 20mm, and although such pipes are relatively easy to earth, they can be time consuming and difficult to install, often requiring the preparation of a channel into which the conduits can be inserted. Metal capping consists of sheets of thin gauge metal, such as galvanised steel, which are bent to form relatively shallow troughs through which wires can be guided. Metal capping is relatively easy to install, as it may be placed flat against an existing surface and covered by a relatively thin layer of plaster, however no convenient way to earth metal capping is currently available. Metal capping is normally provided in standard lengths of 2 metres, and the width of the central channel may range from 16mm (single channel capping) to approximately 20mm (double channel capping), or even 25mm or more (triple channel capping). The thickness of gauge of metal capping varies from 0.25 to 1mm, with 0.25mm being the most common.

[0003] As noted above, under building regulations prevalent in many countries, metal capping needs to be earthed electrically, e.g. connected to the "common earth" of the circuit being protected by the capping. It can be very time consuming ensuring that all lengths of capping are electrically earthed.

[0004] The invention seeks to provide an electrical connector with an earth wire to facilitate earthing lengths of capping.

[0005] According to the present invention there is provided an electrical connector with earth wire comprising:

- a) a first substantially U-shaped connector body adapted to engage over the edge of a section of metal sheet, whereby opposing inner faces of the body abut opposing outer faces of the section of metal sheet, and
- b) a wire having a first end bonded to the U-shaped connector.

[0006] Electrical connectors with earth wires according to the present invention may comprise any wire suitable to function as an earth wire, for example a copper conductive cable of from 1 to 4mm diameter, preferably 1.5 or 2.5mm. The wire may be of any length, but is preferably from 50 to 75mm in length (and can be cut to a shorter

length by the user). Preferably the wire will incorporate a protective coating, and most preferably the coating incorporates an indication that it is an earth wire (for example, for use in the UK the wire will preferably be coloured green and yellow to conform to British standard 7671).

[0007] Electrical connectors with earth wires according to the present invention are provided with the earth wire already attached to the connector body, avoiding the need for the user to attach the earth wire before use, and thereby simplifying use of the electrical connectors. The earth wire may be bonded to the connector body in any conventional manner that permits the link between the wire and the connector body to be electrically conductive. For example, the bonding may be achieved by mechanical or chemical means, or a combination thereof, including the provision of slots in the connector body into which the earth wire may be fitted and/or the use of soldering or adhesives.

[0008] In an embodiment of the present invention a second substantially U-shaped connector body similar to said first substantially U-shaped connector body may be connected to a second end of said wire. Electrical connectors according to this embodiment of the invention are particularly useful for joining two lengths of capping together, for example to enclose unusually long sections of wiring.

[0009] Preferably one way movement means are provided on the or each substantially U-shaped connector body allowing the or each body to be pushed onto an edge of metal sheet but not pulled off.

[0010] Preferably the or each substantially U-shaped connector body has at least one inner opposing face with teeth thereon. Preferably both inner opposing faces have teeth thereon.

[0011] Preferably the teeth are slanted to provide said one way movement means.

[0012] Preferably the or each substantially U-shaped connector body is coated with plastic on its outer surface. The plastic coating, when present, preferably covers the edges of the connector body as well as the upper and lower surfaces thereof, and may also cover a part of one or both inner faces, however the coating should not cover all of the inner faces of the connector body. The coating may be applied to the connector body in any conventional manner including brushing, spraying and deposition. Alternatively, the coating may be in the form of a pre-formed cover sized to fit over and engage the connector body. Any conventional material may be used to coat the connector body, for example PVC. The coating may also cover part of the wire bonded to the connector body, and most particularly will cover the point of connection between the wire and the connector body.

[0013] The coating, where present, may optionally comprise information, for example warning signs and/or product information. The coating may also be coloured (for example, green and yellow for use in the UK to indicate that the connector body is earthed). When present,

the coating may also assist in preventing damage to wiring when the electrical connector is attached to metal sheeting enclosing such wiring, for example capping.

[0014] Electrical connectors with earth wires according to the present invention are preferably formed in the form of a base with arms extending from opposing edges of the base. The arms may be the same size and shape as each other, or may differ in size and/or shape. Optionally, the base may be rectangular, and each of the arms extending from the base may also be rectangular. Generally the arms extending from the base will be parallel, but optionally, they may be angled so that they taper towards each other. The connector body is preferably formed from a single sheet of metal folded to the appropriate shape. The connector body may be folded from any metal having sufficient structural rigidity, including sprung galvanised steel.

