

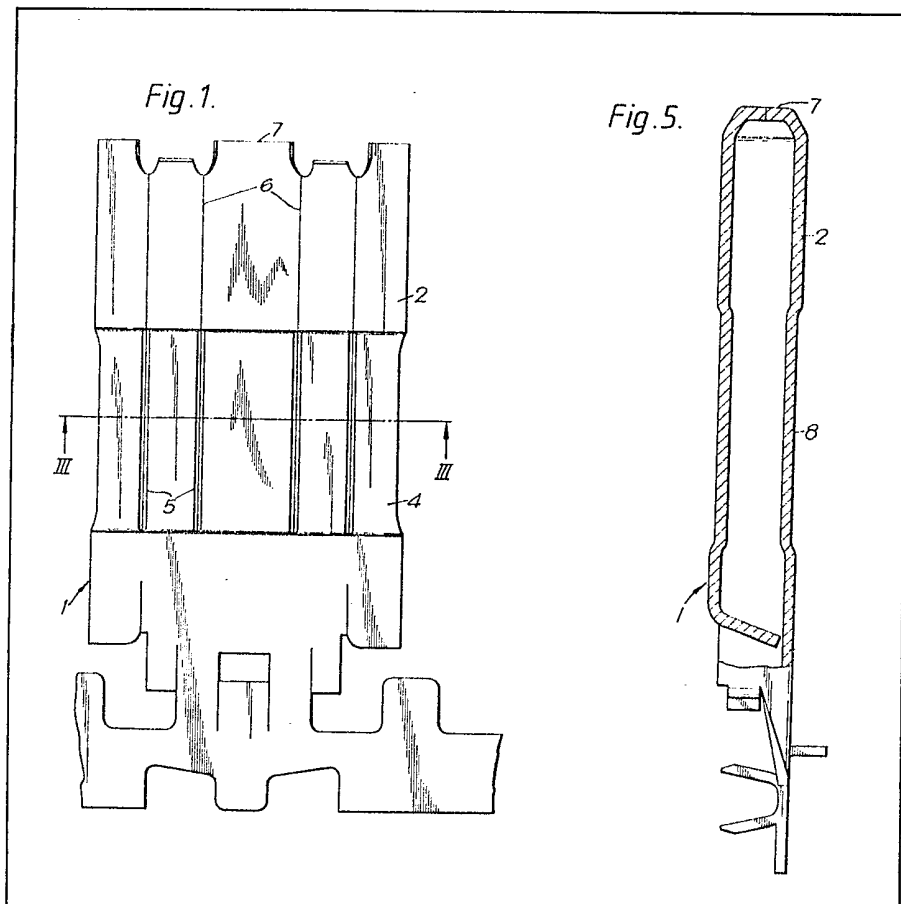
(12) UK Patent Application (19) GB (11) 2 084 412 A

- (21) Application No 8129041
- (22) Date of filing 25 Sep 1981
- (30) Priority data
- (31) 80/30957
- (32) 25 Sep 1980
- (33) United Kingdom (GB)
- (43) Application published 7 Apr 1982
- (51) INT CL³
H01R 13/04
- (52) Domestic classification
H2E 114 DBB HX
- (56) Documents cited
GB 2067028A
- (58) Field of search
H2E
- (71) Applicants
BICC-Burndy Limited,
Parr, St. Helens,
Merseyside WA9 1PR
- (72) Inventor
Terence Edward King
- (74) Agents
E. L. R. Gower,
BICC Limited Patents
Department, 38 Wood
Lane, London W12 7DX

(54) An electrically conductive plug pin

(57) An electrically conductive hollow plug pin is formed from a flat elongate metal preform which over a substantial part (8) of its length remote from one end has been punched to form, in one surface, a depression and, in the opposite surface, a protrusion (4) extending transversely across the width of the preform and has been coined to form

a plurality of grooves (5) extending throughout the length of and transversely spaced across the surface of the protrusion. The preform is folded lengthwise along fold lines (6) extending longitudinally through the grooves to form a hollow pin of rectangular cross-section, the part (8) of the length of the hollow pin formed by the depressed area being of reduced overall cross section and being remote from the free end (7) of the pin. The part (8) will carry a sleeve of insulating material.



