

This invention relates to an electric plug assembly of the kind in which the plug pins and associated conductor terminals are mounted in a preformed base of electrically insulating material, the conductors of a length of flexible insulated multi-conductor cable are electrically connected to appropriate terminals of the plug, and a moulded plug body of electrically insulating material wholly or partially encapsulates the preformed base and the plug pins and associated conductor terminals with an appropriate length of each pin protruding from the plug assembly and is permanently bonded to the insulating covering of a part of the length of cable. Electric plug assemblies of this kind will hereinafter, for convenience, be referred to as "of the kind described".

Three pin electric plug assemblies of the kind described are especially suitable for use with domestic appliances because such appliances can be sold to the public with the electric plug permanently bonded to the flexible cable of the appliance, thereby eliminating the risk that an unskilled user of an appliance may connect a conventional three pin plug to an end of the flexible cable of the appliance in an incorrect manner which, when the appliance is used, may result in injury to the user and/or permanent damage to the appliance.

It is the object of the present invention to provide an improved electric plug assembly of the kind described which is simpler in construction and thereby less expensive to manufacture than electric plug assemblies of the kind described hitherto proposed and used.

According to the invention, the improved electric plug assembly of the kind described comprises a preformed base of electrically insulating material having holes therethrough in which are fitted plug pins which 5 protrude from the rear face of the preformed base and each of which has at least one shoulder bearing against the front face of the preformed base to limit the extent of protrusion of the pin; means integral with the preformed base and associated with each of the holes passing 10 therethrough which effect snap fits with the plug pins to hold the pins in position in the holes with the shoulders bearing against the front face of the preformed base; and a moulded body of electrically insulating material which wholly encapsulates each plug pin-holding means and the 15 conductor terminals associated with the plug pins and which wholly or partially encapsulates the preformed base and is bonded to the insulating covering of an adjacent part of the flexible cable.

Preferably, the preformed base has, adjacent 20 each hole therethrough, at least one flexible lug which is integral with the preformed base and which is of such a shape that it permits passage of a pin through the hole in a direction from the front face to the rear face of the 25 performed base and which has a shoulder which bears against a part of a pin to retain the pin in position in the hole with the shoulder or shoulders of the pin bearing against the front face of the preformed base. Preferably, also, the or each flexible lug associated with each hole 30 through the preformed base constitutes a part of the boundary wall of the hole.

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Where, as is preferred, the plug assembly includes means for electrically connecting a cartridge fuse between the live pin and the its associated conductor terminal and said means comprises two spaced 5 substantially U-shaped resilient electrical contacts, one of which is electrically connected to the live pin and the other to its associated conductor terminal before they are introduced into the preformed base and whose limbs are introduced from the front face of the 10 base through two pairs of slots extending through the base so that the limbs of the electrical contacts protrude into a cartridge fuse recess in the rear face of the base, preferably the preformed base has, associated with each said U-shaped electrical contact, 15 means integral with the preformed base which effects a snap fit with the electrical contact to hold the electrical contact in position in the slots with the contact bearing against the front face of the preformed base and with the limbs of the contact protruding into 20 the cartridge-fuse recess. Preferably, two flexible lugs are associated with at least one pair of slots through which the limbs of an electrical contact protrude into the cartridge-fuse recess, one flexible lug having a shoulder engaging the base of one limb of the electrical 25 contact and the other flexible lug having a shoulder engaging the base of the other limb of the electrical contact, the flexible lugs being of such a shape that they permit insertion of the electrical contact from the front face of the preformed base towards the rear face

thereof and, when the electrical contact is in position, effect snap engagement with the contact to hold it in said position.

The preformed base may be made of any suitable electrically insulating material that has sufficient inherent flexibility to enable lugs integral with the base to be formed for effecting a snap engagement with a pin or electrical contact of the plug assembly. It is preferred to make the preformed base of a glass-filled polypropylene.

It has been found that, in manufacturing electric plug assemblies of the kind described, there is a risk that, during moulding of the plug body, a wire or wires of the exposed end of a cable conductor connected to one of the terminals will become detached from the terminal and will protrude through the moulded plug body. A plug assembly which is connected to a domestic electrical appliance and which has a live wire or wires protruding through the plug body is extremely dangerous, especially if handled with damp hands - as may be the case when the plug assembly is connected to a domestic washing machine.