[0015] Electrical connectors with earth wires according to the present invention may be any size suitable for connection to metal sheets; however, where the electrical connector is intended for use in earthing capping, the two arms of the connector body preferably have an effective clearance (taking into account any teeth that may be present on the inner faces of the body) of between 0.25 and 1.0mm, a preferred clearance being 0.25mm. The overall height of the connector body will depend upon the clearance, and whether or not any teeth or other inner features are present, however it is preferred that the overall height is 5mm or less. Preferably, electrical connectors with earth wires according to the present invention have total widths of no more than 16mm (including any coating if present), more preferably the width is from 10 to 16mm, most preferably 15 or 16mm. The length of electrical connectors with earth wires according to the present invention is not critical, so long as the connector body is capable of engaging the edge of the section of metal sheet, however preferred lengths are from 15 to 30mm.

[0016] Preferably electrical connectors with earth wires according to the present invention are suitable for use in earthing lengths of capping.

[0017] The invention also relates to a method of earthing capping comprising applying the above defined connector with earth lead to a section of capping and electrically earthing the earth lead.

[0018] Embodiments of the invention will now be described with reference to the accompanying drawings in which:

Figure 1 shows a perspective view of a connector with earth lead,

Figure 2 shows a perspective view of the connector of Figure 1 on the edge of a section of metal capping, and

Figure 3 shows a double connector.

[0019] Referring to Figure 1 there is shown an electri-

cal connector with earth wire 1.

[0020] Connector 1 has a first substantially u-shaped connector metal body 2 adapted to engage over the edge of a section of metal sheet (see Figure 2). Body 2 has a rectangular base 3, with rectangular arms 4,5 extending from opposing edges of the base 3.

[0021] Rectangular arm 4 has an inner face formed by the ends of an array of teeth 4A in the form of elongate blades which slant towards the rectangular base 3. Rectangular arm 5 has an inner face formed by the ends of an array of teeth 5A in the form of elongate blades which also slant towards the rectangular base 3. The arrays of teeth 4A,5A may be formed by any conventional means, for example slits may be formed in the rectangular arms 4,5, and the teeth 4A,5A may be formed by folding in alternate sections of the arms 4,5. In this embodiment, a plastic cover may be provided which also includes projections corresponding to the slits in the arms 4,5 and which act to lock the arrays of teeth 4A,5A in place.

[0022] An earth wire in the form of a fly lead 6 is bonded at one end 6A to the outer face 4B of rectangular arm 4. The fly lead 6 may be bonded to the outer face 4B of rectangular arm 4 in any conventional manner, so that the connector 1 may be used immediately. The bonding should be of sufficient strength so that the fly lead 6 may not be removed from the connector body 2 under normal conditions of use.

[0023] Preferably the U-shaped connector body 2 may be coated with plastic on its outer surface. The plastic coating preferably covers the outer face 4B of rectangular arm 4, and also the outer face of the rectangular base 3 and rectangular arm 5, and may also cover the edges of the rectangular arms 4,5 and base 3, particularly the leading edges of the rectangular arms 4,5. The coating is preferably in the form of a pre-formed cover, sized to fit over and engage the connector body 2 and to cover the point of connection between the fly lead 6 and the connector body 2.

[0024] It is envisaged that the connector body 2 could be extruded as a continuous length and then cut into sections with each section forming a connector body.

[0025] As shown in Figure 2, connector with earth lead 1 can be pushed onto the edge of metal sheet such as the edge of capping "X" whereby opposing inner faces provided by the ends of teeth 4A,5A of the body 2 abut opposing outer faces of a section of capping "X". The slanted teeth 4A,5A provide one way movement means allowing the body 2 to be pushed onto the edge of capping X, but not pulled off. In this respect teeth 4A,5A may be flexible. The gap between the ends of the teeth may be slightly less than the thickness of the capping "X" so that the teeth are flexed when the body 2 is pushed onto the capping.

[0026] Also when the body 2 is pushed onto the capping, the teeth 4A,5A tend to scratch the surface of the capping so that the teeth make good electrical contact with the capping.

[0027] In use, fly lead 6 can be connected to "earth",

so earthing the capping "X", e.g. to the "common earth" of the circuit being protected by the capping.

[0028] As shown in Figure 3, there is shown a connector with earth lead 10 identical to the connector with earth lead 1 shown in Figure 1, except that two substantially U-shaped connector bodies 12A, 12B (similar to first substantially U-shaped connector body 2) are connected to the first and second ends 16A, 16B of a wire 16. The embodiment shown in Figure 3 can be used to earth two surfaces of metal together, particularly two lengths of capping.

[0029] The invention may take a form different to that specifically described above. For example, instead of elongate blades, the teeth could be individual spikes. Also teeth 4A, 5A could be provided on just one arm 4 or 5 rather than both arms. The shape of the base 3 and/or the shapes of one or both arms 4, 5 may also be varied.

[0030] The invention also relates to a method of earthing capping comprising applying the connector with earth lead described above to a section of capping and electrically earthing the earth lead.

