United States Patent [19]

Reimer

[11] **3,885,854**

[45] **May 27, 1975**

[54] **LOOP SHAPED CIRCUIT TEST POINT**

[75] Inventor: **William A. Reimer,** Wheaton, Ill.

[73] Assignee: **GTE Automatic Electric Laboratories Incorporated,** Northlake, Ill.

[22] Filed: **June 5, 1974**

[21] Appl. No.: **476,482**

[52] **U.S. Cl.**..... **339/218 M;** 29/630 B; 324/158 F; 339/17 C; 339/222

[51] **Int. Cl.**..... **H01r 9/16**

[58] **Field of Search** ..... 339/218 R, 218 C, 218 M, 339/17 R, 17 C, 19, 17 L, 17 LM, 147 P, 149 P, 217 R, 214 R, 222, 278 R, 278 M; 29/629, 630 B; 324/158 F, 158 P, 72.5

[56] **References Cited**

UNITED STATES PATENTS

1,887,421	11/1932	Newman	324/73 R
2,667,624	1/1954	Bels	339/220 C
2,717,985	9/1955	Zellner	339/19
3,001,106	9/1961	Higgs	339/17 C
3,115,381	12/1963	Hoag	339/255 B
3,132,913	5/1964	Pohl	29/629
3,246,280	4/1966	Scagnelli	339/17 LM
3,340,440	9/1967	Minter	339/17 M
3,696,296	10/1972	Aktiebolaget	324/73 R

OTHER PUBLICATIONS

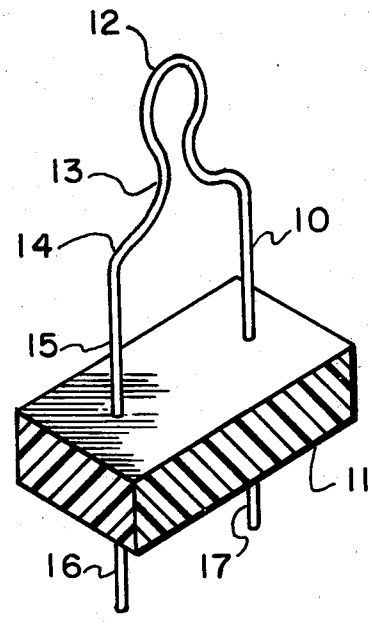
Electronic Products, cem file 2550, p. 76, Mar. 15, 1969.

Primary Examiner—Joseph H. McGlynn
Assistant Examiner—James W. Davie

[57] **ABSTRACT**

A loop-shaped circuit test point formed from resilient wire held in a rigid mounting block through the combination of torsion and compression. When the top of the loop is cut, the two ends will spring apart isolating the circuit connection. When reconnection of the loop is desired the two top sections are passed by each other and crossed over and released thus allowing two section of the loop to hold each other together.

