

DESCRIPTION
TWO COMPONENT CASING CONNECTOR

This invention relates to a connector such as an electrical plug.

Electrical plugs, such as 13 amp plugs used in the UK for connecting electrical appliances to the mains power supply, are well known and have been moulded in rubber or polycarbonate. However, there are problems with such conventional plugs because they can be pulled out of a socket by a child, either by pulling on the plug directly or on the cable. This has the danger that the child may be exposed to high voltage live electrical parts, for example if the plug is only partially removed but the pins are still in the socket. Furthermore there is the risk of damage or inconvenience caused by unplugging of equipment, such as a computer, video recorder or refrigerator.

Another problem, for example with plugs made of polycarbonate is that they can be damaged by impact if dropped. Additionally, good quality plugs are usually moulded with an integral connecting cable and a strain relieving part for the cable. This can be difficult to fabricate with certain plug materials. Adding designs to the plug to convey information such as lettering or company logos can increase the complexity and cost of manufacture.

It is an object of the invention to alleviate, at least partially, some of the above problems.

Accordingly, the invention provides a connector comprising:

an inner rigid case; and

an elastically deformable outer layer.

Embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings in which:

Figure 1 is a rear view of a casing of a connector according to the invention;

Figure 2 is a front view of the casing of the connector shown in Figure 1;

Figure 3 shows a connector according to the invention in use;

Figure 4(a) is a rear view of an inner case of a connector according to the invention;

Figure 4(b) is a cross-sectional side view of the inner case of Figure 4(a);
Figure 5 is a rear view of a casing of a connector according to the invention;
and

Figure 6 is a rear view of a casing of a connector according to the invention.

The connector of the invention will be described as embodied in an electrical plug. The plug casing in Figure 1 comprises an inner case 10 and an outer layer 12. For clarity, the internal parts, terminals and pins of the plug are not illustrated. A cavity or blind-hole 14 is provided in the outer layer 12 on both sides of the plug. Each cavity 14 opens onto the rear face of the plug which becomes flush with a surface of a corresponding socket when the plug and socket are mated.

The inner case 10 in this example is made of a polycarbonate material which provides a rigid case for the plug to protect the inner parts and to provide a rugged plug. The outer layer 12 is made of a soft elastomer material. This acts as a protective covering to avoid damage to the hard polycarbonate case in an impact, such as if the plug is dropped on the floor. The elastomer material feels soft to the touch which gives aesthetic appeal to the product.

Figure 2 shows a front view of the plug. The soft elastomer outer layer 12 covers the majority of the plug in this view. Indicia 16, such as lettering or logos, can be provided on the plug and will be described in greater detail later.

Figure 3 shows the plug being inserted into a socket. If a light pressure is exerted on the sides 18 of the plug, they deform and some air is expelled from the cavities 14. The pressure of a normal hand grip is adequate because the cavities 14 are formed in the soft outer layer 12. The rigid inner case 10 protects the inside of the plug from deformation and provides a support against which the sides 18 of the plug can be squeezed. When the plug is fully inserted in the socket with the full squeezing effect still maintained, and then the pressure on the sides of the plug is released, the sides of the plug try to return to their original shape due to the resilience of the layer 12. This creates a reduced pressure inside the cavities 14 which creates a suction force by which the plug is held against the surface of the socket 20. The material of the soft outer layer 12 can form a good seal against the surface 20.

With the plug inserted in this way and held firmly against the socket, the

danger of it being unplugged easily by a child is prevented.

To release the plug, the reverse of the procedure for insertion is followed, that is a pressure is exerted on the sides 18 of the plug to relieve the suction/reduced pressure of the cavities 14, and then the plug can be unplugged as normal. This would be difficult for a child to do because it requires the plug to be grasped across its full width and a force to be exerted on both sides at the same time as pulling it out of the socket.

The two-component construction of the plug casing also has the advantage that it enables the appearance of the plug to be enhanced. One simple way of doing this is to make the inner case 10 and the outer layer 12 in different coloured materials. Another way is to mould a design in the front surface of the inner case which is then apparent as surface relief on the front of the outer layer 12. Preferably, as shown in Figure 2, a raised pattern such as lettering or a logo 16 on the front face of the inner case 10 projects through the outer layer 12. The design 16 is particularly noticeable if the materials of the inner case 10 and outer layer 12 are of different tones or contrasting colours.

In a further enhancement, if the design 16 on the inner case 10 which projects through the outer layer 12 is translucent and a lamp is provided within the plug, the design, lettering, or logo 16 can be illuminated. The illumination can be provided without compromising the integrity of the plug front casing and without extra manufacturing steps being required for the casing.

The front casing of the plug according to the invention can be manufactured at low cost using a multi-component injection moulding process. Firstly, the inner hard casing 10 of polycarbonate material, such as shown in Figures 4(a) and 4(b) is moulded. This moulding can include internal features of the casing, such as partitions for the assembled plug and also any design 16. The outer layer is then moulded as an elastomer "skin" over the first moulding in a process known as "over-moulding". Figure 5 illustrates the case 10 with the over-moulded layer 12. The cavities 14 can be formed easily in the second moulding by means of mould-cores.

A cable strain relief part 22 can be integrally moulded with the elastomer outer layer 12 as shown in Figure 6.

The completed front casing can be manufactured in a single work cycle and is then ready for assembly with the remaining parts to form the finished plug.

More than one cavity 14 can be provided on each side of the plug, as illustrated. They could all be used to provide suction to increase the force with which the plug is fixed to the socket, alternatively, the extra cavities make the outer layer 12 of the plug more flexible so that it can be squeezed more easily.

Although the invention has been described in relation to an electrical plug, it could of course be used in any other suitable connector.



CLAIMS

1. A connector comprising:
an inner rigid case; and
an elastically deformable outer layer.
2. A connector according to claim 1, wherein portions of said rigid case protrude through said elastically deformable material to define a design.
3. A connector according to claim 1 or 2, wherein said rigid case comprises a polycarbonate material.
4. A connector according to any one of the preceding claims, wherein said elastically deformable material comprises an elastomer.
5. A connector according to any one of the preceding claims, which is an electrical plug.
6. A method of producing a connector comprising the steps of:
moulding an inner rigid body; and
over-moulding an elastically deformable material around said rigid body.
7. A method according to claim 6, wherein at least one mould core is used to form at least one cavity in said elastically deformable material.
8. A method substantially as described herein with reference to Figures 1 to 6 of the accompanying drawings.