[0031] Further modifications will be apparent to those skilled in the art without departing from the scope of the present invention.

Claims

1. An electrical connector with earth wire comprising:

- a) a first substantially U-shaped connector body adapted to engage over the edge of a section of metal sheet, whereby opposing inner faces of the body abut opposing outer faces of the section of metal sheet, and
- b) a wire having a first end bonded to the U-shaped connector.

2. An electrical connector with earth wire according to claim 1, wherein a second substantially U-shaped connector body similar to said first substantially U-shaped connector body is connected to a second end of said wire.

3. An electrical connector with earth wire according to claim 1 or 2, wherein one way movement means are provided on the or each substantially U-shaped connector body allowing the or each body to be pushed onto an edge of metal sheet but not pulled off.

4. An electrical connector with earth wire according to claim 3, wherein the or each substantially U-shaped connector body has at least one inner opposing face with teeth thereon.

5. An electrical connector with earth wire according to claim 4, wherein both inner opposing faces have teeth thereon.

6. An electrical connector with earth wire according to claim 4 or 5, wherein the teeth are slanted to provide said one way movement means.

7. An electrical connector with earth wire according to any preceding claim, wherein the or each substantially U-shaped connector body is coated with plastic on its outer surface.

8. An electrical connector with earth wire according to claim 7, wherein the plastic coating is a pre-formed cover sized to fit over and engage the connector body.

9. An electrical connector with earth wire according to any preceding claim, wherein the or each U-shaped body is formed from a base with arms extending from opposing edges of the base.

10. An electrical connector with earth wire according to claim 9, wherein the or each U-shaped body is formed from a rectangular base with rectangular arms extending from opposing edges of the base.

11. An electrical connector with earth wire according to an preceding claim for use in earthing lengths of capping.

12. A method of earthing capping comprising applying a connector with earth lead according to any preceding claim to a section of capping and electrically earthing the earth lead.

