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GB A 2085673
GB 1348805
GB 1233309
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(58) Field of search
G1U
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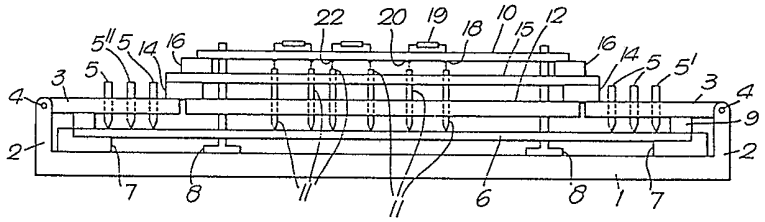
(54) Printed circuit board testers

(57) To reduce the cost of a different probe array for every kind of PCB (10) to be tested each test node connection of a tester is permanently wired to a single ended probe (5,5′,5″) on a jig (1,2) having a standard probe pattern. A double ended probe array (11) is arranged to connect board test nodes with a circuit board pattern (6) which is then contacted by the single ended probe pattern. Since the double ended probes are recoverable the items per PCB type to be tested are the circuit board (6) and the plate (12) containing the board probe pattern. Alternatively the plate (12) may have a grid pattern for probes, only those probes required for a particular PCB type to be tested being fitted.

Fig.1.



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The drawing(s) originally filed was (were) informal and the print here reproduced is taken from a later filed formal copy.

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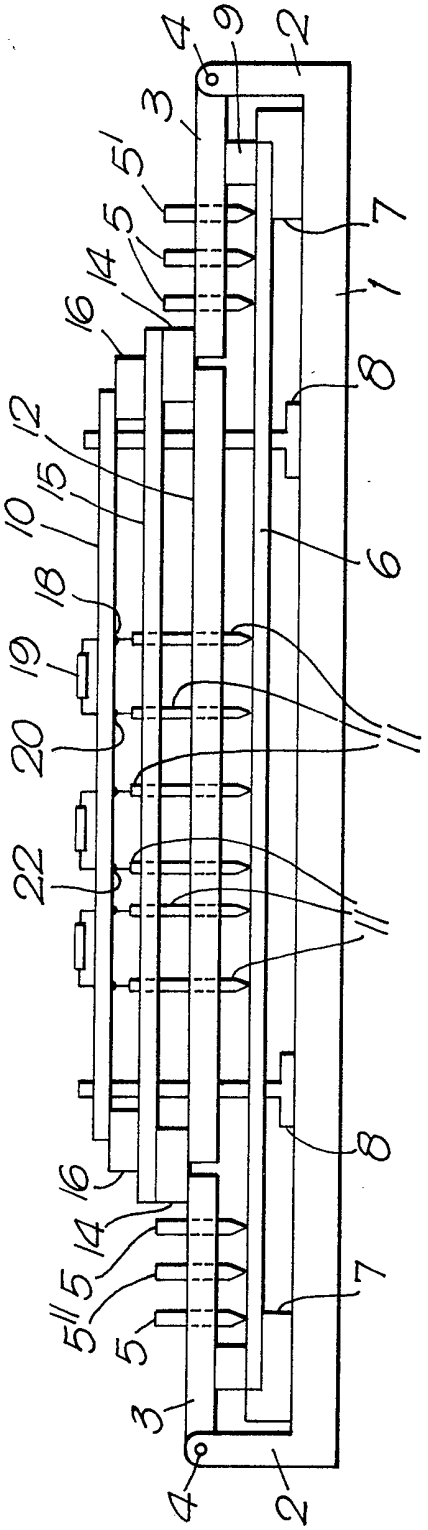

Fig.1.

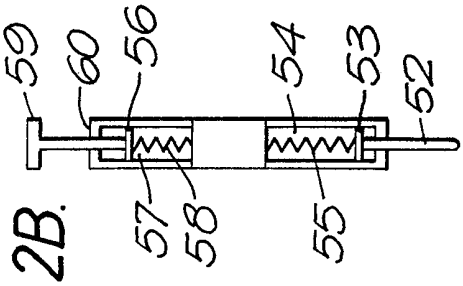

Fig.2B.

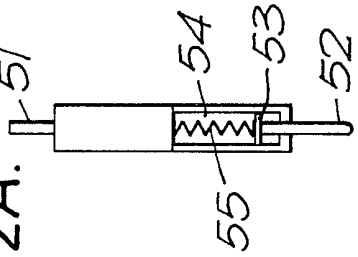

Fig.2A.

SPECIFICATION

Printed circuit board testers

The present invention relates to printed circuit board testers and in particular to interfaces for interconnecting test equipment and printed circuit boards under test.

Many printed circuit board test equipments are designed to test the components and construction of a circuit on such a circuit board by temporary connection to the actual printed circuit of the board. Such connection normally is achieved by using a probe array connected to inputs or outputs of the equipment, the probe array being aligned with the circuit board and the two being brought into contact. The equipment then proceeds through a test programme.

