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(54) Shielded jack socket assembly

(57) A shielded jack socket assembly (1) comprises a jack socket assembly formed by a printed circuit board (2) which has secured to the far side thereof (as shown in Figure 1) a jack socket, and a shielding can (8) which provides electromagnetic shielding to the jack socket. The can (8) is of metal and is formed with a tang (17) which projects through an opening provided in the PCB (2) when the can (8) is in its use position. The tang (17) is formed with a relatively large aperture (18) and a tapering slot (19). The tang (17) cooperates with appropriate apertures provided in a moulding (20) which forms part of the jack socket assembly to form an electrical terminal to which the drain wire (7) of an incoming cable (5) can readily be attached. Preferably, a second shielding can is located on the side of the PCB remote from the first shielding can, the two shielding cans being provided with contact portions which automatically interengage as the shielding cans are positioned to provide electrical connections therebetween. Preferably, the shielding cans both snap fit onto engagement with appropriate latch surfaces provided on the jack socket assembly.

Fig.1.

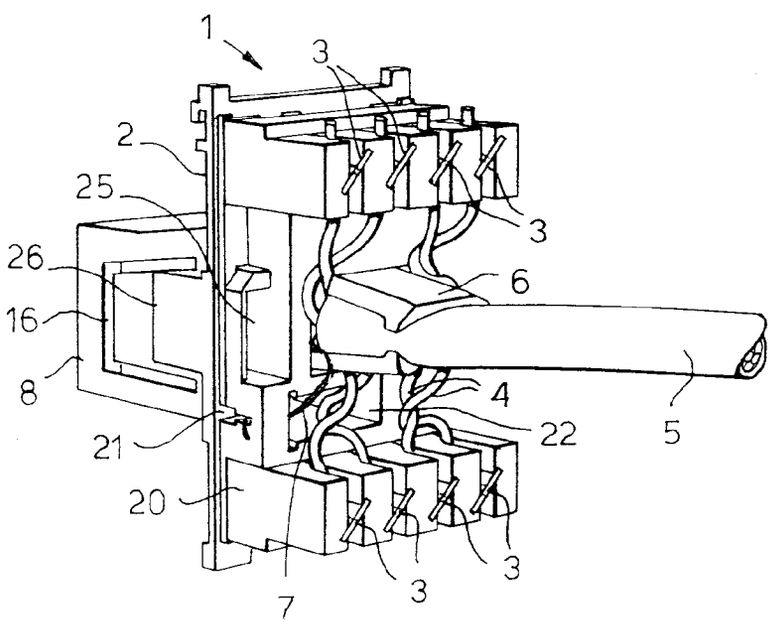

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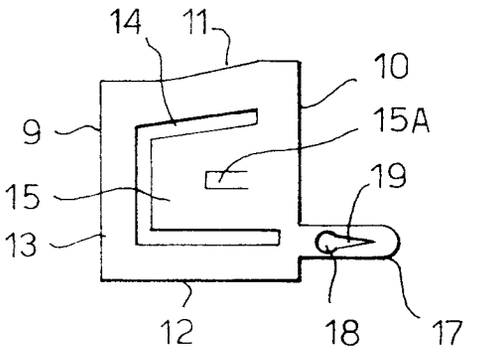
Fig.2.



Description

This invention relates to a shielded jack socket assembly, that is to say jack socket assembly which incorporates shielding material to provide electromagnetic shielding to at least some element of the assembly.

The term "jack socket assembly" as used herein means an assembly comprising a printed circuit board having mounted on one face thereof a jack socket and mounted on the other face thereof at least one terminal for connection to a wire, the PCB providing a connection between the terminal and at least one contact of the jack socket.

Jack socket assemblies are commonly used in installations where a releasable wiring connection is required. Often, a multiplicity of jack socket assemblies are mounted on a rack for receipt of a corresponding multiplicity of jack plugs to provide connections to cabling connected to the terminals of the jack socket assemblies.

