



US006822466B1

(12) **United States Patent**  
**Holcombe et al.**

(10) **Patent No.:** **US 6,822,466 B1**

(45) **Date of Patent:** **Nov. 23, 2004**

(54) **ALIGNMENT/RETENTION DEVICE FOR CONNECTOR-LESS PROBE**

(56) **References Cited**

**U.S. PATENT DOCUMENTS**

(75) Inventors: **Brent A. Holcombe**, Colorado Springs, CO (US); **Brock J. LaMeres**, Colorado Springs, CO (US)

5,949,244 A \* 9/1999 Miley ..... 324/762  
6,091,253 A \* 7/2000 Huang ..... 324/758  
6,497,735 B2 \* 12/2002 Tao ..... 44/275  
6,529,023 B2 \* 3/2003 Becker et al. .... 324/754

(73) Assignee: **Agilent Technologies, Inc.**, Palo Alto, CA (US)

\* cited by examiner

*Primary Examiner*—Michael Tokar  
*Assistant Examiner*—Jimmy Nguyen

(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(57) **ABSTRACT**

An alignment/retention device. The device includes a housing having a first side and an opposing second side. The housing includes an opening which extends from the first side to the second side. Multiple alignment pins are imbedded in the housing and extend external to both the first and second sides. On the first side the alignment pins are capable of insertion into matching holes on an electronic probe, and on the second side the alignment pins are capable of insertion into matching holes on an electronic circuit assembly.

(21) Appl. No.: **10/644,365**

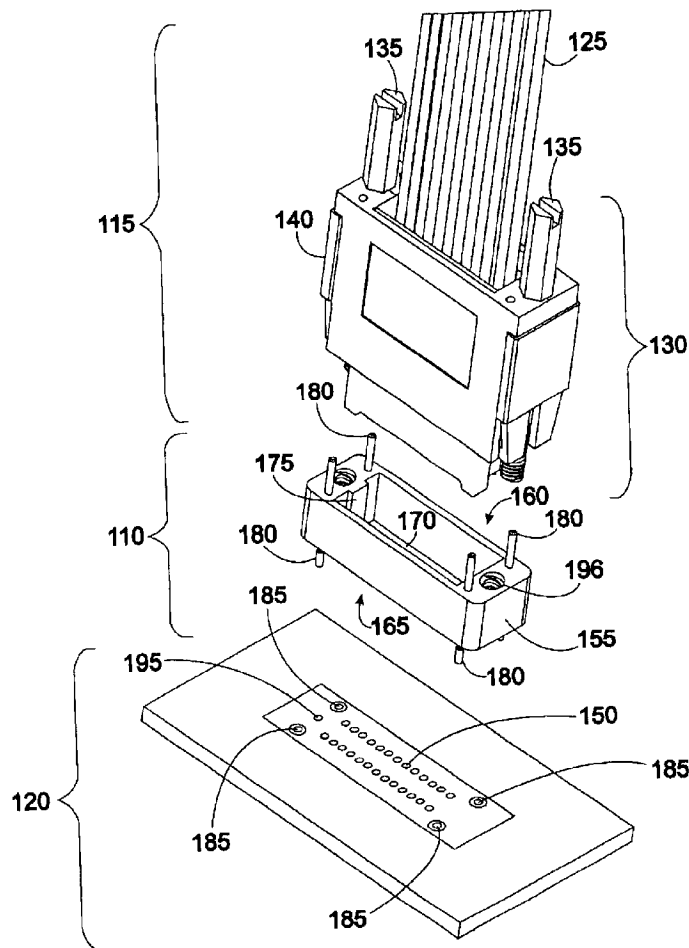
(22) Filed: **Aug. 20, 2003**

(51) **Int. Cl.**<sup>7</sup> ..... **G01R 1/04**

(52) **U.S. Cl.** ..... **324/761; 324/754; 324/158.1; 439/289; 439/374**

(58) **Field of Search** ..... **324/758, 761, 324/754, 158.1, 72.5; 439/482, 700, 289, 374, 378, 362**

