

PIN-HEADER

This invention relates to an electrical connector or a pin-header for use in modern business machine, computer equipment and the like and, in particular, a pin-header to be mounted within an airtight sealed casing.

A pin-header of such an internal mount type comprises a housing having metal pins extending therethrough.

The melting point of insulating plastics of which the housing of the pin-header is made is generally equal to, or lower than the soldering temperature. For this reason, care has to be taken to prevent a slippage of the pins from the housing resulting from heat upon soldering. Further, it is necessary to prevent an inflow of a flux which is used upon soldering into an area of contact with one of the pins.

As to the internal mount type connector, an airtight seal connection type is known which has to strictly prevent temperature, humidity and so on from intruding from outside. This type of connector is used to make connection, for example, between a printed-circuit board sealed in a casing, such as a disc drive unit in a modern business machine or a computer equipment and an external power supply unit or a single processing

unit.

In the pin-header of this type an effective airtight seal is required at those insertion holes of a housing where associated pins are held relative to the housing.

Conventionally, there is a high demand for a pin-header which satisfies all the mounting requirements or manufacturing requirements as set out above. In order to satisfy these requirements, it is known for the pin-header to comprise a housing having insertion holes for the pins and molded as such with the use of a thermoplastic resin. The pins are inserted through the holes and a resin sealant is introduced between the internal wall surface of each insertion hole and the outer peripheral surface of the associated pin so as to prevent defective contact resulting from the inflow of a flux into that contact area upon soldering.

This method offers no effective solution to the aforementioned problem because it is not possible to prevent a slippage of the pin out of the insertion hole or to prevent intrusion of temperature, humidity, dirt, etc., in to the insertion hole. It is, therefore, not yet possible to provide a connector satisfying all the requirements as already set out above.

Further, there is also a demand for an internal mount type pin-header which can be made lower in manufacturing cost while solving the aforementioned

problems.

It is accordingly the object of the invention to provide an electrical connector or pin-header which can solve its mounting and manufacturing problems, that is, prevent a slippage of a pin out of its housing resulting from heat upon soldering and prevent defective contact resulting from the inflow of a flux into a pin area upon soldering and can ensure a high airtight seal yet with a reduced manufacturing cost.

According to one aspect of the invention, an electrical connector or pin-header comprises an insulating housing having opposed surfaces defined by peripheral edges of the housing holes extending between the opposed surfaces and conductive pins extending through the holes; characterised in that one of the surfaces of the housing is defined by a first recess within the peripheral edge of the one surface, each hole has an enlarged second recess around the associate pin leading to the one surface and the first and second recesses are filled with an insulating resin.

According to an embodiment of the invention, the horizontal cross-sectional area of each hole is greater at least near the one surface of the housing than the horizontal cross-sectional area of the conductive pin, so as to form the second recess.

In another aspect the invention provides an electrical connector or pin-header comprising a housing of insulating material having first and second surfaces, said first surface having a peripheral edge defining a recessed

portion of said first surface, said first surface serving for mounting with a mounting member for connection to a printed circuit board, said housing further having a plurality of holes or apertures formed in said recessed portion of said first surface and extending to said second surface, each said aperture being adapted to receive an electrically conductive pin terminal which extends through said aperture and has ends extending from said first and second surfaces, a part of each said aperture formed near said first surface having a larger cross section than the remainder of said aperture, said part also having at least a portion of its walls tapered to decrease said cross section as said walls extend away from said first surface, and an insulating resin disposed in said recessed portion of said first surface and in the parts of the aperture formed in said first surface so that when heated, said resin flows and fills the tapered wall portion of each aperture thereby acting as a sealant around each pin terminal.

Since the insulating resin fills the first recess of the housing, there is no possibility that the insulating resin will overflow out of the housing. Further, the insulating resin also fills in all the second recesses around the pins and the heat transmission from the pin to the housing, for example, upon soldering is suppressed with the presence of the insulating resin.

This invention can be more fully understood from

the following detailed description of an embodiment when taken in conjunction with the accompanying drawings, in which:

Figure 1 is a perspective view showing a pin-header made in accordance with the invention

Figure 2 is a perspective view in cross-section showing a major portion of the pin-header of Fig. 1; and

Figure 3 is a perspective view showing the pin-header with the recess and relief around the pins filled with a sealant.

Figure 1 shows a pin-header having an insulated housing 11 having conductive pins 12 extending through opposed surface of the housing 11.

The insulating housing 11 is formed, as a molded body, using a thermoplastic insulating resin, such as PBT (polybutylene-terephthalate), nylon, PPS (polyphenylene sulfide) and PET (polyethylene-terephthalate). A flange 13 is provided on the outer peripheral edge of the housing 11 such that it extends in a direction perpendicular to the length of the pin 12. When the pin-header 10 is fitted into an associated mating area of a mount member on the "casing" side so that connection is made to a printed board (not shown) in the airtight sealed casing, the flange 13 cooperates with the mount member to provide airtight seal with the casing.

A pin holding section 14 is provided at the central area of the housing 11. The section 14 is

provided with a plurality of insertion holes 16 provided at its predetermined places to correspond to the pins 12. the pin holding section 14 is formed as a recess 15 of a predetermined depth as measured from the top surface of the flange 13. The recess 15 is defined by the peripheral edge, that is, the flange 13.

