Aug. 6, 1968 I. S. PAYNE 3,396,313

PLUG AND SOCKET FOR THE MOUNTING OF AN ASSEMBLY OF ELECTRICAL COMPONENTS

Filed Sept. 23, 1966

Fig. 1.

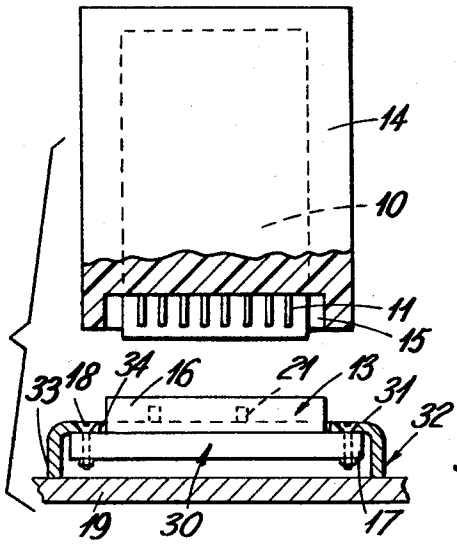


Fig. 2.

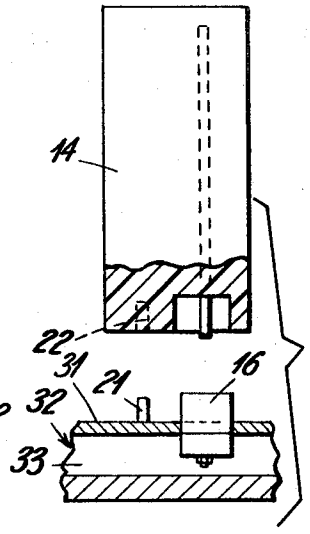


Fig. 3.

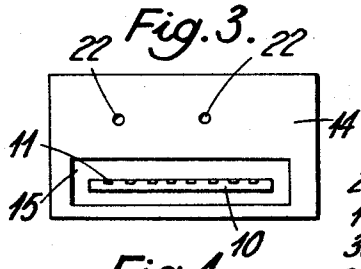


Fig. 4.

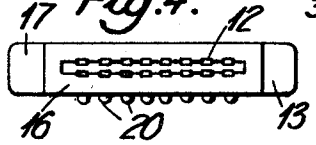
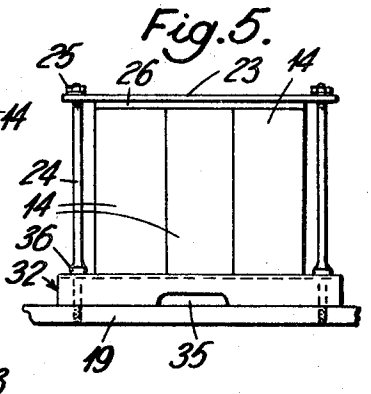


Fig. 5.



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3,396,313

PLUG AND SOCKET FOR THE MOUNTING OF AN ASSEMBLY OF ELECTRICAL COMPONENTS

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3 Claims. (Cl. 317—101)

ABSTRACT OF THE DISCLOSURE

A unit comprising an assembly of electrical components has along one edge a row of plug contacts of strip form and a portion adjacent the said edge encapsulated in a body of insulating material from which the plug contacts project, which body provides an integral open-mouthed hollow casing surrounding the plug contacts and extending for a depth at least equal to the amount by which the plug contacts project from the body, in combination with a multi-contact edge connector having socket contacts which interengage with the plug contacts of the unit, the body of the connector being a sliding fit along both sides of the row of interengaging contacts within the open mouth of the integral hollow casing of the unit.

This invention relates to the mounting of electrical components.

According to the invention an assembly of electrical components are held together to form, as a separable unit, at least part of an electrical circuit, which unit has along one edge a multiplicity of plug contacts (or sockets) for engagement with the sockets (or contacts) of a multi-contact connector and has at least a portion, adjacent the said edge having the contacts (or sockets), encapsulated in a body of insulating material which is arranged, when the contacts (or sockets) are in engagement with the sockets (or contacts) of a connector, to co-operate with the body of the connector to support the unit whereby the contacts (or sockets) are relieved of this function.

In one form of the invention the components are mounted on a carrier, e.g. a printed circuit board and the encapsulation preferably surrounds all the electrical components and the carrier.

In another form of the invention the components are mounted in a box or other housing, which housing is at least partially filled with encapsulating material whereby at least the said portion adjacent the edge having the contacts (or sockets) is encapsulated in a body of insulating material. In the case of the unit being provided with plug contacts, the contacts may be strip or pin contacts.

The said encapsulating body preferably provides an open-mouthed hollow casing surrounding the contacts (or sockets) which casing is capable of housing at least part of the connector and forming a sliding-fit therewith, the casing and the connector being designed so that the said part of the connector is received within the casing before the contacts (or sockets) are fully engaged with the sockets (or contacts) of the connector.

By this construction a bending force applied to the unit or to the connector will be resisted by the joint between the said casing and the part of the connector housed therein and not by the contacts or sockets. Such a construction is therefore of advantage when vibration or knocking of the unit is likely to take place during manufacture, installation or use of the unit.

The invention also includes an assembly, as aforesaid, in combination with a connector having a multiplicity of sockets (or contacts) for reception of the contacts (or sockets) of the unit and having a body which co-operates with the encapsulated body portion of the unit to support the unit.

Means may be provided whereby the unit and the connector can only be assembled in one predetermined manner. Such means may conveniently comprise at least one interlocking pin and socket which pin is designed for engagement in the socket when the connector and the unit are in their predetermined assembly positions, the pin being associated with the connector and the socket with the encapsulated casing or vice versa.