Accordingly, the improved electric plug assembly of the present invention preferably incorporates means which will eliminate or at least substantially reduce any risk of a wire or wires protruding through the plug body. In one preferred embodiment, the moulded body of the plug consists of two separately formed parts, an inner moulded body of electrically insulating material which wholly encapsulates at least the conductor terminals associated with the live and neutral pins, and preferably the conductor terminals

associated with all the plug pins, and an outer moulded body of electrically insulating material which wholly or partially encapsulates the inner moulded body and is bonded to the insulating covering of an adjacent part of 5 the flexible cable. Where, for example, the outer moulded body is of urea or polyester, preferably the inner moulded body is of nylon, polyvinyl chloride or polyester. The inner moulded body may be of a colour different and readily distinguishable from that of the 10 outer moulded body and, preferably, at least a part of the inner moulded body is visible to provide an indication that an inner moulded body is present within the plug. In another embodiment of the invention, a preformed cover of an electrically insulating material 15 that is substantially harder than the moulded insulating material of the plug body is encapsulated within the moulded plug body and is connected to the preformed base in which the plug pins and associated conductor terminals are mounted in such a way as to overlie at least the live 20 and neutral terminals, and preferably all of the terminals, thereby to form a guard between said terminals and the outer surface of the moulded plug body. In this case, preferably the preformed cover is initially detachably connected to the preformed base in which the 25 plug pins and associated conductor terminals are mounted and, in a preferred embodiment, the preformed cover has protuberances which are snap fits in appropriately located holes or recesses in the preformed base.

The invention is further illustrated by a description, by way of example, of a preferred 13 amp three-pin plug assembly of the kind described with reference to the accompanying drawings, in which:-

5 Figure 1 is a plan view of the preformed base of the plug assembly with the pins and cartridge fuse contacts mounted therein;

 Figure 2 is a sectional side view of the preformed base taken on the line II-II in Figure 1;

10 Figure 3 is a sectional side view of the preformed base taken on the line III-III in Figure 1, and

 Figure 4 is a sectional side view of the preformed base taken on the line IV-IV in Figure 1.

15 Referring to the drawings, the improved electric plug assembly comprises a preformed base 1 of a glass-filled polypropylene having therethrough a hole 2 for reception of a live pin 12, a hole 3 for reception of a neutral pin 13 and a hole 4 for reception of an earth pin
20 14. Each of the pins 12, 13 and 14 is of hollow form and protrudes from the rear face of the preformed base 1, the pin 12 having two shoulders 15, the pin 13 having two shoulders 16 and the pin 14 having two shoulders 17, all of which shoulders bear against the front face of the
25 base. The pin 13 has an integral ferrule 18 for

connection to the neutral conductor of a flexible three core cable (not shown); the pin 14 has an integral ferrule 19 for connection to the earth conductor of the cable.

The preformed base 1 has, adjacent the hole 2, a flexible lug 22 which is integral with the base and which has a shoulder 25 that bears against a part of the pin 12 to retain the pin in position in the hole with the shoulders 15 bearing against the front face of the base. The flexible lug 22 is of such a shape that it permits passage of the pin 12 through the hole 2 in a direction from the front face to the rear face of the preformed base 1 and effects a snap fit with the pin to hold the pin in position in the hole with the shoulders 15 of the pin bearing against the front face of the base. Similarly, the preformed base 1 has, adjacent the hole 3, an integral flexible lug 23 having a shoulder 26 retaining the pin 13 in position and, adjacent the hole 4, an integral flexible lug 24 having a shoulder 27 retaining the pin 14 in position, the flexible lugs 23 and 24 operating in the same manner as the flexible lug 22.

The preformed base 1 has, in the rear face of the base between the holes 2 and 3 and the hole 4, a cartridge fuse recess 5 and has two pairs of slots 6 and 7 which extend through the base and open into the cartridge fuse recess. Positioned in the pair of slots 6 is a substantially U-shaped resilient electric fuse clip 20

whose limbs protrude into the cartridge fuse recess 5 and which has an integral ferrule 21 for electrically connecting the fuse clip to the live conductor of the flexible three core cable. The fuse clip 20 is retained in position by two flexible lugs 28 which are integral with the base 1 and which have shoulders 29 bearing against the base of the clip. The flexible lugs 28 are of such a shape that they permit passage of the limbs of the clip 20 through the slots 6 in a direction from the front face to the rear face of the preformed base 1 and effect snap fits with the base of the clip to hold it in position in the slots with the shoulders 29 of the lugs bearing against the base of the clip.

The live pin 12 has a tongue 30 which is spot welded to the base of a substantially U-shaped resilient fuse clip 38 whose limbs protrude through the pair of slots 7 into the cartridge fuse recess 5. The fuse clip 38 is retained in position by a flexible lug 39 which is integral with the preformed base 1 and which has a shoulder 40 bearing against the tongue 30 integral with the live pin 12. The flexible lug 39 is of such a shape that it permits passage of the limbs of the fuse clip 38 through the slots 7 in a direction from the front face to the rear face of the preformed base and effects a snap fit with the tongue 30 to hold the fuse clip in position in the slots with the shoulder 40 of the lug bearing against the tongue.

The conductor terminals associated with all the plug pins are wholly encapsulated in an inner moulded body of electrically insulating material (not shown) and an outer moulded body of electrically insulating material (not shown) partially encapsulates the inner moulded body and is bonded to the insulating covering of an adjacent part of the flexible three core cable.

Since the plug pins and fuse clips are retained in position in the preformed base by resilient lugs integral with the base, the preformed base with the pins and fuse clips mounted in it can be transported within a factory to a machine for moulding the plug body with negligible risk that a pin or fuse clip will be displaced.

