(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 237 679**
A2

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **86309664.0**

(51) Int. Cl.[4]: **G01R 1/073**

(22) Date of filing: **11.12.86**

(30) Priority: **17.03.86 US 840261**

(43) Date of publication of application:
23.09.87 Bulletin 87/39

(84) Designated Contracting States:
DE FR GB IT NL

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(54) Probe heads.

(57) A probe head for connecting an electronic instrument to an electronic system comprises a retainer member made of dielectric material and having first and second generally parallel main faces and an outer peripheral surface that extends from the second main face towards the first main face. The probe head also comprises a plurality of generally cylindrical pins of conductive material attached to the retainer member and extending generally perpendicular to the main faces. The pins are exposed at the outer peripheral surface of the retainer member. Upon engagement of the probe head with a receptable that defines a cavity that is bounded laterally by an internal peripheral surface and has terminals distributed about its internal peripheral surface and presented towards the cavity, electrical connection is made between the terminals of the receptacle and the pins of the probe head.

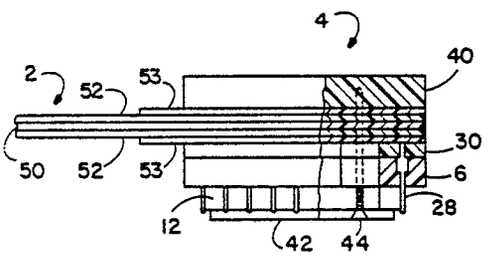

FIG. 1

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PROBE HEADS

This invention relates to probe heads.

Background of the Invention

In order to enable development of software for a microprocessor-based product, it is conventional to use an emulator that is connected to the product in place of the target microprocessor. The emulator communicates with the product under development over a probe cable that terminates in a probe head that is fitted into the microprocessor receptacle of the product under development.

In designing a probe head for use at the termination of an emulator cable, it is usual to duplicate as closely as possible the exact contact geometry of the microprocessor that is emulated. In the case of some microprocessors, such as the quad pack version of the Motorola M68HC11A8, however, this implies the use of costly production tooling. This arises because the quad pack employs a JEDEC standard package, having generally square form with terminals extending over the peripheral surface of the package, and the terminals have multiple bends.

Summary of the Invention

A preferred probe head embodying the present invention comprises a retainer member of dielectric material having first and second generally parallel main faces and a peripheral surface that joins the main faces. The probe head also comprises a plurality of generally cylindrical pins of conductive material secured to the retainer member and extending generally perpendicular to the main faces. The pins are exposed at the peripheral surface of the retainer member. When the probe head is engaged with a receptacle defining a cavity that is bounded laterally by an internal peripheral surface and has terminals distributed about its internal peripheral surface, electrical connection is made between the terminals of the receptacle and the pins of the probe head.

Brief Description of the Drawings

For a better understanding of the invention, and to show how the same may be carried into effect, reference will now be made, by way of example, to the accompanying drawings in which:

FIG. 1 is a side view, partly in section and partly in elevation, of a probe head,

FIG. 2 is a partly cut away plan view of the probe head shown in FIG. 1,

FIG. 3 is a side view to an enlarged scale, partly in section and partly in elevation, of a component of the probe head at an early stage in fabrication thereof,

FIGS. 4 and 5 are partial views in section of the FIG. 3 component at successive stages in fabrication, and

FIG. 6 is a partial bottom plan view of the FIG. 3 component.

Detailed Description

FIG. 1 illustrates a probe cable 2 which is connected at one end to a microprocessor emulator (not shown) and carries a probe head 4 at its other end. The probe head 4 is designed to fit the receptacle for a JEDEC package of the kind that is generally rectangular in plan view and has terminals distributed about the peripheral surface that joins the two opposite main faces of the package.

The probe head 4 comprises a pin retainer 6 of generally square shape. The pin retainer is made from a block 10 (FIG. 3) of plastic material, such as ABS, that is selected for its machinability. The block is generally square in plan view. Counterbored holes 14 are drilled from the upper surface 8 of the block 10. The holes are distributed over the upper surface 8 along a closed path 16 of square configuration. After drilling the holes, the block 10 is machined to remove a material around the periphery of the lower surface of the block so as to form a plinth 12 that is square in overall cross-sectional form but is smaller in cross-sectional area than the upper portion of the block. The length of each side of the square-section plinth is about equal to the distance between two opposite sides of the square path 16 along which the counterbored holes 14 are distributed, minus a distance that is a small part of the diameter of the narrow portion of the hole. Therefore, the holes open to the shoulder surface 18 that surrounds the plinth 12, and the plinth has sector-section channels 19 extending from the shoulder surface 18 to the lower surface of the plinth. Material is also removed by machining from inside the area bonded by the square path to form a hole 20 through the block 10.

