

This invention relates to electric socket outlets of the kind comprising at least two socket contacts to which an electric plug having at least two pins
5 protruding from the plug body can be electrically connected and it is especially, but not exclusively, concerned with electric socket outlets of this kind for use in domestic and similar wiring systems.

The use in domestic, industrial and other premises
10 of visual display units, mini-computers and other equipment requiring both electrical and optical connections to an electrical supply source and a light emitting device is increasing year by year and the provision of simple and inexpensive electric and optical
15 connectors for effecting such connections is highly desirable.

In the Specification of our co-pending Patent Application No. 82 27577 filed on the same day as the present application, there is described and claimed an
20 improved electric plug comprising at least two pins which protrude from the plug body, wherein at least one of the pins of the plug has at least one throughbore extending along its length and wherein a separate optical fibre or an optical bundle as hereinafter
25 defined is housed in said throughbore, is fixed with respect to the pin over at least a part of the length of

the fibre or bundle adjacent the free end of the pin,
and is connected to, or adapted to be connected to, or
is integral with, an optical fibre or an optical bundle
of a flexible electric cable extending into the plug
5 body.

By the expression "optical bundle" is meant a
group of optical fibres or a group of fibres including
at least one optical fibre and at least one non-optical
reinforcing fibre or other reinforcing elongate member.

10 It is an object of the present invention to
provide, for use with an improved electric plug in
accordance with the aforesaid co-pending patent
application, an improved electric socket outlet which,
when said electric plug is connected thereto, will
15 provide both an effective electrical connection and an
optical fibre or bundle joint of satisfactory light
transfer efficiency.

According to the invention, in an electric socket
outlet having at least two socket contacts for reception of
20 two pins of an electric plug, at least one of the socket
contacts has, associated with the socket contact, at least
one optical fibre or optical bundle as hereinbefore defined
which is constrained to lie within, and substantially
parallel to the axis of, the socket contact.

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Preferably, the socket contact or each of the socket contacts having at least one associated optical fibre or optical bundle comprises a circumferentially continuous or discontinuous sleeve of metal or metal alloy of high electrical conductivity and, slidably mounted in the sleeve, a tubular pin which is urged by an associated spring in a direction towards one open end of the sleeve and in which at least one optical fibre or optical bundle protruding from the pin in the opposite direction is so embedded in encapsulating material that the part of the fibre or bundle within the pin lies substantially parallel to the axis of the sleeve.

One contact surface, or each of at least two contact surfaces, of the sleeve of the socket contact preferably has a groove or rib extending substantially parallel to the axis of the sleeve for engagement with a rib or groove on the outer surface of the associated spring-loaded tubular pin and with a rib or groove on an outer surface of a pin of an electric plug, thereby to prevent substantial transverse movement of the tubular pin and of the plug pin with respect to the socket contact. Where the socket contact is to receive a plug pin of substantially rectangular transverse cross-section, preferably the sleeve of the socket contact is of substantially U-shaped

transverse cross-section and has a longitudinally
 extending groove or rib on the inner surface of each of
 the oppositely disposed side walls of the sleeve; in
 this case, the associated spring-loaded tubular pin will
 5 also be of substantially rectangular transverse cross-
 section and will have a rib or groove extending along
 the outer surface of each of its major side walls.

The extreme end face of the or each optical fibre
 or optical bundle in the spring-loaded tubular pin of
 10 the or each socket contact of the electric socket outlet
 may be substantially flush with the open end face of the
 tubular pin in which it is encapsulated or, to reduce
 risk of damage to the end face of the or each optical
 fibre or optical bundle, the extreme end face of the or
 15 each optical fibre or optical bundle may be spaced from
 the free end of the pin. In the latter case, losses due
 to damage, contamination and misalignment of optical
 fibres or optical bundles can be reduced by
 incorporating in the spring-loaded tubular pin of the or
 20 each socket contact, at the optical interface with an
 associated pin of an electric plug, an optical element
 which reduces the risk of damage to the end of the or
 each optical fibre or bundle and/or enlarges the light
 beam or changes its angle of divergence. Suitable
 25 optical elements include quartz windows and lenses.

Where, as is preferred, the improved electric plug in accordance with our aforesaid co-pending patent application is a three pin 13A plug and the earth pin of the plug has at least one throughbore in which is housed
5 an optical fibre or optical bundle, the improved electric socket outlet will have three socket contacts, the earth socket contact being the socket contact having at least one optical fibre or optical bundle constrained to lie within, and substantially parallel to the axis
10 of, the socket contact.