7 Claims, 4 Drawing Figures



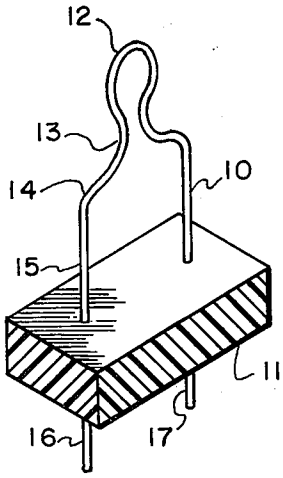


FIG. 1

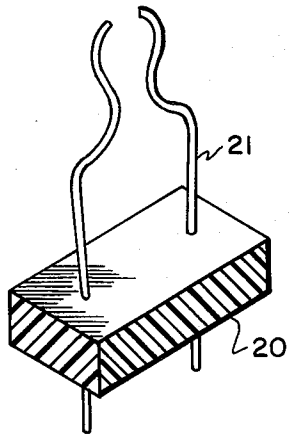


FIG. 2

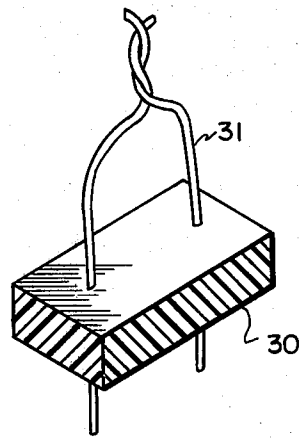


FIG. 3

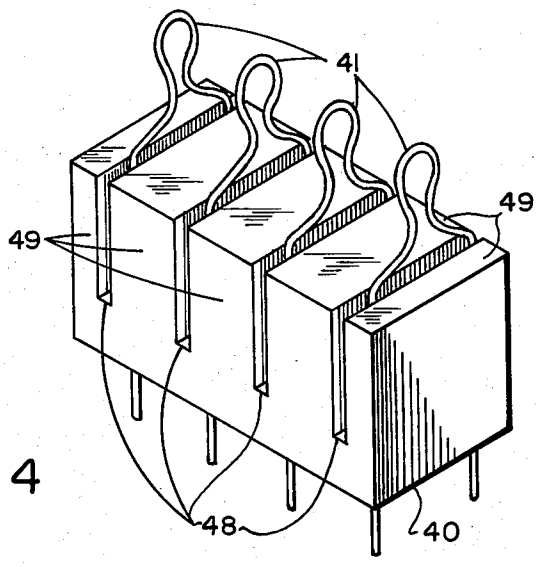


FIG. 4

LOOP SHAPED CIRCUIT TEST POINT

FIELD OF THE INVENTION

This invention relates to circuit testing equipment and more particularly to a loop-shaped circuit test point for disconnecting and then reconnecting component(s) in a circuit for troubleshooting purposes.

DESCRIPTION OF THE PRIOR ART

With the increase in the number of components that can be mounted on a single printed wiring card it has become necessary to provide circuit troubleshooting capability during initial circuit design. This capability is normally provided by bringing test points to unused connector pins or adding special components that provide accessible test points. The most difficult circuit configuration to troubleshoot is one in which a single printed conductor interconnects a number of similar devices on a printed wiring card. An error may be traceable to the single printed conductor or one of the components, but the one way to determine what is creating the error is to selectively disconnect one or more printed conductors from the component or vice versa.

In U.S. Pat. No. 2,605,314 to Schelke issued July 29, 1952, holding means are disclosed whereby an electrical cable containing a multiplicity of wires is fitted with intermediate disconnect devices whereby one or more of the wires may be disconnected. In Schelke each wire is cut and a terminal placed on each end. The bottom terminal has a nut attached to it such that when a screw is passed through the top terminal and into the nut the two terminals would be pulled together. The complete structure is encapsulated and the terminals coated with an insulating material which holds the terminals apart. When the circuit is desired to be completed the screw is tightened down thereby pulling the top terminal against the bottom terminal. When the circuit is to be opened, the screw is loosened thereby allowing the top terminal which is held apart by the insulating material spring up against the screw. However, Schelke's means are not adaptable for performing the connect-disconnect function on printed wiring cards, as Schelke appears only applicable to cable or heavy wire conductors.

In U.S. Pat. No. 3,274,534 to Shortridge issued Sept. 20, 1966, a circuit connector to make contact with the electronic circuit module terminals for check-up purposes without damaging the leads is disclosed. A plurality of biased independently moveable contact pins is spaced longitudinally across the connector housing and arranged for movement in extension and retraction. A number of pins are inclined to one side of the connector housing and others to the opposite side. Connected to the pins is an output terminal and a lead from the pins to the terminal. When testing is desired the apparatus is placed upon the module with the pins fully extended. Pressure is then applied to the apparatus which forces the pins back into the housing to insure contact with the module terminals.

Such a device while apparently working well for electronic circuit modules, does not have the capability of disconnecting a subcircuit from a much larger circuit, of the type found on printed wiring cards, and because of apparent size limitations it would be inoperable with printed wiring cards. It is the object of this invention to

provide a new and improved circuit test means capable of use from printed wiring cards.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the loop-shaped circuit test point in accordance with the present invention.

FIG. 2 is a perspective view of the loop-shaped circuit test point which has been cut with the two ends displaced from each other in accordance with the teachings of the present invention.

FIG. 3 is a perspective view of the loop-shaped circuit test point after the loop has been cut with the wires self-engaging to complete the circuit in accordance with the present invention.

FIG. 4 is a perspective view of a mounting arrangement containing several loop-shaped circuit test points mounted on the same solid base in accordance with the present invention.