In certain installations it is desirable to provide electromagnetic shielding to at least some portion of the jack socket assemblies. Typically, shielding is arranged around some part of the assembly and the shielding is connected to earth and to any shielding provided around the conductors of the incoming cable. Shielding arrangements of the prior art have, in general, been relatively time consuming to assemble resulting in a substantial increase in the time required to assemble a shielded set of jack socket assemblies as compared with the time required for assembling a corresponding set of unshielded assemblies in a similar installation.

The present invention, in one embodiment, provides a shielded jack socket assembly which is particularly quick and easy to assemble and in particular is particularly easy to connect to the shielding of an incoming cable.

According to one aspect of the present invention a shielded jack socket assembly comprises a jack socket assembly (as hereinbefore defined) and a shielding can providing electromagnetic shielding to at least some part of the jack socket assembly, wherein the shielding can includes a tang which, in use, cooperates with a portion of the jack socket assembly to form an electrical terminal for receipt of a wire to provide an electrical connection between the wire and the can.

In a particularly preferred embodiment of the invention the tang includes a generally keyhole shaped opening comprising a relatively large aperture and a tapering slot extending from the aperture whereby a wire may readily be passed through the aperture and then pulled sideways into the slot to form an interference fit with the material of the tang. Preferably, a portion of the jack socket assembly houses the tang and supports the tang against deformation during insertion and locking of a wire. Preferably, the jack socket assembly adjacent the tang is moulded in a manner to provide a tapered lead-in to the aperture, thereby facilitating rapid insertion of a wire into the aperture. The wire may, for example, be a drain wire extending from the shielding of an incoming cable and accordingly by inserting the drain wire through the aperture and pulling it sideways to lock into the slot a rapid and reliable electrical connection between the drain wire and the can is established.

In a particularly preferred embodiment of the invention the shielded jack socket assembly comprises, in addition to the shielding can referred to above, a second shielding can which shields a portion of the jack socket assembly located on the opposite side of the PCB from the first mentioned shielding can. For example, the first shielding can may be positioned to shield the jack socket whilst the second shielding can is positioned to shield the terminals and other components of the jack socket assembly on the side of the PCB remote from the jack socket. Preferably, the first and second shielding cans include mutually interengaging and cooperating components such that when the cans are positioned they are automatically electrically connected to each other by the engagement of corresponding portions of the cans. By this means, if the first mentioned shielding can is connected to the drain wire of an incoming cable as described above, the second shielding can will automatically also be electrically connected to the shielding of the cable when it is positioned.

Preferably, the jack socket assembly provides means which cooperate with one of the, or with each, can to provide a snap fit location of one of the or of each can such that positioning of the or each can in its operative position automatically snap fit engages the can with the jack socket assembly.

In a particularly preferred embodiment of the invention a multiplicity of jack socket assemblies are mounted side by side on a common rack. With such an arrangement, the rack preferably includes a conductive plate adjacent the jack socket assemblies and a spring clip connected to the conductive plate at the location of each jack socket assembly to provide for an automatic electrical connection between the conductive plate and the or one of the shielding cans when the jack socket assembly is snapped into position. The mounting rack for the jack socket assemblies may, for example, be generally as illustrated in Figure 1 of U.K. patent publication GB-A-2274027 in which case the conductive plate can conveniently be located against the inner face of the generally U-shaped plastics retaining clip illustrated in that Figure. Preferably, the conductive plate is itself generally U-shaped and nests within the generally U-shaped clip. This arrangement ensures that the or each shielding can is automatically connected to the conductive plate as the jack socket assemblies are snapped into position. This provides electrical interconnection between the shielding cans and, if the conductive plate is earthed, provides an earth connection to the shielding cans.

In a preferred embodiment of the invention the spring clips associated with the conductive plate can be

removed and, when the clips are removed, no electrical connection will be present between the cans and the conductive plate when the jack socket assemblies are in their use position. Such an arrangement allows considerable flexibility of installation allowing the installer to provide either an earth connection to the or each can of a particular shielded jack socket assembly or no earth connection, according to whether or not the spring clip is left in position or removed.