GB 2 084 412 A

Fig. 1.

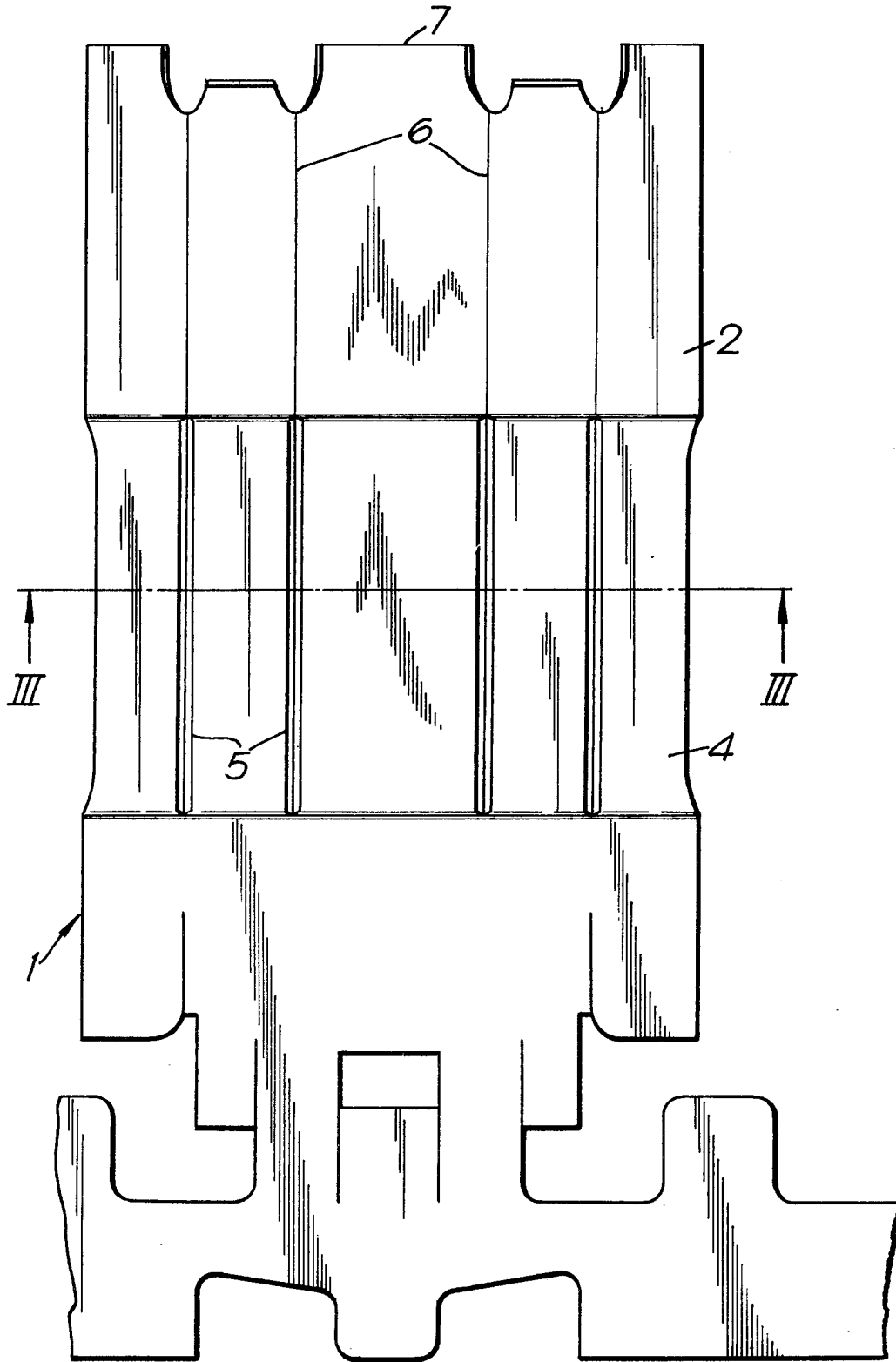