In the FIGS. 1–4 comparable portions bear similar second digits.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

With reference now to FIG. 1 the loop-shaped circuit test point **10** is placed in a rigid base **11.** The solid base **11** is constructed from an insulated electrically non-conductive material. The test point **10** is formed from a section of resilient electrically conductive wire. The wire includes a head portion **12** at the top of the loop, at the bottom of the head the wire converges and finally parallel to form the neck portion **13.** The wire expands then to form the shoulder portion **14** and following a diverging path the main body **15** angles out slightly from the shoulder **14** until it reaches a rigid base **11,** at which point it passes through the base **11** on a slightly converging path and emerges at the other side of the base **11** parallel to each other to form the circuit connecting terminals **16** and **17** which are connected to the desired printed wiring conductor or component.

SUMMARY OF THE INVENTION

The present invention discloses a loop-shaped circuit test point formed from resilient electrically conductive wire. The test point is capable of making connection to and/or isolating specific sections of the printed wiring card and/or specific components mounted on the printed wiring card. The loop is held in a rigid non-conductive base through a combination of torsion and compression whereby the wires pass through the base in an angular configuration with respect to the main body of the loop and slightly twisted, such that when the top of the loop is cut, the wires will spring apart thereby displacing each other so that an accidental connection will not occur. At this time the desired tests may be conducted on the circuit by connecting either to one side of test point or to the individual component. The circuit can be reconnected simply by forcing the resilient electrically conductive wires at the two halves of the loop past each other and crossed over and releasing thereby allowing them to interconnect because of their curvature.

Several test points may be placed together in close proximity on the same rigid base, so they would be able to connect several printed wiring conductors spaced closely together. The size of the overall test point can be small, thereby enabling it to be compatible with that

of the typical integrated circuit dimensions, while not interfering with its function and operation. Further, in cases where high voltages and currents are present, test points may be constructed of a heavier conductive wire material.

The converging and diverging wire paths result in a compression force being applied to the top of the loop. When the top of the loop at the head **12** is cut this compression force causes the wires to spring apart.

Before the wire is placed in the rigid base **11** each side of the main body **15** is axially twisted. This results in a force being applied to the head **12** of the loop, such that when the head **12** is cut at the crown or center the wires will displace in a plane perpendicular to their separation resulting from the compression force described above.

FIG. **3** shows a test point that has been cut and then reconnected. This is accomplished by physically moving each half of the test point past each other and crossing over, then releasing, because of the test point curvature the wires will self-engage and because of the resiliency of the material the wires will make a solid electrical contact.

FIG. **4** exemplifies a testing assembly consisting of a multiple array of test points **41.** Test points **41** are held in place by a solid base **40** similar to the rigid base **11** shown in FIG. **1,** with the exception that the base comes farther up on the test point main body, and the base **40** contains an isolating regions **48** in which the test points **41** are situated and a barrier regions **49.** By the use of the barriers **49** accidental short-circuiting of the test points caused by them coming into contact with each other is avoided. Further the isolating regions **48** permit proper wire motion to enable test points to function properly.

While but two embodiments in the present invention are shown, it will be obvious to those skilled in the art that numerous modifications can be made, without departing from the spirit of the present invention, which shall be limited only by the scope of the claims appended hereto.

What is claimed is:

1. A loop-shaped circuit test point constructed of electrically conductive wire comprising: a head shaped portion forming the top of said test point; a body portion consisting of two legs, the uppermost portion of said body converging to form a shoulder portion; a neck portion coupling said shoulder portion to said head portion, each of said legs following a diverging path from said shoulder portion, the lower portion of each of said legs passing through a rigid base on a slightly converging path and passing through and beyond said base essentially parallel to each other, to form circuit connecting terminals.

2. A loop-shaped circuit test point as claimed in claim **1** wherein: said electrically conductive wire is prestressed by mounting in said rigid base.

3. A loop-shaped circuit test point as claimed in claim **1** wherein: said electrically conductive wire is of resilient material.

4. A loop-shaped circuit test point as claimed in claim **1** wherein: said rigid base is constructed of a electrically non-conductive material.

5. A loop-shaped circuit test point as claimed in claim **1** wherein: said electrically conductive wire is twisted axially before insertion into said base.

6. A loop-shaped circuit test point as claimed in claim **1** wherein: said base further includes at least one additional loop shaped circuit test point passing therethrough.

7. A loop-shaped circuit test point as claimed in claim **6** wherein: said base contains at least one electrically non-conductive barrier located between said test points.

* * * * *