By way of example, a specific embodiment of the invention will now be described with reference to the accompanying drawings in which:

FIGURE 1 is an exploded elevation, partly in section, of a unit and associated socket connector;

FIGURE 2 is an end elevation, partly in section, of the unit and socket connector as shown in FIGURE 1;

FIGURE 3 is an underplan of the unit shown in FIGURES 1 and 2;

FIGURE 4 is a top plan of the socket connector shown in FIGURES 1 and 2; and

FIGURE 5 is an elevation of three sets of unit and socket connector mounted on the same mounting plate.

With reference to FIGURES 1 to 4, the unit includes a carrier which in this example is a printed circuit board **10**, which board is designed for use in the electrical equipment of an industrial truck. The invention is, of course, not limited thereto but in such a case the printed circuit board is subjected to vibration and knocking during manufacture or installation and during use of the truck and is therefore much improved by use of the invention.

The printed circuit board **10** is provided with a multiplicity of strip contacts **11** for engagement in the spring sockets **12** of a multi-contact socket connector **13**.

The printed circuit board **10** and all of the electrical elements attached thereto are moulded in a rigid encapsulation **14**, which encapsulation, at the end of the board adjacent the contacts **11**, is formed to provide a rectangular hollow open-mouthed casing or recess **15** which surrounds the strip contacts **11**. The walls of the casing are also spaced from the printed circuit board **10** and the strip contacts **11** so that the casing will surround or house an upstanding portion **16** of the connector **13**, which portion **16** houses the spring contacts **12**. The dimensions of the casing **15** and the portion **16** of the connector **13** are such that, in use, the portion **16** is a sliding-fit therein and the depth of the casing is such that the portion **16** is fully inserted therein before the strip contacts **11** are fully inserted in the spring contacts **12**. Any bending force applied to the board **10**, and thus to the casing **15**, or the connector **13** will thus be resisted by the joint therebetween and not by the strip contacts **11**.

The connector **13** is provided with a base **30** which, at each end, protrudes beyond the portion **16** of the connector. In this example, the connector is mounted in position by securing (by countersunk screws **18**) each protruding end **17** of the connector base to the underside of the base **31** of an upturned channel-shaped plate **32**, the base **31** being provided with an opening **34** through which the portion **16** of the connector can pass. The arms **33** of the plate **32** are secured to a mounting plate **19** which plate **19** is in turn rigidly mounted to the chassis of the truck. The upper surface of the base **31** of the plate **32** which surrounds the opening **34** serves to limit the insertion of the portion **16** of the connector into the casing **15** of the board.

Each of the spring contacts **12** of the connector is also provided with a connector tag **20** for connecting the contact to an external circuit.

Locating means are provided so that the board **10** and the connector **13** can only be assembled in a predeter-

mined manner, which means comprise a pair of pins **21** mounted on the upper surface of the base **31** of the plate **32** for engagement in two holes **22** in the underside of the encapsulation **14**. Other positions for the pins and their associated holes may be used for further boards. Also, the pins may project from the encapsulation **14** for reception in holes in the base **31** of the plate **32**.

If desired, the board **10** may be provided with an encapsulation **14** of such a colour that is distinctive to its desired position or to its particular arrangement of the locating pins.

With regard to FIGURE 5, three encapsulated boards are mounted together on the same mounting plate **19**. For additional support, the boards are clamped to the mounting plate **19** by a metal scrap **23** and bolts **24**, which bolts, in this example, are provided with shoulders **36** which secure the plate **32** to the mounting plate **19**. A strip of rubber **26** is located underneath the strap **23** to avoid damage to the boards when the nuts **25** on the bolts **24** are tightened. Alternatively the metal strap **23** and bolts **24** may be replaced by a box, e.g. of plastic, which encases the upstanding portions of the three boards **10** and which is secured to the mounting plate **19** by, for example, spring clips. It will be noticed that each of the three boards is supported on a single channel-shaped plate **32**, which plate has three openings **34** in its base through which pass the upstanding portions **16** of the three connectors. Each board is also moulded in an encapsulation of a different colour, the colour of the encapsulation determining the position of the board on the mounting plate **19**. The plate **32** is provided with a cable entry **35** for the wires passing to the tags **20** of the connectors.

It will be appreciated that the construction of the casing or recess **15** of this example is such that it surrounds the full length of the strip contacts **11** of the board **10** and thereby protects the contacts from damage before assembly.

It is also to be appreciated that the invention is not restricted to a printed circuit board mounted in the manner described but also includes other carriers mounted in this way. The invention further includes an assembly in accordance with the invention manufactured by mounting one or more electrical components in a box and then filling the box with encapsulating material.

The invention also includes an assembly in which the sockets are provided by the unit and the contacts are provided by the connector.

I claim:

1. An assembly of electrical components held together, as a unit by encapsulation in a body of insulating material, which unit has along one edge a row of plug contacts of strip form, the said plug contacts projecting from said body, said encapsulating body providing an open-mouthed hollow casing surrounding the plug contacts which casing is integral with the encapsulating body and extends for a depth at least equal to the amount by which the plug contacts project from the body, the unit being provided in combination with a multi-contact edge connector having a corresponding row of socket contacts held in a body and interengaged with the plug contacts of the unit, the body of the edge connector being a sliding fit along both sides of the row of interengaging contacts within the open mouth of the said integral hollow casing of the unit.

2. An assembly as claimed in claim **1** in which the length by which each plug contact projects from the encapsulating body is less than the depth of the associated socket contact of the edge connector.

3. An assembly as claimed in claim **1** in which the said electrical components are mounted on a carrier and connected together by a printed circuit on the carrier, the carrier projecting into the said hollow casing and supporting the plug contacts which extend from and form part of the printed circuit.

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