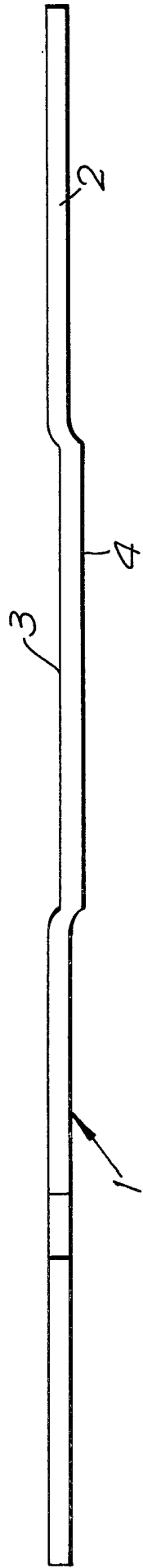
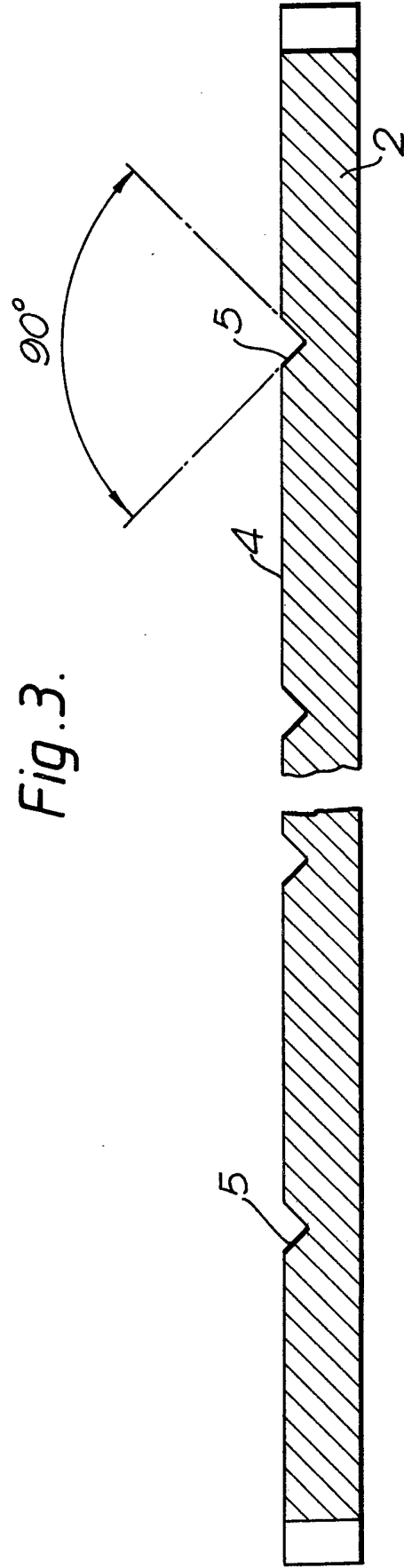


