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(12) # EUROPEAN PATENT APPLICATION

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(54) **Electrical connectors.**

(57) An electrical connector comprises an insulating body formed from a thermoplastic material with at least one spring contact retainer secured in a hole formed through the body. The spring contact retainer is secured by applying heat to the surface of the body surrounding the hole, after insertion of the spring contact retainer, whereby the thermoplastic material melts and flows around the end of the spring contact retainer.

The heat is preferably produced by pressing a shaped tool against the body and creating relative ultrasonic vibrations between the tool and the body.

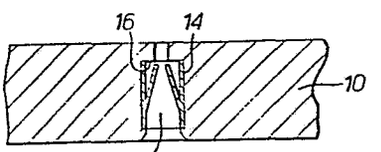

FIG. 1.

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ELECTRICAL CONNECTORS

This invention relates to electrical connectors of the kind consisting of an insulating body in which are located a number of electrical contacts, each electrical contact being held in the insulating body by a spring contact retainer.

Each spring contact retainer must be retained in the insulating body and provide a stipulated contact retention force to permit the contacts to be replaced when necessary, but hold the contacts securely during normal use of the connector. This can be achieved by various methods such as by forming an undercut hole in the body using a soluble core, and inserting a partially deformed cylindrical retainer into the undercut hole until it can adopt its normal undeformed shape. Another method is to force a retainer into an open cored hole in a plastics insulating body, the retainer having external protrusions which penetrate the wall of the hole and prevent its removal.

It is an object of the present invention to provide an electrical connector in which one or more spring contact retainers are retained in the insulating body by a quicker and more economic method.

According to the present invention an electrical

connector comprises an insulating body formed from a thermoplastic material and at least one spring contact retainer secured in a hole formed therein, the spring contact retainer being secured by applying heat to the surface of the body surrounding the hole, after insertion of the spring contact retainer, whereby the thermoplastic material melts and flows around the end of the spring contact retainer.

Preferably the spring contact retainer is secured after insertion into the body by applying a tool to the surface of the body surrounding the end of the hole with a predetermined pressure and applying relative vibration therebetween, whereby the thermoplastic material melts and flows around the end of the spring contact retainer.

Preferably the hole extends through the body and one end of the spring contact retainer abuts a shoulder formed in the hole.

Preferably the relative vibration between the tool and the body is ultrasonic.

The body is preferably pressed against a stationary tool by a member adapted to apply a predetermined static force and to apply ultrasonic vibrations to the body.

An embodiment of the invention will now be described by way of example only with reference to the accompanying drawings in which

Figure 1 is a cross-sectional view of part of an electrical connector made in accordance with the invention,

Figure 2 is a cross-sectional view of part of a body and contact retainer assembly resting on a tool fixture,

Figure 3 illustrates a method of applying pressure and vibrations to the assembly shown in Figure 2 and

Figure 4 is a view of apparatus for performing the method shown in Figure 3.

The electrical connector shown in Figure 1 comprises a thermoplastics body 10 having a hole 12 therethrough in which is secured a spring contact retainer 14. The hole 12 is formed with a shoulder 16 which the end of the contact retainer 14 abuts, the other end of the contact retainer being held in position by the material of the body which has been heated to melting point and allowed to flow around the end of the contact retainer.

One method of performing this operation is illustrated in Figures 2, 3 and 4. The spring contact retainer is inserted into the hole 12 and the body 10 placed over a shaped tool 18 which is mounted on a fixture 20. The end of the hole 12 may be surrounded by a raised annulus 26 to increase the quantity of material around the end of the contact retainer 14. A welding horn 22 is brought into contact with the body 10 and a predetermined

static force applied together with ultrasonic vibrations of the horn. The ultrasonic vibrations are used to generate heat by causing the area of the body around the hole 12 to vibrate against the tool 18. Frictional heat is released and transmitted within a fraction of a second to cause the thermoplastic material 24 to melt and flow. The combination of force and heat causes the material 24 to flow behind and around the contact retainer 14 and hence, when it sets, permanently retains the contact retainer in position.

Whilst the fitting of only one contact retainer 14 in position has been described and shown in Figures 1 to 3, the body 10 may have a number of such contact retainers. All the retainers can be simultaneously secured in position using the method with a tool fixture 20 with a similar number of tools 18 as shown in Figure 4.

CLAIMS:

1. An electrical connector comprising an insulating body formed from a thermoplastic material and at least one spring contact retainer secured in a hole formed therein, the spring contact retainer being secured by applying heat to the surface of the body surrounding the hole, after insertion of the spring contact retainer, whereby the thermoplastic material melts and flows around the end of the spring contact retainer.

2. An electrical connector as claimed in claim 1 in which the spring contact retainer is secured, after insertion into the body, by applying a tool to the surface of the body surrounding the end of the hole with a predetermined pressure and applying relative vibration therebetween, whereby the thermoplastic material melts and flows around the end of the spring contact retainer.

3. An electrical connector as claimed in claim 1 or claim 2 in which the hole extends through the body and one end of the spring contact retainer abuts a shoulder formed in the hole.

4. An electrical connector as claimed in claims 2 or 3

in which the relative vibration between the tool and the body is ultrasonic.