**CLAIMS:**

1. An electric plug assembly of the kind described comprising a preformed base of electrically insulating material having holes therethrough in which are fitted plug pins which protrude from the rear face of the preformed base and each of which has at least one shoulder bearing against the front face of the preformed base to limit the extent of protrusion of the pin; means integral with the preformed base and associated with each of the holes passing therethrough which effect snap fits with the plug pins to hold the pins in position in the holes with the shoulders bearing against the front face of the preformed base; and a moulded body of electrically insulating material which wholly encapsulates each plug pin-holding means and the conductor terminals associated with the plug pins and which wholly or partially encapsulates the preformed base and is bonded to the insulating covering of an adjacent part of the flexible cable.
2. An electric plug assembly of the kind described comprising a preformed base of electrically insulating material having holes therethrough in which are fitted plug pins which protrude from the rear face of the preformed base and each of which has at least one shoulder bearing against the front face of the preformed base to limit the extent of protrusion of the pin and having, adjacent each hole therethrough, at least one



flexible lug which is integral with the preformed base, which flexible lug is of such a shape that it permits passage of a pin through the hole in a direction from the front face to the rear face of the preformed base and

5 which has a shoulder which bears against a part of a pin to retain the pin in position in the hole with the shoulder or shoulders of the pin bearing against the front face of the preformed base; and a moulded body of electrically insulating material which wholly
10 encapsulates the flexible lugs and the conductor terminals associated with the plug pins and which wholly or partially encapsulates the preformed base and is bonded to the insulating covering of an adjacent part of the flexible cable.

15 3. An electric plug assembly as claimed in Claim 2, wherein the or each flexible lug associated with each hole through the preformed base constitutes a part of the boundary wall of the hole.

4. An electric plug assembly as claimed in any one
20 of the ^{preceding} ~~preformed~~ Claims which includes means for electrically connecting a cartridge fuse between the live pin and its associated conductor terminal and said means comprises two spaced substantially U-shaped resilient electrical contacts, one of which is electrically
25 connected to the live pin and the other to its associated conductor terminal before they are introduced into the preformed base and whose limbs are introduced from the front face of the base through two pairs of slots



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extending through the base so that the limbs of the electrical contacts protrude into a cartridge fuse recess in the rear face of the base, wherein the preformed base has, associated with each said electrical
5 contact, means integral with the preformed base with which the electrical contact effects a snap fit to hold the electrical contact in position in the slots with the contact bearing against the front face of the preformed base and with the limbs of the contact protruding into
10 the cartridge-fuse recess.

5. An electric plug assembly as claimed in Claim 4, wherein two flexible lugs are associated with at least one pair of slots through which the limbs of an electrical contact protrude into the cartridge-fuse recess, one flexible lug having a shoulder engaging the
15 base of one limb of the electrical contact and the other flexible lug having a shoulder engaging the base of the other limb of the electrical contact, the flexible lugs being of such a shape that they permit insertion of the electrical contact from the front face of the preformed
20 base towards the rear face thereof and, when the electrical contact is in position, effect snap engagement with the contact to hold it in said position.

6. An electric plug assembly as claimed in any one
25 of the preceding Claims, wherein the preformed base is made of a glass-filled polypropylene.

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7. An electric plug assembly as claimed in any one of the preceding Claims, wherein the moulded body of the plug consists of two separately formed parts, an inner moulded body of electrically insulating material which
5 wholly encapsulates at least the conductor terminals associated with the live and neutral pins, and an outer moulded body of electrically insulating material which wholly or partially encapsulates the inner moulded body and is bonded to the insulating covering of an adjacent
10 part of the flexible cable.

8. An electric plug assembly as claimed in Claim 7, wherein the inner moulded body of electrically insulating material wholly encapsulates the conductor terminals associated with all the plug pins.

15 9. An electric plug assembly as claimed in Claim 7 or 8, wherein the inner moulded body is of a colour different and readily distinguishable from that of the outer moulded body and at least part of the inner moulded body is visible to provide an indication that an inner
20 moulded body is present within the plug.

10. An electric plug assembly as claimed in any one of Claims 1 to 6, wherein a preformed cover of an electrically insulating material that is substantially harder than the moulded insulating material of the plug
25 body is encapsulated within the moulded plug body and is connected to the preformed base in which the plug pins



and associated conductor terminals are mounted in such a way as to overlie at least the live and neutral terminals thereby to form a guard between said terminals and the outer surface of the moulded plug body.

5 11. An electric plug assembly as claimed in Claim 10, wherein the preformed cover overlies all the plug pin terminals.

12. An electric plug assembly as claimed in Claim 10 or 11, wherein the preformed cover is initially
10 detachably connected to the preformed base in which the plug pins and associated conductor terminals are mounted.

13. An electric plug assembly as claimed in Claim 12, wherein the preformed cover has protuberances which are
15 snap fits in appropriately located holes or recesses in the preformed base.

~~14.~~
17. An electric plug assembly substantially as
hereinbefore described with reference to and as shown in the accompanying drawings.