Pins 28 are inserted in the holes 14. Each pin 28 has a lower shank portion 22, a head portion 24 and an enlarged diameter portion 26 between the shank portion and the head portion. The diameter of the shank portion is such that it fits snugly in the smaller diameter portion of one of the holes 14.

The bottom of the enlarged diameter portion 26 engages the bottom of the counterbored portion of the hole 14 and prevents the pin from passing right through the hole 14.

A bushing 30 of dielectric material formed with holes 32 is fitted over the pin retainer 6, and the head portions 24 of the pins 28 extend upwardly through the holes 32 respectively. The bushing 30 is formed with a central hole 24 of the same configuration as the hole 20 of the pin retainer 6.

The flexible circuit 2 comprises a substrate 50 of polyimide having conductor runs 36 of copper formed thereon. Cover sheets 52 and 53 cover the conductor runs and reinforce the flexible circuit in the vicinity of the probe head. The cover sheets 52 may be made of the material sold under the trademark TEFLON FEP, and the cover sheets 53 may be of polyimide. The conductor runs 36 terminate in contact pads 38 that are exposed on both sides of the substrate and are connected with plated through holes in the substrate. The layout of the contact pads 38 corresponds to the arrangement of the head portions 24 of the pins 28. The head portions of the pins are soldered to the contact pads 38 respectively. Top and bottom covers 40 and 42 are attached using screws 44 that pass upwardly through the bottom cover 42, the pin retainer 6, the bushing 30 and the flexible circuit 2 and engage holes in the top cover 40.

The bottom cover 42 is square and is somewhat smaller than the plinth 12. The plinth 12 is sized to fit in a standard JEDEC receptacle (not shown), and the positions of the holes 14 are such that the pins 28 contact the terminals at the inner periphe ral surface of the receptacle. As is known, the JEDEC receptacle has a keying formation in one corner. The plinth is correspondingly chamferred at one corner, as shown at 32 in FIG. 6. Therefore, the plinth can be inserted in the receptacle in only one angular position. Because the top cover 40 is connected to the pin retainer 6 by the screws 44, the top cover facilitates handling of the pin retainer and the flexible circuit without stressing the solder joints between the flexible circuit and the pins.

The holes 20 and 34 in the pin retainer and the bushing form a cavity that may be used to accommodate electronic components (not shown) that are connected to conductor runs of the flexible circuit.

It will be appreciated that the present invention is not restricted to the particular embodiment that has been described and illustrated, and that variations may be made therein without departing from the scope of the invention as defined in the appended claims and equivalents thereof. For example, although in the case of the illustrated probe head, the pins are attached to the pin retainer by virtue of their shank portions being inserted through the holes 14, the pin retainer could be molded about the pins or the pins could be inserted into the pin retainer ultrasonically. The present invention is not restricted to any particular configuration of the pin retainer or any particular arrangement of pins.

Claims

1. A probe head for use in connecting an electronic instrument to an electronic system that has a receptacle for receiving a multiple terminal electronic component, which receptacle defines a cavity that is bounded laterally by an internal peripheral surface and has terminals distributed about its internal peripheral surface and presented towards the cavity, said probe head comprising a retainer member made of dielectric material and having first and second generally parallel main faces and an outer peripheral surface that extends from the second main face towards the first main face, and also comprising a plurality of generally cylindrical pins of conductive material attached to the retainer member and extending generally perpendicular to the main faces, said pins being exposed at the outer peripheral surface of the retainer member, whereby, upon engagement of the probe head between the terminals of the receptacle and the pins of the probe head.

2. A probe head according to claim 1, wherein the retainer member has an upper portion bounded by said first main face, and a lower portion bounded by said second main face, said second main face being smaller than said first main face, and wherein the pins extend through holes in the upper portion of the retainer member.