The present invention is also concerned with a means of providing an electrical connection to the shielding of a shielded electric cable. Shielded electric cables are commonly used for data transmission and it is well known to provide the data carrying conductors of the cable with a shielding comprising a mesh or film of electrically conductive material which surrounds the data carrying conductors and is itself covered with the outer plastics sheath of the cable. In order to provide an electrical connection to the shielding (usually for earthing purposes) it is conventional to strip the outer plastics sheath from the cable adjacent the termination of the cable and provide an appropriate connection to the sheath at that point. However, this arrangement is not wholly satisfactory especially in cases where the shielding is provided by a metal film or a carrier having deposited thereon a metal film. In such cases, some form of clamp must be provided to give an adequate electrical connection to the shielding, and the provision of such clamps is both relatively costly and adds to the assembly and installation time of equipment incorporating such cables.

According to another aspect of the present invention there is provided a method of forming an electrical connection to the shielding of an electric cable comprising providing a conductive metal plate having at least one aperture therein, stripping outer insulation from the cable to expose a portion of the shielding; and clipping the stripped portion of the cable to the conductive plate using a clip which straddles the stripped portion of the cable and engages the aperture in the conductive plate to hold the shielding in firm electrical contact with the conductive plate.

In a particularly preferred embodiment of the invention a single aperture is provided in the conductive plate for each cable, the aperture having a width equal to or somewhat greater than the diameter of the cable after the sheathing has been removed. With such an arrangement, the clip can be designed to engage opposite faces of the aperture to hold the stripped cable against the conductive plate. By appropriately dimensioning of the clip the cable may be slightly deformed at the point of clipping so that opposite edges of the aperture will dig slightly into the material of the shielding to provide good electrical contact therewith.

In a particularly preferred embodiment of the invention a short length of stiff plastics channel is located between the clip and the shielding to prevent abrasion of the shielding by the clip and to spread the clamping force applied by the clip over a relatively long portion of the shielding.

The invention will be better understood from the following description of a preferred embodiment thereof, given by way of example only, reference being had to the accompanying drawings wherein:

Figure 1 illustrates schematically a perspective view of one embodiment of the invention;
Figure 2 is a schematic side view of the shielding can of the embodiment of Figure 1; and
Figure 3 illustrates assembly of the embodiment of Figure 1 with a further shielding can and also illustrates the clamping technique according to the present invention.

Referring firstly to Figure 1, there is illustrated an embodiment of a shielded jack socket assembly according to the present invention. The jack socket assembly comprises a printed circuit board 2 which has secured, to the underside thereof as viewed in Figure 1, a jack socket. The opposite side of the PCB has secured thereto a plastics moulding 20 which houses appropriate conductors to form eight "Krone" terminals 3 to which are secured individual wires 4 of a cable 5. The terminals 3 provide, via circuitry mounted on the PCB, connections between the conductors of the cable 5 and the terminals of the jack socket.

The incoming cable 5 is secured to a cable management clip 6 (which is part of the moulding 20) by suitable means, (e.g. a cable clip) and is of the "shielded" type, i.e. it incorporates a shielding layer of metal surrounding the wires 4 and beneath the outer sheath of the cable. A so-called "drain wire" 7 extends through the cable 5 in contact with the shielding thereof and provides a means by which an electrical connection to the shielding can be obtained.

A shielding can 8 substantially encloses the jack socket. The shielding can includes an end face 9 which includes an opening through which a jack plug can be inserted to engage the jack socket. The opposite end 10 of the can forms an open mouth enabling the can to be telescoped over the jack socket. The upper 11 and lower 12 faces of the can are substantially imperforate. The two side faces 13 of the can (only one of which is shown in the drawings) each incorporate a generally C-shaped slot 14 so that the inner part of the face forms a tongue-like projection 15. The body of the jack socket is moulded from plastics material and incorporates, on each side thereof, a raised bar 16. The arrangement is such that as the can 8 is telescoped over the jack socket the tongues 15 will be cammed outwardly by the bars 16 until the bars 16 snap into the base of the generally C-shaped grooves 14. This arrangement enables the can to be positively located and snap fitted onto the jack socket by simple telescopic movement. The can can, if necessary, be removed by prising the tongues 15 outwardly to clear the bars 16 and then withdrawing the can

from the jack socket.