**20 Claims, 5 Drawing Sheets**



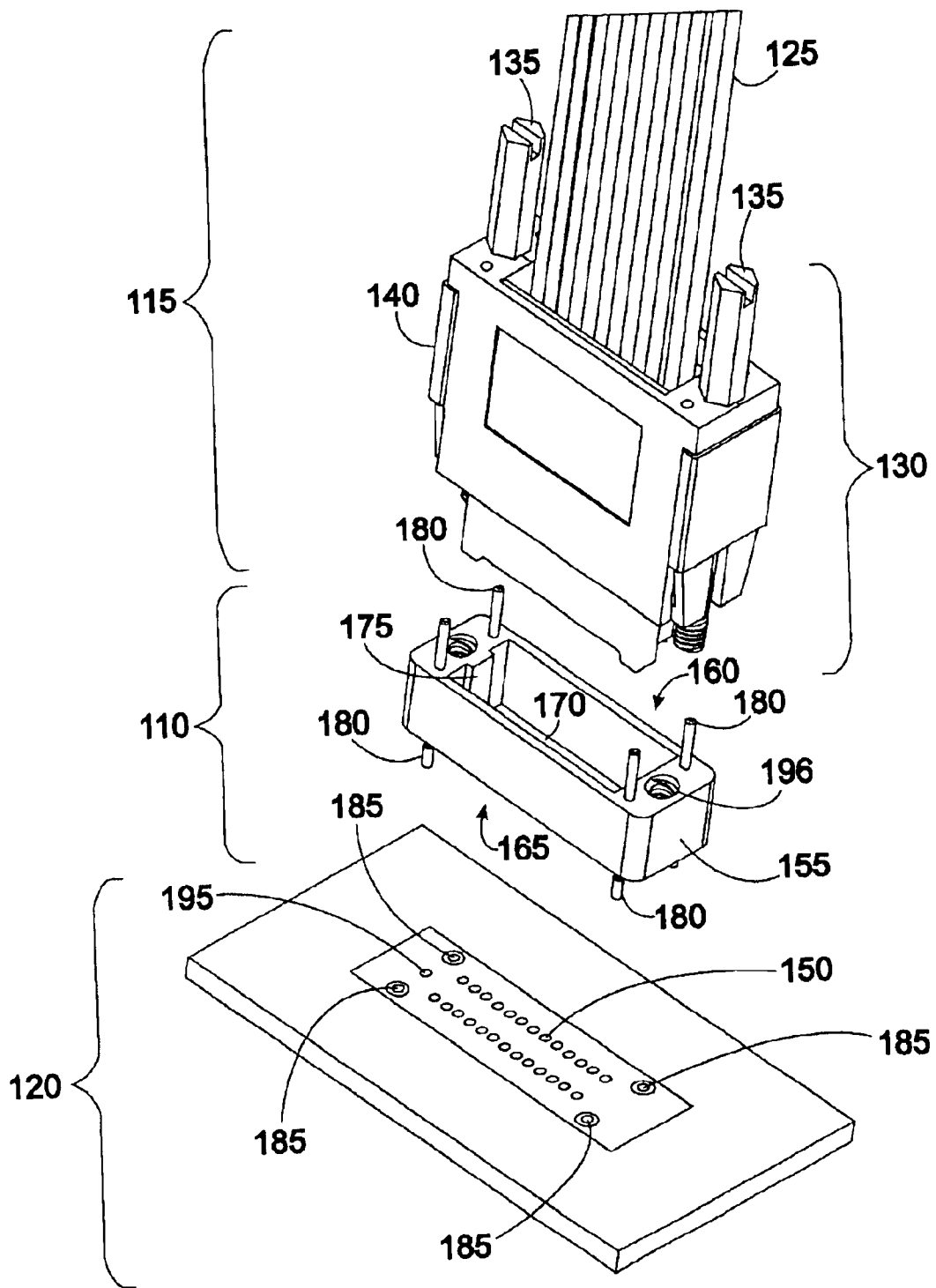


FIG. 1

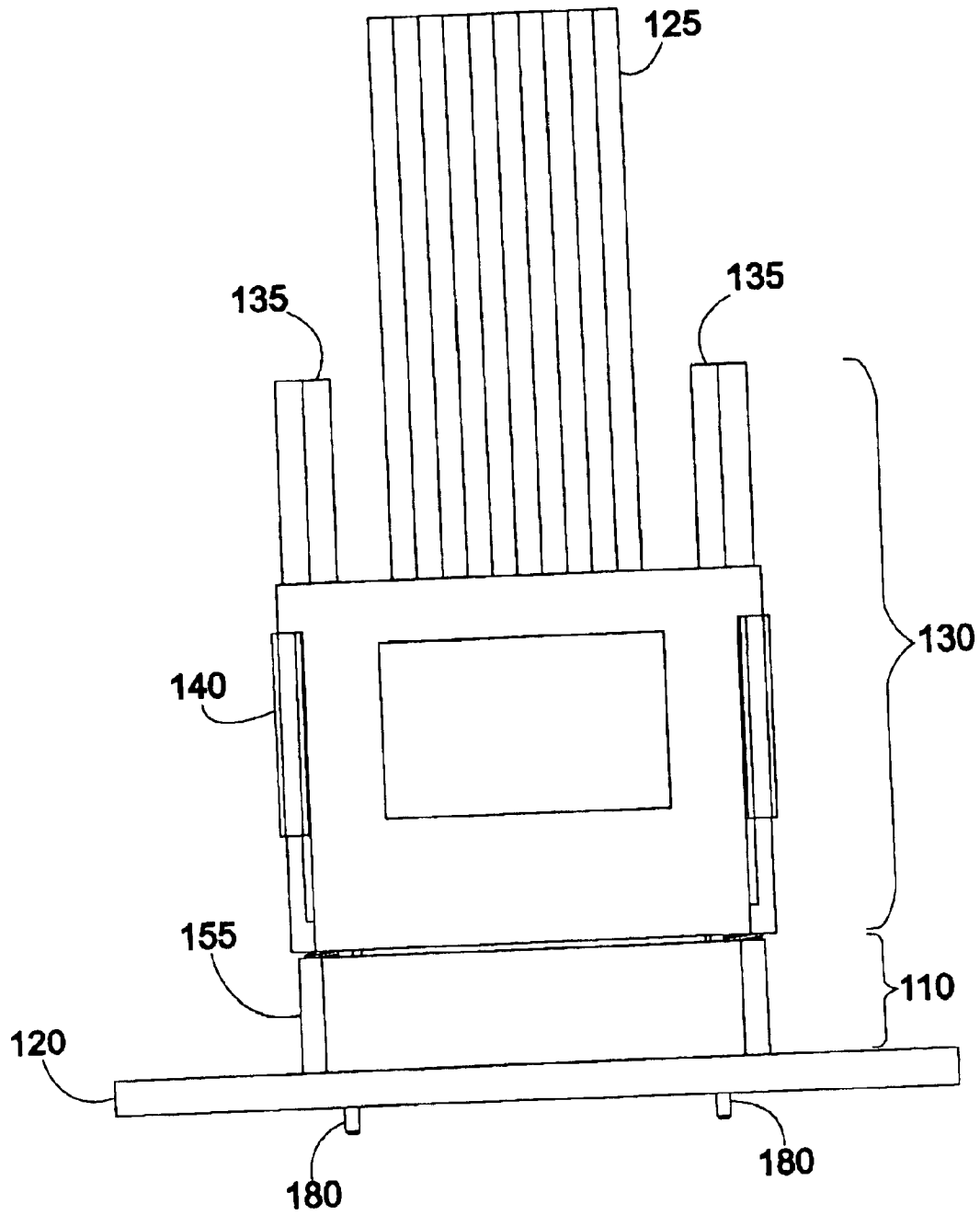


FIG. 2

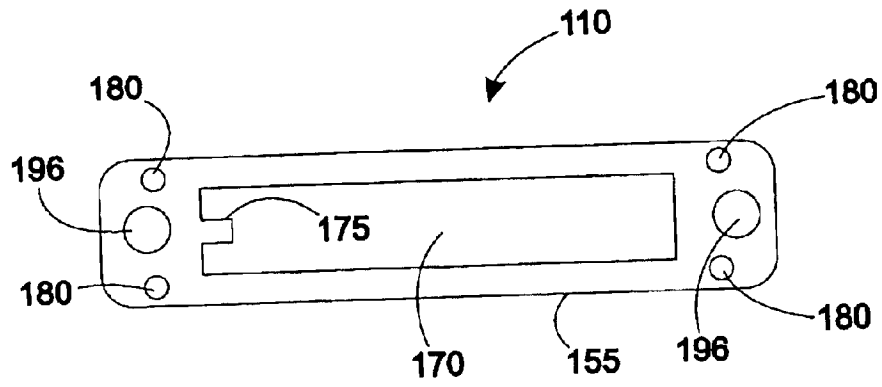


FIG. 3A

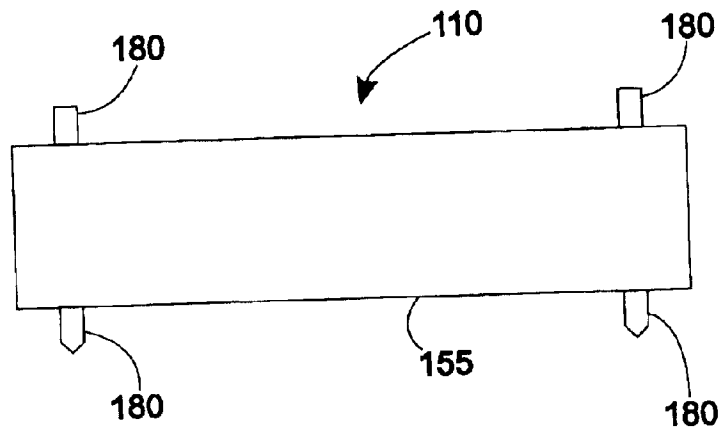


FIG. 3B

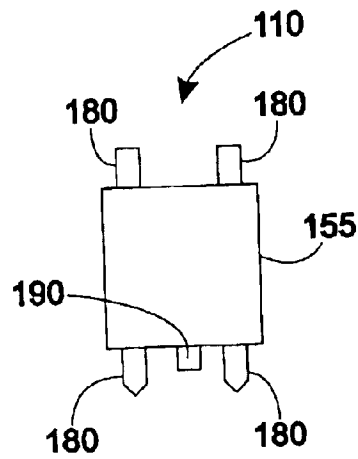


FIG. 3C

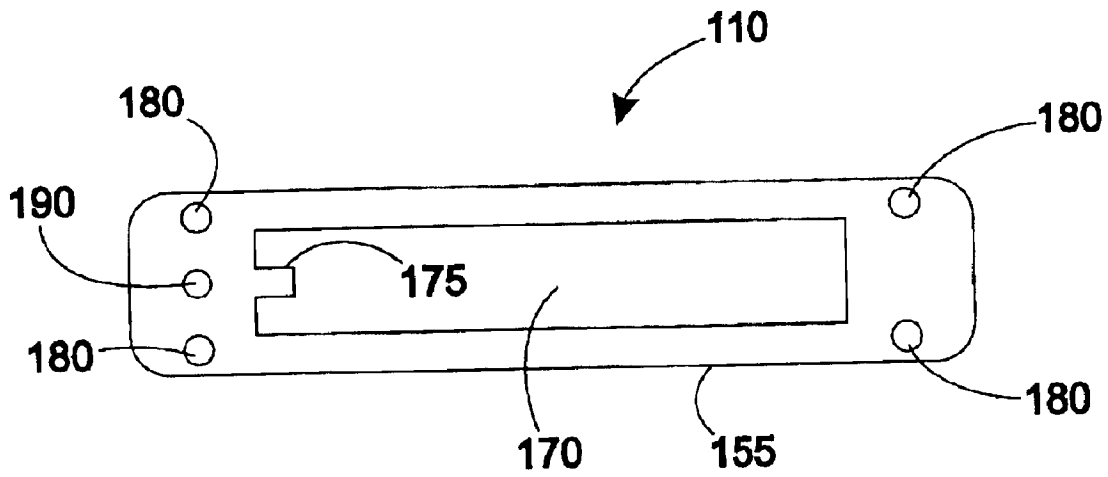


FIG. 3D

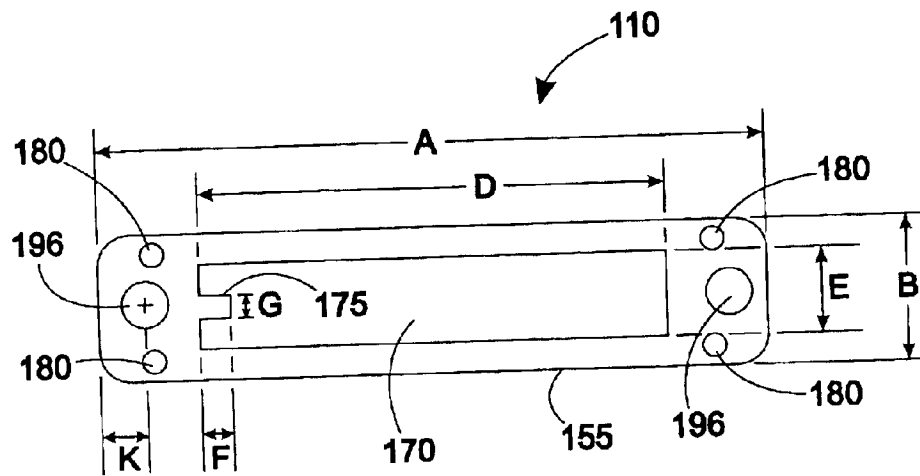


FIG. 4A

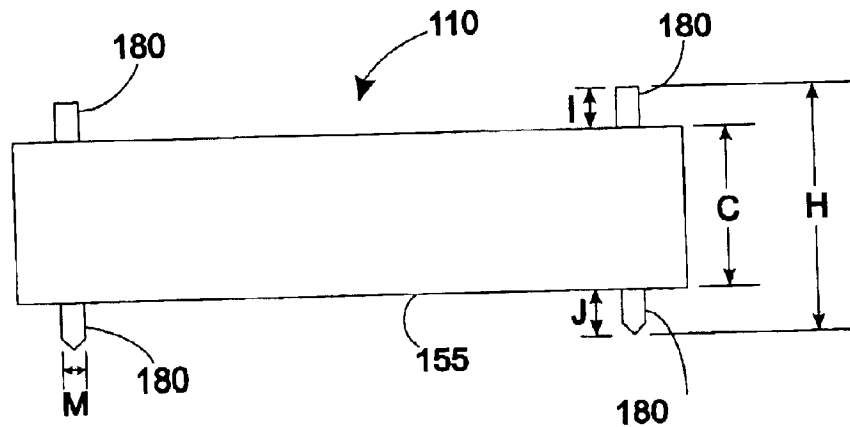