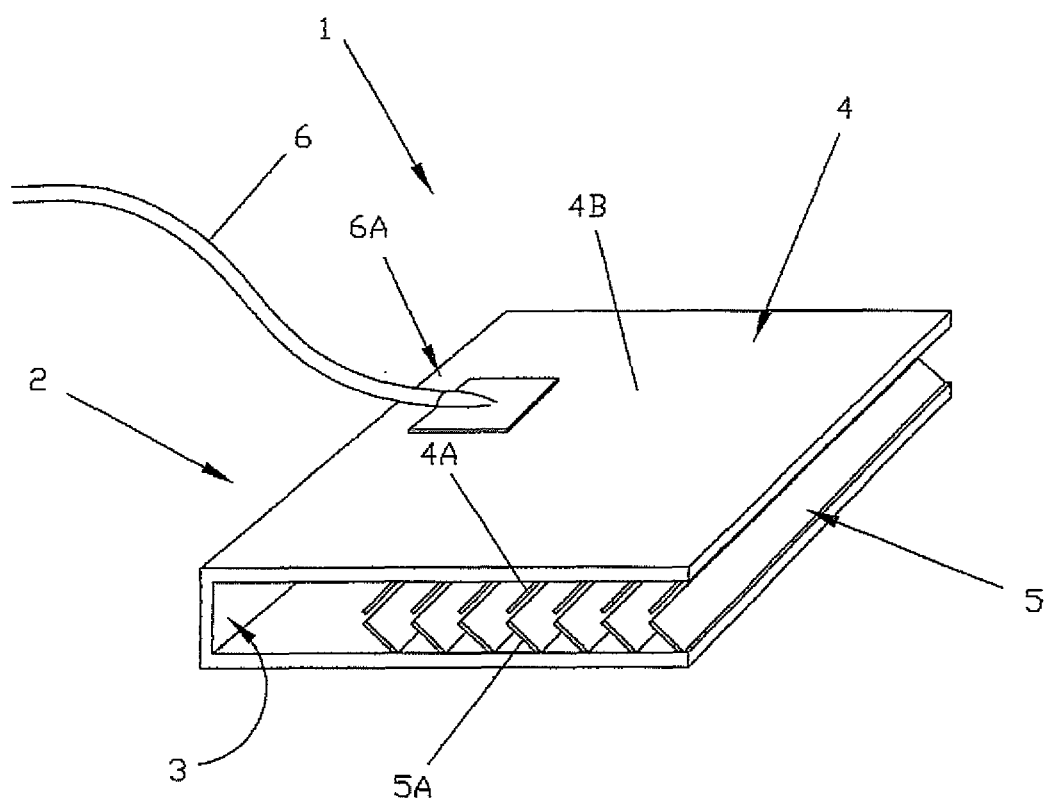


Figure 1

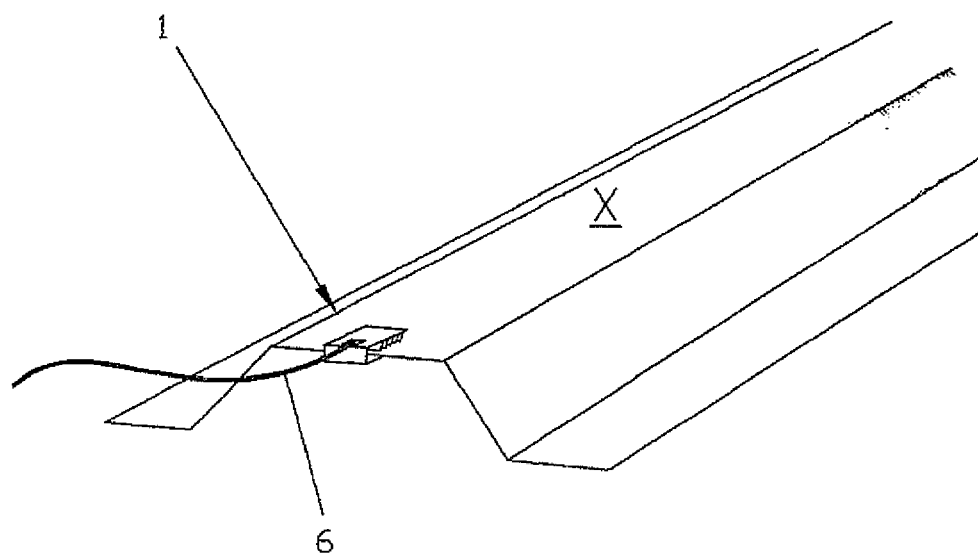


Figure 2

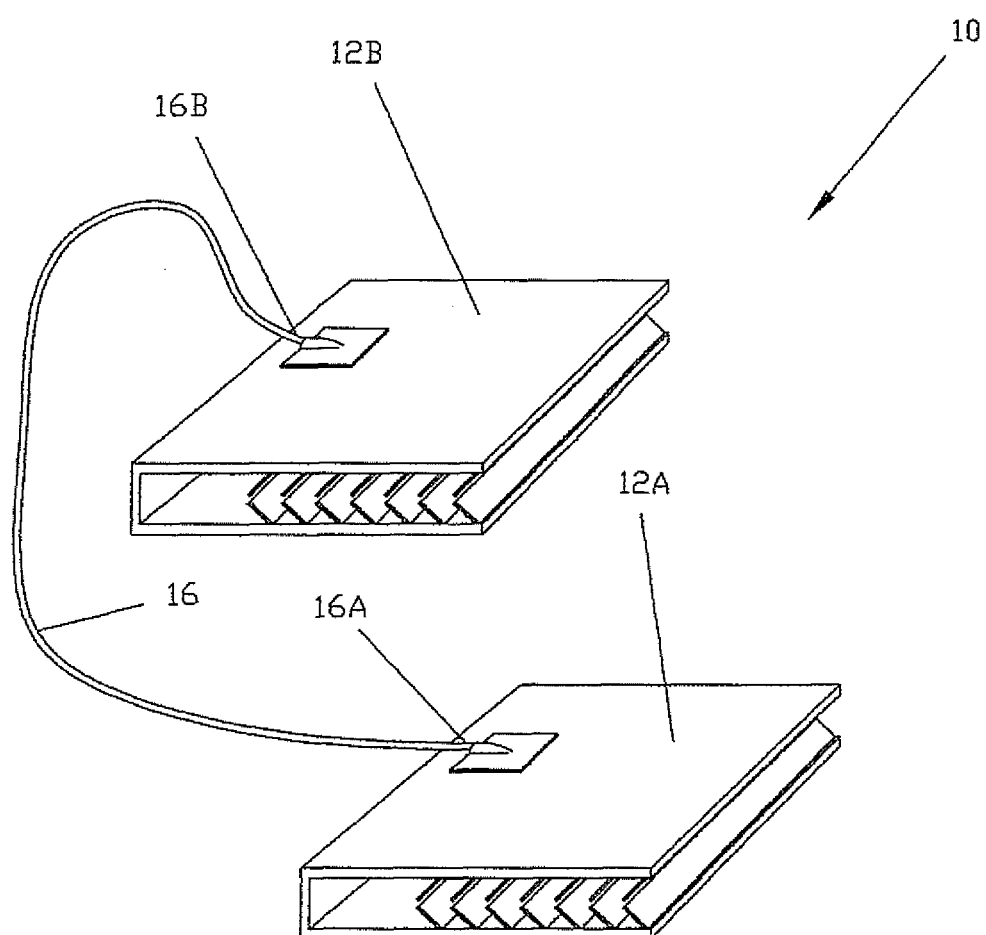


Figure 3