In the past such probe arrays have been dedicated to use in the testing of one particular circuit, each new circuit design requiring a differing probe array. The production of such a probe array is a specialist task requiring many hours of skilled labour to produce and leading to delays in testing circuits assembled to a new design.

It is an object of the present invention to provide apparatus for effecting temporary interconnection of a printed circuit board and test equipment for such a board which does not require alteration of the direct connection between the test equipment and test probes associated therewith to effect interconnection of differing circuit board layouts.

According to the present invention in a connection interface for interconnecting input and/or outputs of test equipment with test nodes of a printed circuit board to be tested, a removeable interconnection board of a electrically-insulating material carries a first plurality of contacts in a pattern which substantially mirrors a pattern of test nodes of a printed circuit board to be tested, each of said first plurality of contacts is electrically connected to a respective one of a second plurality of contacts which are also carried on said removeable interconnection board and which form a respective pattern spaced apart from the pattern of the first plurality of contacts, a first plurality of electrially-conducting probes is mounted in a first electrically-insulating board in a pattern such that one end of each probe contacts a respective one of said first plurality of contacts whilst the opposed ends of the probes present a pattern of contacts for connection to test nodes of a printed circuit board under test, a second plurality of electrically-conducting probes is mounted in at least one second electrically-insulating board such that one end of each of the second plurality of probes contacts a respective one of said second plurality of contacts, and the opposed end of each of the second plurality of probes is arranged for electrical connection to a respective input or output of test equipment such that, in use, when a printed circuit board is brought into contact with said pattern of contacts presented by said first plurality of probes each test node thereof is temporarily electrically connected to a respective input or output of test equipment connected as aforesaid.

Preferably said at least one second electrically insulating board is hingeably attached to a frame which has means to locate said interconnection board, said first electrically insulated board and a printed circuit board to be tested.

Said first electrically insulated board may be provided with apertures in a predetermined grid for holding said first plurality of probes, each of said first plurality of probes being fitted to the board as required. Alternatively said insulating board may be fully equipped with a plurality of part probes on a grid pattern such that fitting of the other part of each of the first plurality of probes is carried out as required.

Each of the probes may be spring loaded, the second plurality at one end only and the first plurality at both ends.

A connection interface in accordance with the invention will now be described by way of example only with reference to the accompanying drawings of which:-

Figure 1 is a cutaway view of the interface when fitted with a board to be tested; and

Figures 2A and *B* are cross sectional views respectively of a single ended probe and a double ended probe of the apparatus of Figure 1.

Referring to Figure 1 the interface has a substantially rectangular base 1 with raised sidewalls 2 to which first electrically insulating boards providing probe mounting plates 3 are attached by hinges 4. The probe mounting plates 3 each carry a number of rows of probes 5, 5′, 5″, each of which is permanently connected by wire wrapping or soldering for example to a respective lead (not shown) to a respective test input or output of test equipment (not shown). It will be appreciated that one or more probe mounting plats 3 may be provided and mounted on one or more sides of the base 1 in dependence on the number of probes 5 required for connection.

Each of the probes 5, 5′, 5″ has a single contact face and is spring loaded such that when the mounting plates 3 are in the operating position (as shown in the Figure) the contact face is in electrical contact with one end of a printed circuit track of an interconnection board 6. The interconnection board 6 is effectively a printed circuit board of known kind which is supported by a number of supports 7 and is located by location pegs 8 which are attached to the base 1 and over which corresponding apertures in the interconnection board 6 are passed.

When the interconnection board 6 is fitted to the interface a gasket 9 (of neoprene rubber for example) is fitted above the board before bringing the probe mounting plates 3 into the operating position. The gasket 9 provides some support for the probe mounting plates 3 but principally provides a vacuum seal.

The tracks on the interconnection board 6 are arranged to terminate opposite test nodes of a board 10 which is to be tested, interconnection to the test nodes being effected by use of double ended sprung probes 11. The double ended probes 11 are mounted by being loosely held in a second electrically insulating board providing a respective mounting plate 12 which also has location apertures arranged to fit

over the locating pegs 8.

A further sealing gasket 14 seals the gap between the probe mounting plate 3 and the mounting plate 12 and supports and seals a circuit board 'family' plate 15 through which pass the probes 11 and pegs 8. Finally the family plate 15 is sealed to a printed circuit board 10 to be tested by a respective sealing gasket 16. The family plate 15 and gasket 16 provide a seal suitable for a particular outline common to a group of printed circuit boards to be tested, and hence may be usd effectively to adjust the size of the aperture of the interface so that it is 'universal' to printed circuit boards 10 up to the size of this interface aperture. Thus a smaller printed circuit board 10 requires a smaller aperture provided by the family plate 15 and gasket 16.

It will be realised that the sealing gaskets 9, 14 and 16 whilst capable of being independent items may be permanently affixed to one of the items for which a seal is provided. Conveniently for example the gaskets 14 and 16 may be affixed to the family plate 15.