Fig. 2.



2/4

Fig. 3.



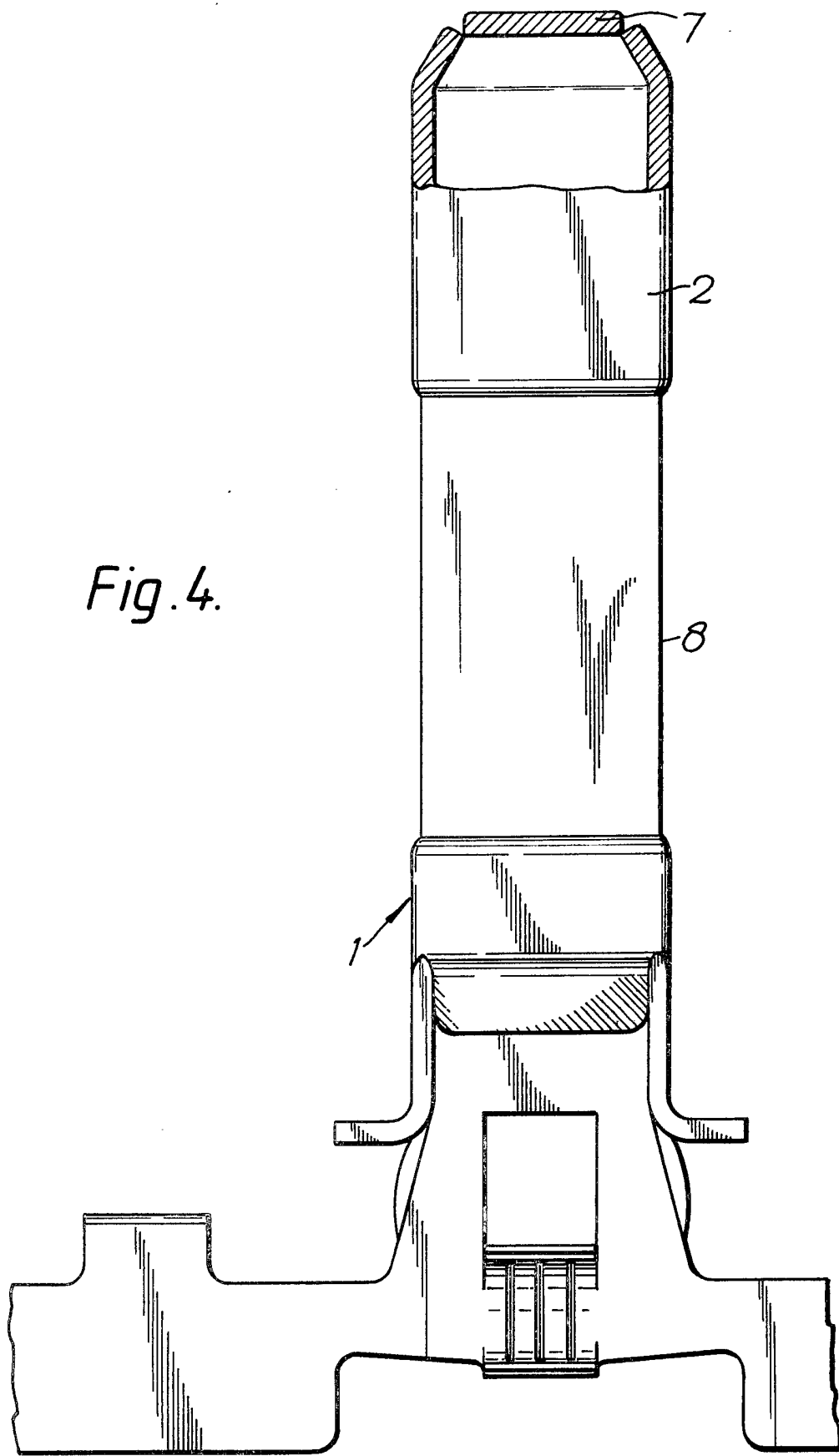
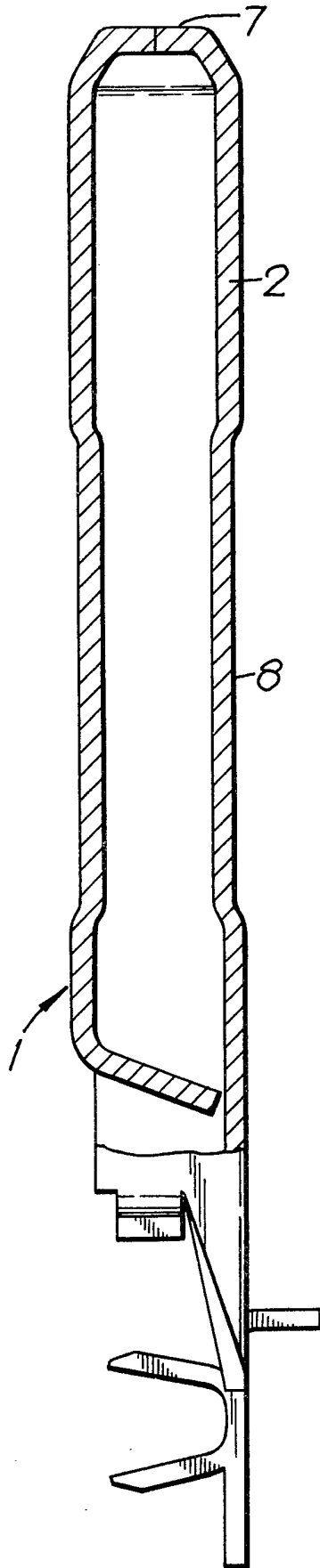