5. An electrical connector as claimed in claim 4 in which the body is pressed against a stationary tool by a member adapted to apply a predetermined static force and to apply ultrasonic vibrations to the body.

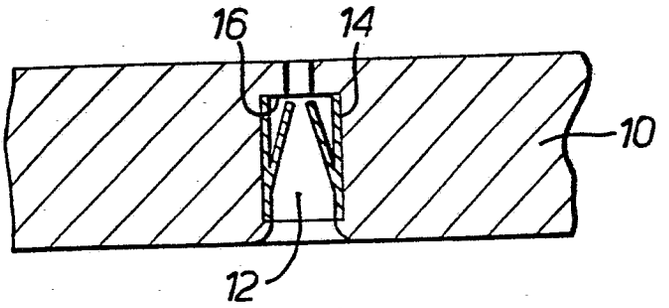

FIG. 1.

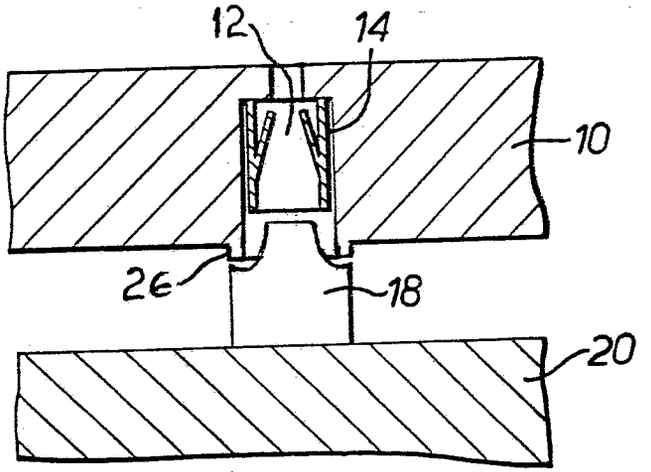

FIG. 2.

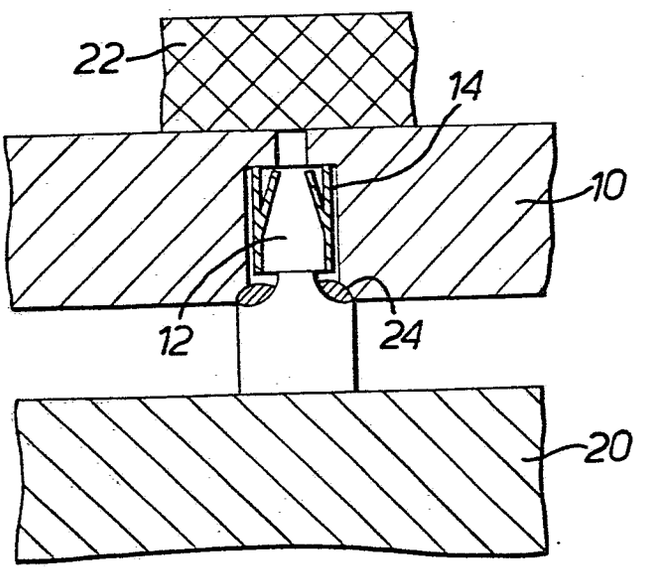

FIG. 3.

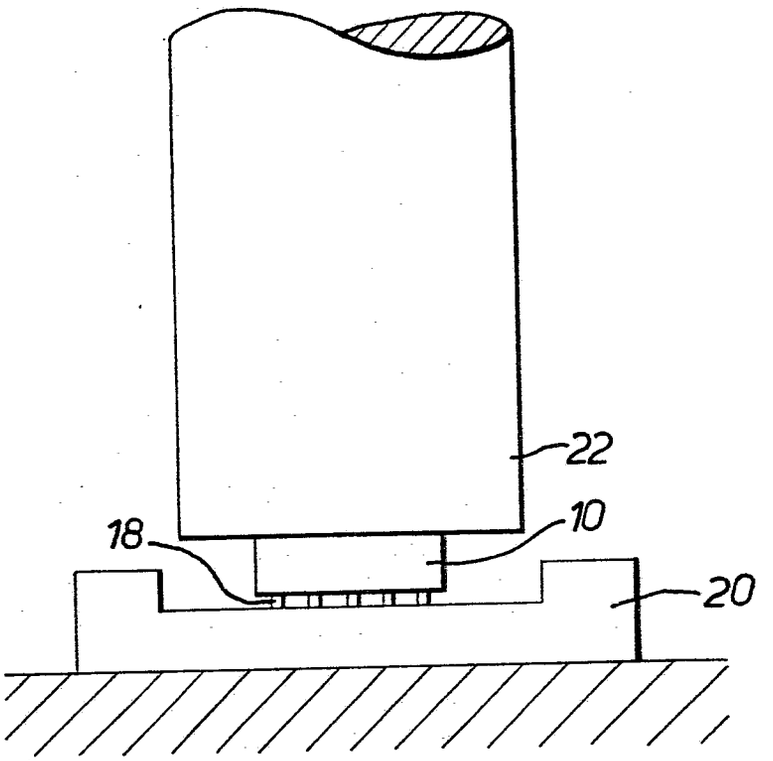

FIG.4.