Referring now particularly to Figure 2 it will be noted that the can 8 is formed with an integral tang 17 which projects from one of the side faces 13. The tang includes an opening formed by a relatively large aperture 18 and a slot 19 which extends from the aperture 18 and tapers inwardly away from the aperture 18. As the can is slid into position over the jack socket as described above the tang passes through an opening provided in the PCB and into a slot provided in the plastic moulding 20. When the can 8 is fully snapped into position the opening formed by the aperture 18 and slot 19 is in register with a corresponding opening 21 provided in the plastics moulding. On the opposite side of the tang 17 to the opening 21 the plastic moulding provides a tapering chute like recess 22 which is shaped into position to ensure that a wire, pushed down the base of the recess 22, will be directed through the aperture 18 of the tang and out through the opening 21. The shape of the opening 21 is such that a wire so inserted can be pulled (as by a pair of pliers) perpendicularly away from the plane of the PCB 2 to bring the wire into the slot 19 and into a corresponding slot of the opening 21. The design of the slots is such that when so positioned the wire will form an electrical contact with the tang 17 and will be retained in position by the plastics material of the moulding 20.

It will be appreciated that the above described arrangement provides a particularly easy system for electrically connecting the drain wire 7 to the can 8. More particularly, the can 8 is first positioned over the jack socket as described above and the drain wire 7 is then slid down the recess 21 through the aperture 18 and through the opening 21. The exposed end is then grasped as by a pair of pliers and the wire is pulled vertically upwards away from the plain of the PCB 2 to form the required electrical connection and secure the wire in position. The exposed end portion of the wire may then be cut off.

Whilst in many installations the above described shielded jack socket assembly will meet system requirements, there are systems in which additionally shielding of the components located on the side of the PCB opposite to the jack socket may be required. In such instances a rear shielding can 23 (Figure 3) is preferably assembled over the moulding 20. The can 23 includes a pair of tangs 24 projecting from opposite side faces thereof. As the can is pushed home the tangs 24 pass through apertures 25 (Figure 1) provided in the moulding 20 to snap-fit into engagement with a ridge provided on the inside of a tongue 26 of the moulding 20. When the can 23 is pushed home the tangs 24 are trapped between the tongues 26 and spring fingers 15A provided on opposite side faces of the can 8. Accordingly, as the can 23 is pushed home electrical connection is automatically effected with the can 8.

In use, a multiplicity of shielded jack socket assemblies 1 may be mounted on the plastic spring clip as illustrated in Figure 1 of GB-A-2274027. In a particularly preferred arrangement the plastic clip of Figure 1 of GB-A-2274027 has nested in the interior thereof a channel-shaped conductive plate 27. The plate 27 includes apertures 28 which are slightly larger in size than the apertures provided in the U-shaped plastics clip of Figure 1 of GB-A-2274027 so that when the PCB 2 is clipped into position between the legs of the U-shaped clip the shielding can 8 is received in the aperture in the plastic clip and passes as a clearance fit through the aperture 28 in the contact plate 27. With such an arrangement no electrical connection will be made between the cans 8 and 23 (if the latter is present) and the contact plate 27. However, if desired a spring clip 29 may be secured to the conductive plate 27 to effect an automatic electrical connection between the plate 27 and the can 8 as the shielded jack socket assembly is snapped into position in the generally U-shaped plastic clip. To this end, the clip 29 includes a jaw portion 30 which may be positioned to grip either flange 31 of the conductive plate 27, and a contact portion 32 which extends upwardly from the jaw portion 30 to engage the can 8 as the shielded jack socket assembly is slipped into position. The clip 29 is made from suitable resilient metal so that it will both maintain its grip on the flange 31 and maintain its resilient contact with the can 8 in use.

Preferably, the conductive plate 27 is supplied with a clip 29 positioned corresponding to each aperture 28 and, if for some reason electrical contact between the can 8 and the contact plate 27 is not required in relation to any particular shielded jack socket assembly, the clip corresponding to that assembly is removed during installation.