Fig. 4.

Fig. 5.



SPECIFICATION

An electrically conductive plug pin

This invention relates to electrically conductive plug pins and is especially, but not exclusively, concerned with electrically conductive plug pins for use in electric plugs of the kind used in domestic and similar wiring systems.

When an electric plug is electrically connected in a socket outlet but the faces of the plug and outlet do not abut, there is a substantial risk that a child or other person will introduce a finger or other object between these faces and receive an electric shock. To reduce this risk, it has been proposed and is sometimes the practice to provide on at least each line pin of the plug an insulating protective covering which extends around and along a substantial part of the length of the pin projecting from the insulating plug body. Such insulating protective pin coverings may be integral parts of the plug body but more recently it has been proposed to use, for each insulating pin covering, a separate sleeve of insulating material which fits over part of the length of a pin. Where a pin is of solid form it is a simple matter to reduce the cross-section of the pin over that part of the length of the pin that is to receive the sleeve and to arrange for the reduction in cross-section and/or the wall thickness of the sleeve to be such that the outer surface of the insulating sleeve is a smooth continuation of the outer surface of the unreduced part of the length of the pin.

More recently, it has been proposed to form each line pin of an electric plug for use in domestic and similar wiring systems from a preform of sheet metal or sheet metal alloy which has been folded or otherwise shaped to form a hollow pin. Where it is desired to apply a sleeve of insulating material to a substantial part of the length of such a hollow pin, it has been proposed to reduce the thickness of that part of the preform of sheet metal or sheet metal alloy that is to form the part of the hollow pin which is to receive the insulating sleeve so that that part of the pin is of reduced overall cross-section as compared with the remainder of the length of the pin. It has been found, however, that this has the serious disadvantages that it results in waste of the metal or metal alloy removed from the preform and that the strength of the pin in the region of the reduced part of its length may be lowered to an undesirable extent.

It is an object of the present invention to provide a simple and inexpensive electrically conductive hollow plug pin of substantially rectangular cross-section which is especially, but not exclusively, suitable for use in "13 amp" electric plugs of the kind to which British Standard Specification No. 1363 relates.

According to the present invention, the improved electrically conductive hollow plug pin is formed from a substantially flat elongate preform of metal or metal alloy which, over a substantial part of its length remote from one end of the preform, has been punched or otherwise worked

to form, in one surface of the preform, a depression and, in the opposite surface, a protrusion each extending transversely across the width of the preform and has been coined or otherwise worked to form, in the surface of the protrusion, a plurality of grooves extending throughout the length of and transversely spaced across the protrusion, and which has been folded lengthwise along fold lines extending longitudinally through said grooves to form a hollow pin of substantially rectangular cross-section, the substantial part of the length of the hollow pin formed by the depression in the preform being of reduced overall cross-section and being remote from the free end of the pin.