In use a vacuum is applied to the cavities between the plates 6, 12, 15 and the circuit board 10 thus bringing the test nodes of the circuit board 10 into contact with the contact plates of the probes 11, the interconnection board 6 into contact with the opposed ends of the probes 11 and the probes 5, 5', 5" into contact with the interconnection board 6. Hence an electrical circuit between each of the test nodes and a respective input or output of the test equipment is provided.

Referring also to Figure 2A the probes 5, 5', 5" of electrically conducting material have a connection point 51 for wire wrapping or other connection to be made and a contact point 52 attached to a floating platform 53 which is held captive in a cavity 54 of the probe. A spring 55 ensures that the contact tends to extend to its fullest limit so that, when in use, a good contact is made with respective track of the interconnection board 6.

Referring now to Figures 1 and 2B the lower half of each of the probes 11 is of similar construction to the lower half of the single ended probe of Figure 2A. In the upper half of the probe a plate 56 is held captive in a further cavity 57 and is acted on by a further spring 58 which tends to move the platform upwards (as shown). A 'T' shaped contact plate 59 may be inserted through an aperture 60 of the probe to contact the plate 56 in a removeable manner.

It is here noted that a captive contact of the kind shown in the lower half of Figures 2A and B may be used as the upper contact of the double ended probe. However, by providing the removeable upper contact plate 49 further economy may be made in the parts of the apparatus required to be changed when difference circuits are to be tested.

Alternatively, commercially available single ended and double-ended probes of well known construction may be employed.

Thus the probe mounting plate 12 may have a network of probes on a small grid pattern. When a change of circuit board is made, whilst all of the contact points 52 come into contact with the interconnection board 6 only those to which the contact plate 59 has been fitted will contact test nodes of the circuit board 10.

In some changes of circuit of the board 10 to be tested only the interconnection board 6 need be replaced. For example if on one type of circuit the probe 5' is required to be connected to a test node 18 to effect connection of an output of the test equipment to a component 19 whilst another probe 5" is required to effect connection of an input of the test equipment a test node 20 then tracks on the board 6 are provided accordingly. If, subsequently, on a differing printed circuit to be tested the input attached to probe 5" is required to be connected to another test node say 22 then a different interconnection board 6 is used.

However if there is a requirement for testing a circuit board of a similar kind without a connection to the test node 20 then removing the T connector 59 of the appropriate probe 11 will be all that is required.

Integrated circuit sockets may be fitted onto board 6 together with any other ancilliary devices that may help in the testing of printed circuit boards. This will allow the fitting of RAM packs or other such ICs some of which may be preprogrammed to work in configuration with the test programme. These IC sockets are then tracked or wired directly to probes 11 which will make contact with the printed circuit board under test.

It is here noted that in the majority of changes of the type of circuit board to be tested all three of the boards 6, 12 and 15 may require changing. However, there is no requirement for the wiring between the test probes 5 and test equipment to be amended.

CLAIMS

1. A connection interface for interconnecting inputs and/or outputs of test equipment with test nodes of a printed circuit board to be tested, wherein a removeable interconnection board of electrically-insulating material carries a first plurality of contacts in a pattern which substantially mirrors a pattern of test nodes of a printed circuit board to be tested, each of said first plurality of contacts is electrically connected to a respective one of a second plurality of contacts which are also carried on said removable interconnection board and which form a respective pattern spaced apart from the pattern of the first plurality of contacts, a first plurality of electrically-conducting probes is mounted in a first electrically-insulating board in a pattern such that one end of each probe contacts a respective one of said first plurality of contacts whilst the opposed ends of the probes present a pattern of contacts for connection to test nodes of a printed circuit board under test, a second plurality of electrically-conducting probes is mounted in at least one second electrically-insulating board such that one end of each of the second plurality of probes contacts a respective one of said second plurality of contacts, and the opposed end of each of the second plurality of probes is arranged for electrical connection to a respective input or output of test equipment such that, in use, when a printed circuit board is brought into contact

with said pattern of contacts presented by said first plurality of probes each test node thereof is temporarily electrically connected to a respective input or output of test equipment connected as aforesaid.

2. A connection interface as claimed in Claim 1, in which said at least one second electrically insulating board is hingeably attached to a frame which has means to locate said interconnection board, said first electrically insulated board and a printed circuit board to be tested.

3. A connection interface as claimed in Claim 1 or Claim 2, in which said first electrically insulated board is provided with apertures in a predetermined grid for holding said first plurality of probes, each of said first plurality of probes being fitted to the board as required.

4. A connection interface as claimed in Claim 1 or Claim 2, in which said first electrically insulating board is fully equipped with a plurality of part probes on a grid pattern such that fitting of the other part of each of the first plurality of probes is carried out as required.

5. A connection interface as claimed in any one of Claims 1 to 4, in which each of the probes is spring loaded, the second plurality at one end only and the first plurality at both ends.

6. A connection interface for interconnecting inputs and/or outputs of test equipment with test nodes of a printed circuit board to be tested, substantially as herein described with reference to the accompanying drawing.

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