The invention is further illustrated by a description, by way of example, of a preferred 13A electric socket outlet for reception of a 13A three pin electric plug in accordance with our aforesaid co-
15 pending patent application, with reference to the accompanying drawings, in which:-

Figure 1 is a front view of the electric socket outlet;

20 Figure 2 is a side view, partly in section and partly in elevation, of the earth socket contact of the socket outlet with the earth pin of a 13 A three pin electric plug connected thereto;

Figure 3 is a side view of the earth socket contact looking in the direction of the arrow A in Figure 2, and

5 Figure 4 is a transverse cross-section of the earth socket contact taken on the line IV - IV in Figure 2.

Referring to the drawings, the improved electric socket outlet comprises a front plate 1 of electrically insulating material having two line socket contacts 2 and an earth socket contact 3, each of substantially rectangular transverse cross-section, and a switch 4. The front plate has two holes 5 through which fixing screws (not shown) can be screwed to secure the front plate of the electric socket outlet to a supporting surface.

Each of the line socket contacts 2 is of conventional form for receiving a plug pin of substantially rectangular transverse cross-section.

The earth socket contact 3 comprises a sleeve 7 which is made of a metal of high electrical conductivity and which is of substantially U-shaped transverse cross-section. The inner surface of each of the two oppositely disposed side walls of the sleeve 7 has a

longitudinally extending groove 8. Slidably mounted in the sleeve 7 is a tubular pin 9 which is made of a metal of high electrical conductivity and which is of substantially rectangular transverse cross-section. The tubular pin 9 has extending along each of its major side walls a rib 10 which engages in one of the grooves 8 in a side wall of the sleeve 7, thereby preventing substantial transverse movement of the tubular pin with respect to the sleeve. The tubular pin 9 is urged towards one open end 11 of the sleeve 7 by a coil spring 12 which is secured to the base plate (not shown) of the electric socket outlet. The tubular pin 9 is filled with an encapsulating material 14 in which are embedded two optical fibres F which protrude from the end of the tubular pin remote from the open end 11 of the sleeve 7 and which, within the tubular pin, extend substantially parallel to the axis of the sleeve. The end faces of the optical fibres F are substantially flush with the end face of the tubular pin 9 nearer the open end 11 of the sleeve 7.

When an electric plug 15 in accordance with the aforesaid co-pending patent application and having an earth pin 16 housing two optical fibres and having ribs 17 along opposed side faces is inserted into the socket outlet, the earth pin engages in the sleeve 7 of the earth socket contact 3 and abuts the spring-loaded tubular pin 9 of the earth socket contact with the optical fibres of the earth pin in substantial alignment with the optical fibres F of the spring loaded tubular pin, thereby providing both an effective electrical connection and an optical fibre joint of satisfactory light transfer efficiency.

CLAIMS:

1. An electric socket outlet having at least two socket contacts for reception of two pins of an electric plug, wherein at least one of the socket contacts has,
5 associated with the socket contact, at least one optical fibre or optical bundle as hereinbefore defined which is constrained to lie within, and substantially parallel to the axis of, the socket contact.
- 10 2. An electric socket outlet having at least two socket contacts for reception of two pins of an electric plug, wherein at least one of the socket contacts comprises a circumferentially continuous or
15 discontinuous sleeve of metal or metal alloy of high electrical conductivity and, slidably mounted in the sleeve, a tubular pin which is urged by an associated spring in a direction towards one open end of the sleeve and in which at least one optical fibre or optical
20 bundle protruding from the pin in the opposite direction is so embedded in encapsulating material that the part of the fibre or bundle within the pin lies substantially parallel to the axis of the sleeve.
3. An electric socket outlet as claimed in Claim 2,
25 wherein at least one contact surface of the sleeve of the socket contact has a groove or rib extending substantially parallel to the axis of the sleeve for engagement with a rib or groove on the outer surface of the associated spring-loaded tubular pin and with a rib or groove on an outer surface of a pin of an electric plug.



4. An electric socket outlet as claimed in Claim 3, wherein the sleeve of the socket contact is of substantially U-shaped transverse cross-section and has a longitudinally extending groove or rib on the inner surface of each of the oppositely disposed side walls of the sleeve and the associated spring-loaded tubular pin is of substantially rectangular transverse cross-section and has rib or groove extending along the outer surface of each of its major side walls.
5. An electric socket outlet as claimed in any one of Claims 2 to 4, wherein the extreme end face of the or each optical fibre or optical bundle in the spring-loaded tubular pin of the or each socket contact is substantially flush with the open end face of the tubular pin in which it is encapsulated.
6. An electric socket outlet as claimed in any one of Claims 2 to 4, wherein the extreme end face of the or each optical fibre or optical bundle in the spring-loaded tubular pin of the or each socket contact is spaced from the free end of the pin and is optically connected to an optical element secured in said end of the tubular pin.



7. An electric socket outlet as claimed in Claim 6, wherein the optical element is a quartz window or lens.

8. An electric socket outlet as claimed in any one of the preceding Claims, which socket outlet has three socket
5 contacts, the earth socket contact being the socket contact having at least one optical fibre or optical bundle constrained to lie within, and substantially parallel to the axis of, the socket contact.

9. An electric socket outlet substantially as
10 hereinbefore described with reference to and as shown in the accompanying drawings.