FIG. 4B

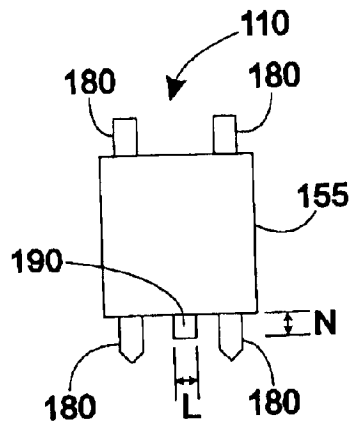


FIG. 4C

1

## ALIGNMENT/RETENTION DEVICE FOR CONNECTOR-LESS PROBE

### BACKGROUND

In the development and manufacture of modern electronic circuits, testing of the circuits, whether it be for design debug, design confirmation, or the troubleshooting of defective circuits, is an indispensable activity. In order to evaluate or debug high-speed digital circuits, accurate measurement and display of signal waveforms and alternating current (AC) characteristics are often desired.

In many instances the measurements are performed by specifically designed probes, which have predefined physical and electrical qualities. The electrical qualities of a probe determine, in part, the response to the AC characteristics, the accuracy of the measurement, and the extent to which the probe detects the signal without detrimentally affecting the operation of the system or circuit being probed. One measure of a probe's intrusiveness is the loading presented by the probe on the circuit. High probe tip capacitance causes circuit loading problems for circuits with fast edge rates. Minimizing the capacitance associated with the probe has been one typical solution for reducing the loading and intrusiveness of the probe.