The above described arrangement enables the cans 8 and 23 of each jack socket assembly to be electrically connected to the conductive plate 27 during installation of the jack socket assemblies. The conductive plate itself may be connected to earth. The cans 8, 23 may be formed from any suitable material and are preferably formed as metal pressings of appropriate material.

Preferably, the cable 5 is anchored to the chassis of the equipment in which the jack socket assembly connected to it is installed a few centimetres from the jack socket assembly itself. To this end, the equipment preferably comprises a further conductive plate 33 to which the cable 5 is secured by means of a saddle clip 34. The clip 34 includes a pair of legs 35 which snap into locking engagement with a corresponding aperture 36 provided in the conductive plate 33. As shown in Figure 3, the illustrated cable 5 is already clipped to the conductive plate. The aperture 36 for the adjacent cable is shown and the clip 34 for use in securing the adjacent cable is shown above its corresponding aperture 36.

In a particularly preferred arrangement the sheath of each cable 5 is stripped in the vicinity of the plate 33 to expose a portion of the shielding of the cable. The clip 34 is dimensioned relative to the cable such that, when the stripped portion of the cable is laid against the plate

33 and the clip 34 pushed home the core of the cable (comprising the conductors and the shielding) will be slightly distorted and will be pushed, to some extent, into the aperture 36. The effect of this arrangement is that the relatively sharp edges of the aperture will dig into the shielding of the cable to provide good electrical connections between the shielding and the conductive plate 33. The conductive plate 33 is preferably connected to system earth. In order to safeguard against abrasion of the stripped cable by the clip 34 a moulded or extruded plastics saddle 37 is preferably positioned between the clip 34 and the stripped portion of the cable.

An installation comprising all the above shielding and earthing features, namely the can 8, the can 23, the conductive plate 27, the clip 29, the conductive plate 33 and the clip 34 provides a particularly high level of shielding and reliable earth connections. The various connections required to earth the can 8, the can 23 and the cable shield are, however, automatically effected during the course of assembly of the components and accordingly no extra assembly time is required in order to ensure the necessary earth connections.

Whilst in the preferred embodiment of the invention all the features described above are present it should be appreciated that the features themselves may be used in any combination or sub-combination. For example, it may be desirable to use the conductive plate 33 and clips 34 to effect earthing of the shielding of the cable even if the shielding can 8 and/or 23 is not required. Similarly, in some installations it may be acceptable to rely on the connection of the drain wire 7 to the can 8 in order to provide effective shielding and use of the conductive plate 33 and clip 34 may not be necessary. In such installations, the plate 34 may simply be used as a means of anchoring the cable without providing an electrical connection to the sheath by substituting a larger size of clip 34 for that which would be used over a stripped portion of cable 5. In certain installations, the use of the can 8 in association with the conductive plate 27 and clips 29 they provide adequate shielding. It should therefore be appreciated that each of the features referred to above is a separate utility and maybe applied alone or in combination with one or more of the other features described.

Claims

1. A shielded jack socket assembly comprising a jack socket assembly (as hereinbefore defined) and a shielding can providing electromagnetic shielding to at least some part of the jack socket assembly, wherein the shielding can includes a contact portion, preferably a tang, which, in use, cooperates with a portion of the jack socket assembly to form an electrical terminal for receipt of a wire to provide an electrical connection between the wire and the can.

2. A shielded jack socket assembly according to Claim 1 wherein the contact portion includes a generally keyhole shaped opening comprising a relatively large aperture and a tapering slot extending from the aperture whereby a wire may readily be passed through the aperture and then pulled sideways into the slot to form an interference fit with the material of the contact portion.

3. A shielded jack socket assembly according to Claim 2 wherein the jack socket assembly adjacent the contact portion is moulded in a manner to provide a tapered lead-in to the aperture, thereby facilitating rapid insertion of a wire into the aperture.

4. A shielded jack socket assembly according to any preceding claim wherein a portion of the jack socket assembly houses the contact portion and supports the contact portion against deformation during insertion and locking of a wire.