3. A probe cable assembly for use in connecting an electronic instrument to an electronic system that has a receptacle for receiving a multiple terminal electronic component, which receptacle defines a cavity that is bounded laterally by an internal peripheral surface and has terminals distributed about its internal peripheral surface and presented towards the cavity, said cable assembly comprising a flexible circuit cable having an instrument end and a probe end, and a plurality of conductor runs extending between said instrument end of the cable and the probe end thereof and terminating in respective contact pads, and the cable assembly also comprising a probe head secured to the cable at the probe end thereof, said probe head comprising a retainer member made of dielectric material and having first and second generally parallel main faces and an outer peripheral surface that extends from the second main face towards the first main face, and a plurality of generally cylindrical pins of conductive material connected to said contact pads respectively, said pins

being attached to the retainer member and extending generally perpendicular to said main faces, and being exposed at the peripheral surface of the retainer member, whereby upon engagement of the probe head with the receptacle, electrical connection is made between the terminals of the receptacle and the pins of the probe head.

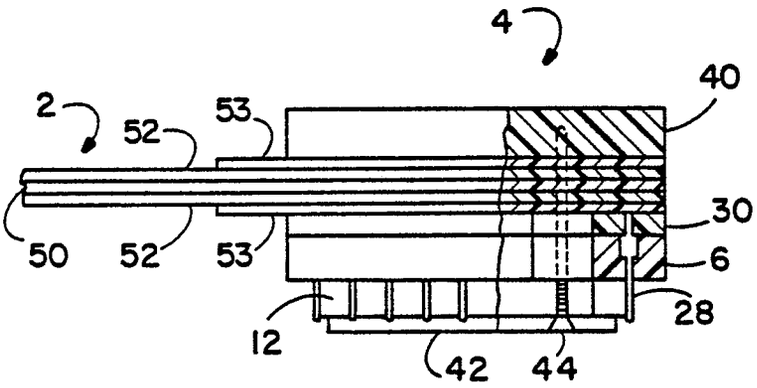

FIG. 1

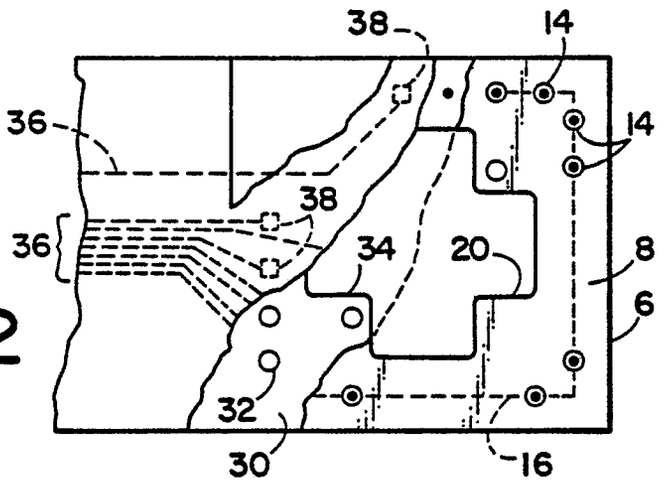

FIG. 2

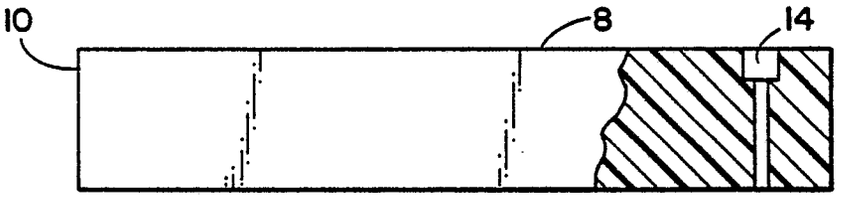

FIG. 3

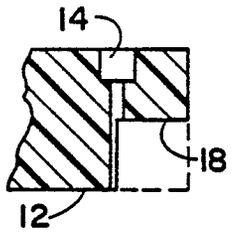

FIG. 4

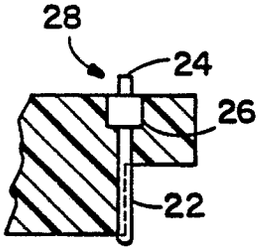

FIG. 5

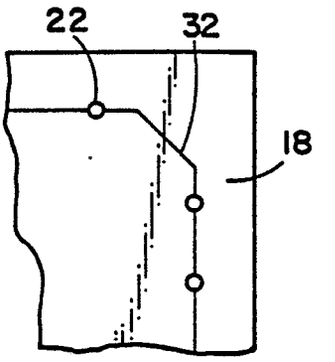

FIG. 6