In this regard, a recent development is a probe system that comprises a semi-rigid support attached to a probing end of a probe. A spring pin and an isolation network are attached to the semi-rigid support. The semi-rigid support permits probing without the use of a mating connector. This so-called connector-less probe can be used to probe printed circuit boards and buses. Such a probe system is described in U.S. patent application Ser. No. 10/373,820, entitled "Connector-Less Probe" filed 25 Feb. 2003 by Brent A. Holcombe et al. which is incorporated herein by reference.

### SUMMARY

In representative embodiments, an alignment/retention device is disclosed. The device includes a housing having a first side and an opposing second side. The housing includes an opening which extends from the first side to the second side. Multiple alignment pins are imbedded in the housing and extend external to both the first and second sides. On the first side the alignment pins are capable of insertion into matching holes on the electronic probe, and on the second side the alignment pins are capable of insertion into matching holes on an electronic circuit assembly.

Other aspects and advantages of the present invention will become apparent from the following detailed description, taken in conjunction with the accompanying drawings, illustrating by way of example the principles of the invention.

### BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings provide visual representations which will be used to more fully describe the invention and can be used by those skilled in the art to better understand it and its inherent advantages. In these drawings, like reference numerals identify corresponding elements.

FIG. 1 is a drawing of an exploded, perspective view of a probe system with an alignment/retention device in a representative embodiment.

FIG. 2 is a drawing of a side view of the probe system with the probe system of the representative embodiment of FIG. 1.

2

FIG. 3A is a drawing of a top view of the alignment/retention device of the representative embodiment of FIG. 1.

FIG. 3B is a drawing of a side view of the alignment/retention device of the representative embodiment of FIG. 3A.

FIG. 3C is a drawing of an end view of the alignment/retention device of the representative embodiment of FIG. 3A.

FIG. 3D is a drawing of a bottom view of the alignment/retention device of the representative embodiment of FIG. 3A.

FIG. 4A is a drawing of a dimensioned top view of the alignment/retention device in the representative embodiment of FIG. 3A.

FIG. 4B is a drawing of a dimensioned side view of the alignment/retention device in the representative embodiment of FIG. 3A.

FIG. 4C is a drawing of a dimensioned end view of the alignment/retention device in the representative embodiment of FIG. 3A.

### DETAILED DESCRIPTION

Various embodiments of an alignment/retention device for a connector-less probe are shown in the drawings for purposes of illustration. These embodiments can be used to obtain hands-free probing or testing of electronic devices and circuits. Such embodiments are especially useful in the electronic test of printed circuit boards, and can be used, for example, with the test probes of an oscilloscope, logic analyzer, or other electronic tester. They provide greater contact stability and alignment for the test points on the item under test. In particular, in conjunction with a connector-less probe they provide a low capacitance, non-destructive method for probing electronic signals on printed circuit boards having a connector-less probe and a related set of test points.

In the following detailed description and in the several figures of the drawings, like elements are identified with like reference numerals.

FIG. 1 is a drawing of an exploded, perspective view of a probe system **100** with an alignment/retention device **110** in a representative embodiment. In FIG. 1, three major components of the probe system **100** are shown. These components are an electronic probe assembly **115**, the alignment/retention device **110**, and an electronic circuit assembly **120**. The alignment/retention device **110** is also referred to herein as the device **110**.

In a representative embodiment, the electronic probe assembly **115** comprises a flexible cable **125** which in turn comprises conductive wires that connect typically a test instrument (not shown in the figures) which could be, for example, an oscilloscope, logic analyzer, other electronic tester, other electronic system, or the like to an electronic probe test head **130** which is also referred to herein as electronic probe **130**. The electronic probe test head **130** can take various embodiments well known in the art but could involve an attachment mechanism **135** for mechanically attaching the electronic probe test head **130** to a device or circuit which is to be tested or probed. The attachment mechanism **135** could be, for example, one or more screws **135**, two of which are shown in FIG. 1. The attachment mechanism **135** attaches to an appropriate mating device **196**, also referred to herein as a fastener part **196**, in order to securely affix the electronic probe test head **130** to the device/circuit to be probed.