Preferably, the part of the length of the hollow pin of reduced overall cross-section carries a preformed sleeve of electrically insulating material and, preferably also, the sleeve is so shaped and dimensioned externally that its outer surface forms a substantially smooth continuation of the outer surface of the unreduced part of the length of the pin. The insulating sleeve is preferably made of a heat shrinkable plastics material so that the heat shrunk sleeve is a tight fit on the reduced part of the length of the hollow pin. Alternatively, the sleeve may be of resilient electrically insulating material and slit throughout its length so that it is a snap fit on the part of the length of the hollow pin of reduced overall cross-section.

By a "heat shrinkable plastics material" is meant a plastics material having a property such that, when a suitable heat-treated sleeve or other article of one shape made from the plastics material, that has been caused to expand or deform into another shape at an appropriate temperature, is subsequently subjected to a sufficiently high temperature, the sleeve or other article will at least partly contract or otherwise recover its original shape.

Heat-shrinkable plastics material that may be used for the sleeve include cross-linked polyethylene which can be caused to contract to an extent sufficient for the sleeve to grip said reduced part of the length of the pin when the sleeve is heated to a temperature of about 150°C, polyester material, polyvinyl chloride, ethylene-vinyl acetate and a certain grade of polytetrafluoroethylene.

Instead of the part of the length of the hollow pin of reduced overall cross-section carrying a preformed sleeve of electrically insulating material, before the preform is folded lengthwise, the depression in the preform may be filled with electrically insulating material so that the outer surface of the insulating material forms a smooth continuation of the outer surface of the remainder of the preform, the preform subsequently being folded lengthwise as previously described.

Since, over that part of the length of each fold line extending lengthwise of the protrusion in the preform, a groove has been formed in the surface of the protrusion, when the preform is folded longitudinally to form the hollow pin there is no outward distortion of metal or metal alloy in the

vicinity of the lengthwise folds which might otherwise result in the subsequently applied insulating sleeve protruding locally above the level of the outer surface of the unreduced part of the length of the hollow pin.

Each groove in the protrusion in the preform may be of any convenient transverse cross-section but preferably it is of substantially V-shaped transverse cross-section and, in a preferred embodiment, the angle subtended by the side walls of the V-shaped groove is approximately 90°. Preferably, the ends of the depression and protrusion integral with other parts of the preform are smoothly radiused or curved.

The end of the hollow pin remote from the free end may have, integral with the pin, means for effecting electrical connection to a terminal of a cartridge fuse in accordance with our co-pending Patent Application No. 7933349; or may have, integral with the pin, a cradle for reception of a bare end of a cable conductor so that the pin is suitable for use in an electrically conductive pin assembly in accordance with our co-pending Patent Application No. 7933348; or may have, secured to the pin, separately formed means for electrically connecting a cable conductor to the pin in accordance with our co-pending Patent Application No. 7901361; or may be otherwise shaped or formed appropriate to the type of plug of which the pin is to form a component part.

The preform may be so longitudinally folded that the adjacent longitudinally extending edges of the folded preform are turned inwardly, thereby reducing the risk that such raw edges of the preform may, in the course of time, be distorted and foul a socket into which the pin is to be inserted.

The invention also includes an electric plug having at least two line pins substantially as hereinbefore described.

The invention will be further illustrated by a description, by way of example, of a preferred hollow plug pin for use in a "13 amp" three pin plug, with reference to the accompanying drawings, in which:—

Figures 1 and 2, respectively, are plan and side views of the preform from which the hollow plug pin is formed;

Figure 3 is a transverse cross-sectional view of the preform taken on the line III—III in Figure 1;

Figure 4 is a front view of the hollow plug pin, partly in section and partly in elevation; and

Figure 5 is a side view of the hollow pin, partly in section and partly in elevation.

Referring to Figures 1 to 3, the preform 1 comprises a flat sheet 2 of brass which, over an area extending along a substantial part of the length of and transversely across the preform, has been punched or otherwise worked to form, in one surface of the preform, a depression 3 and, in the opposite surface, a protrusion 4. At each of four transversely spaced positions across the protrusion 4 a V-shaped groove 5 extends along the whole length of the protrusion. Fold lines 6 extend lengthwise through the grooves 5. At one

end 7 of the preform 1, the preform is appropriately shaped so that when it is folded lengthwise along the fold lines 6 to form a hollow pin of substantially rectangular cross-section, the end 7 of the preform can be folded to form the free or nose end of the pin. The other end of the preform can be shaped in any convenient manner to form integral terminal means for connecting the bare end of a cable conductor to the hollow pin.