5. A shielded jack socket assembly according to any preceding claim wherein, in addition to the first mentioned shielding can, a second shielding can is provided which shields a portion of the jack socket assembly located on the opposite side of the PCB from the first mentioned shielding can.

6. A shielded jack socket assembly according to Claim 5 wherein the first and second shielding cans include mutually interengaging and cooperating components such that when the cans are positioned they are automatically electrically connected to each other by the engagement of corresponding portions of the cans.

7. A shielded jack socket assembly according to any preceding claim wherein the jack socket assembly provides means which cooperate with one of the, or with each, can to provide a snap fit location of one of the, or of each, can such that positioning of the or each can in its operative position automatically snap fit engages the can with the jack socket assembly.

8. A jack socket installation comprising a multiplicity of shielded jack socket assemblies according to any preceding claim mounted side by side on a common rack, the rack preferably including a conductive plate adjacent the jack socket assemblies and a spring clip connected to the conductive plate at the location of each jack socket assembly to provide for an automatic electrical connection between the conductive plate and the or one of the shielding cans when the jack socket assemblies are snapped into position.

9. A jack socket installation according to Claim 8

wherein the mounting rack for the shielded jack socket assemblies is generally as illustrated in Figure 1 of U.K. patent publication GB-A-2274027, and the conductive plate is located against the inner face of the generally U-shaped plastics retaining clip illustrated in that Figure, the conductive plate itself preferably being generally U-shaped and nesting within the generally U-shaped clip.

10. A jack socket installation according to Claim 9 wherein the spring clips associated with the conductive plate can be removed and, when the clips are removed, no electrical connection will be present between the cans and the conductive plate when the jack socket assemblies are in their use position.

Fig.1.

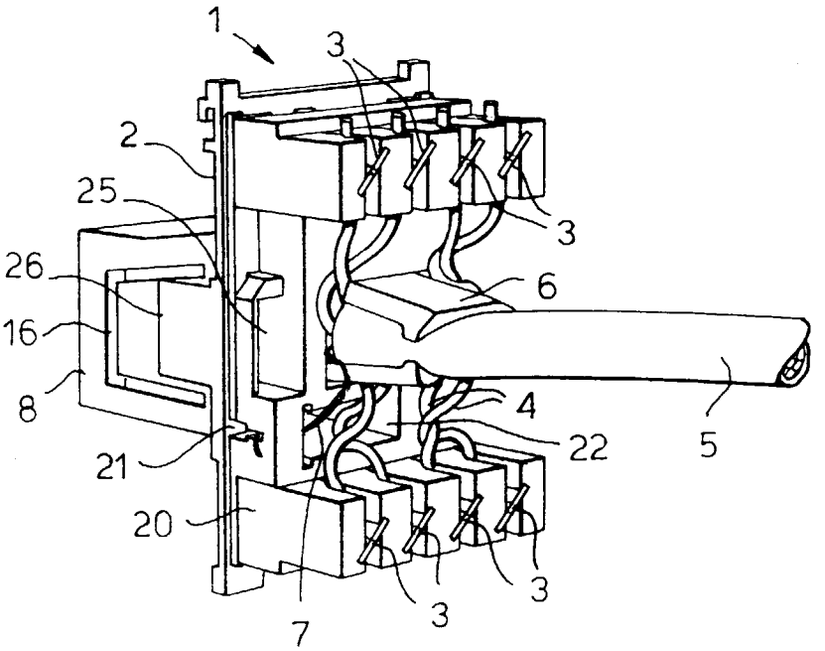


Fig.2.

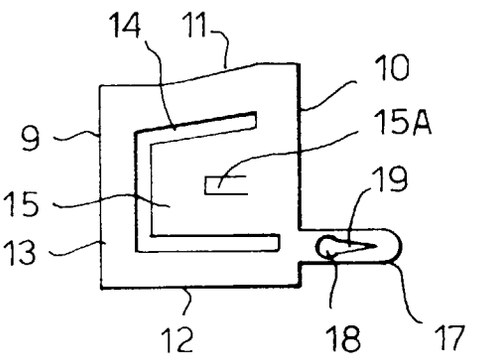


Fig.3.