Each pin or post 12 is made of brass plated will, for example, tin or gold. The pins 12 are inserted into the corresponding insertion holes 16 in the pin holding section 14 and fitted in place. In the neighbourhood of the surface of the housing 11, forming the bottom of the recess 15 the open end portion of each insertion hole 16 is made greater in cross-sectional area than the associated pin 12.

In this way, a further recess or relief 17 is formed in the inner wall surface portion of each insertion hole 16. Each recess 17 provides a space extending in the longitudinal direction of the pin 12 at an area between the inner wall surface of the insertion hole 16 and the outer peripheral surface of the pin 12.

Figure 2 shows, in more detail, the structure of the pin-header 10 shown in Figure 1. As shown in Figure 2, the inner wall surface of the recess 17 of each insertion hole 16 in the housing 11 is tapered from the bottom surface of the recess 15 toward that area where the pin 12 is fitted in place by a compression force acting inside the through hole 16.

The spacing between the outer peripheral surface of the pin 12 and the inner wall surface of the insertion hole 16 is so dimensioned that it can adequately accommodate the difference in expansion coefficient between the pin 12 and housing 11 resulting from heat upon soldering during the introduction and filling of sealant as will be set forth below and/or resulting from heat generated in the connection through conductive transfer from the printed-circuit board to the pins 12. The spacing has to be determined, taking into consideration the material of the pin 12 as well as the hosing properties of the insulating material of the housing 11, in particular, its expansion properties involved by heat, water or humidity absorption.

In the pin-header 10 as shown in Figures 1 and 2, a resin excellent in dimensional stability and heat-resistance, such as an acrylate epoxy urethane resin commercially available under a trade name of Quik-Cure manufactured by E.I. Du Pont de Nemours & Co., is introduced as a filling sealant 18 in to the recess 15 and in to the recesses 17 as shown in Figure 3.

The sealant 18 is fully and positively flowed into the recess 17 defined between the outer peripheral surface of each pin 12 and inner wall surface of the insertion hole 16.

A satisfactory solution to this requirement is to

perform the process of a flow of the sealant 18 by causing a negative pressure to occur in a suction direction upon the manufacture of the pin-header 10 to allow the sealant 18 positively filled in the recess 15,17 it is heated and cured. As to the method of heating, the pin-header 10 with the sealant 18 flowed as set out above can be passed through an oven where the sealant is exposed to, for example, ultraviolet radiation.

Although, in the aforementioned embodiment, an acrylate epoxy urethane resin has been explained as being used as the sealant 18, the present invention is not restricted thereto. For example, use can be made, as the sealant, of not only acrylate epoxy urethane resin but also an acrylic resin (thermoplastic resin), epoxy resin, urethane resin (thermosetting resin) or a mixture thereof or silicone, etc.

It is desirable from the standpoint of manufacturing that resin used as the sealant 18 be cured for a brief period of time under a relatively low temperature. It is also desirable to use a resin material excellent in dimensional stability against the temperature, humidity or other environmental variations.

With the pin-header of the present invention, the recess 15 can be filled with an insulating resin and insulating resin does not overflow from the housing 11. Hence, defective contact with the pins 12 can be avoided.

Further, in the interior of each insertion hole 16 the recess 17 is provided over an area between the inner wall surface of the hole 16 and the outer peripheral surface of the pin 12 is filled with the insulating resin. As a result a high airtight seal is maintained at the area of the hole 16 and the transmission of heat from the pin 12 to the housing upon, for example, by soldering is inhibited by the insulating resin, preventing a slippage of the pin contact out of the housing 11.

Further, the insulator 11 can be a one-piece molding formed with the recesses 17 of each through hole 16 and the recess 15. Thus a resultant connector is easier to manufacture and low in manufacturing cost.



CLAIMS

1. An electrical connector or pin-header comprising an insulating housing having opposed surfaces defined by peripheral edges of the housing, holes extending between the opposed surfaces and conductive pins extending through the holes; characterised in that one of the surfaces of the housing is defined by a first recess within the peripheral edge of the one surface, each hole has an enlarged second recess around the associate pin leading to the one surface and the first and second recesses are filled with an insulating resin.

2. An electrical connector or pin-header comprising a housing of insulating material having first and second surfaces, said first surface having a peripheral edge defining a recessed portion of said first surface, said first surface serving for mounting with a mounting member for connection to a printed circuit board, said housing further having a plurality of holes or apertures formed in said recessed portion of said first surface and extending to said second surface, each said aperture being adapted to receive an electrically conductive pin terminal which extends through said aperture and has ends extending from said first and second surfaces, a part of each said aperture formed near said first surface having a larger cross section than the remainder of said aperture, said part also having at least a portion of its

walls tapered to decrease said cross section as said walls extend away from said first surface, and an insulating resin disposed in said recessed portion of said first surface and in the parts of the aperture formed in said first surface so that when heated, said resin flows and fills the tapered wall portion of each aperture thereby acting as a sealant around each pin terminal.

3. An electrical connector or pin-header according to claim 1, wherein the horizontal cross-sectional area of each hole is greater at least near the one surface of the housing than the horizontal cross-sectional area of the conductive pin, so as to form the second recess.

4. An electrical connector or pin-header according to claim 1, 2 or 3 wherein the resin is an acrylate epoxy urethane resin, an acrylic resin, an epoxy resin, a urethane resin or a mixture thereof.

5. An electrical connector or pin-header, substantially as hereinbefore described with reference to Figures 1 to 3 of the accompanying drawings.