As will be seen on referring to Figures 4 and 5, by folding the preform 1 along fold lines 6 passing through the grooves 5, a hollow pin is formed having a part 8 of reduced cross-section over which a heat shrunk sleeve of cross-linked polyethylene can be positioned.

CLAIMS

1. An electrically conductive hollow plug pin formed from a substantially flat elongate preform of metal or metal alloy which, over a substantial part of its length remote from one end of the preform, has been punched or otherwise worked to form, in one surface of the preform, a depression and, in the opposite surface, a protrusion each extending transversely across the width of the preform and has been coined or otherwise worked to form, in the surface of the protrusion, a plurality of grooves extending throughout the length of and transversely spaced across the protrusion, and which has been folded lengthwise along fold lines extending longitudinally through said grooves to form a hollow pin of substantially rectangular cross-section, the substantial part of the length of the hollow pin formed by the depression in the preform being of reduced overall cross-section and being remote from the free end of the pin.

2. An electrically conductive hollow plug pin as claimed in Claim 1, wherein the part of the length of the hollow pin of reduced overall cross-section carries a preformed sleeve of electrically insulating material.

3. An electrically conductive hollow plug pin as claimed in Claim 2, wherein the sleeve of electrically insulating material is so shaped and dimensioned externally that its outer surface forms a substantially smooth continuation of the outer surface of the unreduced part of the length of the hollow pin.

4. An electrically conductive hollow plug pin as claimed in Claim 2 or 3, wherein the insulating sleeve is made of a heat shrinkable plastics material which has been so heat shrunk that the sleeve is a tight fit on the reduced part of the length of the hollow pin.

5. An electrically conductive hollow plug pin as claimed in Claim 2 or 3, wherein the insulating sleeve is of a resilient electrically insulating material and slit throughout its length so that it is a snap fit.

6. An electrically conductive hollow plug pin as claimed in Claim 1, wherein, before the preform is folded lengthwise, the depression in the preform is filled with electrically insulating material so that the outer surface of the insulating material forms a

smooth continuation of the outer surface of the remainder of the preform.

5 7. An electrically conductive hollow plug pin as claimed in any one of the preceding Claims, wherein each groove in the surface of the protrusion in the preform is of a substantially V-shaped transverse cross-section.

10 8. An electrically conductive hollow plug pin as claimed in Claim 7, wherein the angle subtended by the side walls of the V-shaped groove is approximately 90°.

15 9. An electrically conductive hollow plug pin as claimed in any one of the preceding Claims, wherein the ends of the depression and protrusion integral with other parts of the preform are smoothly radiused or curved.

20 10. An electrically conductive hollow plug pin as claimed in any one of the preceding Claims, wherein the end of the hollow plug pin remote from the free end has, integral with the pin, means for effecting electrical connection to a terminal of a cartridge fuse.

11. An electrically conductive hollow plug pin

25 as claimed in any one of Claims 1 to 9, wherein the end of the hollow plug pin remote from the free end has, integral with the pin, a cradle for reception of a bare end of a cable conductor.

30 12. An electrically conductive hollow plug pin as claimed in any one of Claims 1 to 9, wherein the end of the hollow pin remote from the free end has, secured to the pin, separately formed means for electrically connecting a cable conductor to the pin.

35 13. An electrically conductive hollow plug pin as claimed in any one of the preceding Claims, wherein the preform is so longitudinally folded that the adjacent longitudinally extending edges of the folded preform are turned inwardly.

40 14. An electrically conductive hollow plug pin substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

45 15. An electric plug having at least two line pins each in accordance with any one of the preceding Claims.