



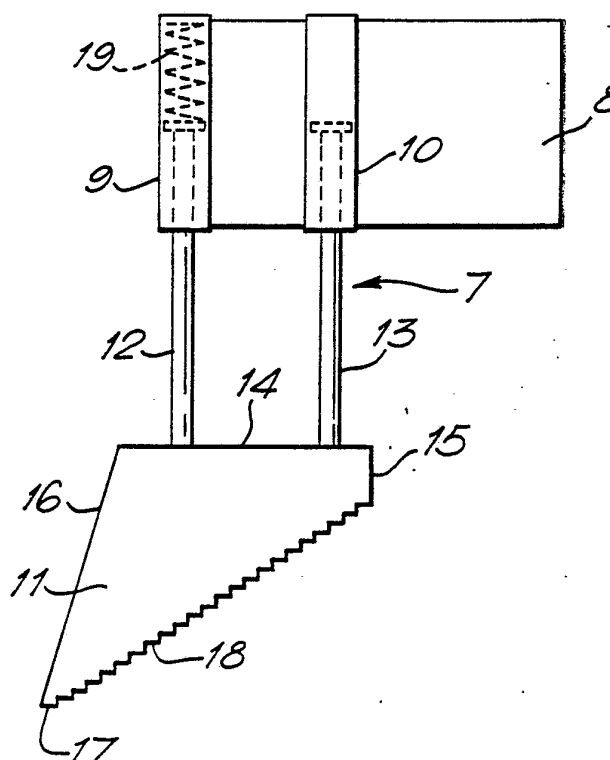
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<p>(21) International Application Number: PCT/GB89/01473 (22) International Filing Date: 11 December 1989 (11.12.89) (30) Priority data: 8829273.5 15 December 1988 (15.12.88) GB (71) Applicant: BATH SCIENTIFIC LIMITED [GB/GB]; Ly-sander Road, Bowerhill Estate, Melksham, Wiltshire SN12 6SP (GB). (72) Inventor: WATTS, Vivian, Charles ; 22 Lydiard Way, Trowbridge, Wiltshire BA14 0UN (GB). (74) Agent: NEWSTEAD, Michael, John; Page & Co., Temple Gate House, Temple Gate, Bristol BS1 6PL (GB).</p>		<p>(81) Designated States: AT (European patent), BE (European patent), CH (European patent), DE (European patent), DK, ES (European patent), FR (European patent), GB, GB (European patent), IT (European patent), JP, LU (European patent), NL (European patent), SE (European patent). Published <i>With international search report.</i></p>

(54) Title: ELECTRICAL TESTING PROBE

(57) Abstract

For contacting electrical pads of different geometries, an electrical testing probe (7) comprises: a probe body (11) which is generally laminar and which tapers downwardly to provide a contact portion (17); and a carrying member (8) which carries said probe body.



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ELECTRICAL TESTING PROBE

The present invention relates to an electrical testing probe, for example for use in testing printed
5 circuit boards.

In the field of testing printed circuit boards, for example such boards before they have components added, a method of testing requires more than one moving electrical testing probe. A requirement of such
10 a probe is that it has a small area of contact such that it does not make a short circuit between closely spaced electrical pads that may be present on the printed circuit board. Additionally, it is often a requirement that probes come into close proximity with
15 each other; and further that a probe can provide when necessary a purely vertical motion with no horizontal motion when making contact with the printed circuit board so that no scrubbing action takes place between the probe and the probed surface which could damage the
20 surface being tested.

Current designs of probes have probe bodies with very small diameters and are able to cater for the above requirements. Figure 1 shows schematically such a probe, in which reference numeral 1 denotes the
25 probe, this comprising a probe body 2 held spring-loaded in a sleeve 3 of a stand-off member 4. Figure 2 shows two such probes with a typical minimum probe separation A in one horizontal direction.

However, such a probe as is shown in Figure 1 may
30 not adequately meet the requirement that it can probe both an electrical pad with a small geometry and also a pad which has a large geometry with a hole in the centre of the pad. Although such a probe will

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adequately contact the former, in the case of the latter it could travel down the centre of the pad and through the hole without making electrical contact (see Figure 3 in which reference numeral 5 denotes a pad with a small geometry and Figure 4 in which reference numeral 6 denotes a pad with a large geometry).

According to the present invention, there is provided an electrical testing probe comprising: a probe body which is generally laminar and which tapers downwardly to provide a contact portion; and a carrying member which carries said probe body.

The present invention will now be described, by way of example, with reference to Figures 5 to 10 of the accompanying drawings, in which:

Figure 5 shows from one side a probe according to an example of the invention;

Figure 6 shows a view from above of the probe;

Figure 7 shows from one side two such probes near each other and with a typical minimum separation in one horizontal direction;

Figure 8 shows a view from above of two such probes near each other and with a typical minimum separation in an orthogonal horizontal direction; and

Figures 9 and 10 show the probe body of such a probe contacting an electrical pad with a small geometry and an electrical pad with a large geometry respectively.

Referring first to Figure 5, a probe 7 according

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to an example of the invention comprises a stand-off member 8 which carries sleeves 9 and 10, reference numeral 11 denoting a laminar probe body in the form of a thin blade of electrically conductive material. The probe body 11 is carried by a rod-shaped member 12 which is held by virtue of a spring 19 in a spring-loaded manner in sleeve 9 and a rod-shaped member 13 which slides in sleeve 10 and serves to prevent rotation of the probe body 11.

10 The probe body 11 has a straight upper side 14 which is horizontal; a first, straight lateral side 15 which is vertical; a second, straight lateral side 16 which is raked backwards from a tip 17 of the probe body; and a lower side 18 whereby the probe body tapers
15 downwardly towards tip 17. As shown, side 18 is formed to have a stepped or staircase pattern, although it could, if desired, be a straight side.

Such a probe may be used in a system comprising a further such probe for testing automatically printed
20 circuit boards. Each of the probes would be movable automatically in two orthogonal (X and Y) horizontal directions and in the vertical (Z) direction. The probes would be moved to contact specific points on the printed circuit board for the purpose of automatically
25 making resistive and/or capacitive checks under the control of a computer. For example, two such probes may be used in apparatus as described in International Application No. PCT/GB89/01216.

By virtue of the side 16 of the probe body 11
30 raking back at an angle to the vertical from the tip 17, if this side is out of parallel with the vertical, it will not cause two such probe bodies to make contact with each other when they come in close proximity.

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The horizontal dimension of tip 17 determines the minimum size of electrical pad with which contact can safely be made without shorting out an adjacent pad. In conjunction with the thickness of the probe body 11, it determines the surface area contact that is made with a surface being tested.

By virtue of sides 16 and 18 of the probe body 11 whereby the latter tapers downwardly towards its tip 17, the probe body 11 can contact both an electrical pad with a small geometry and an electrical pad with a large geometry (without merely passing through the centre of the hole of the latter without making electrical contact with the pad). This is shown by way of Figures 9 and 10 respectively.

Although, as mentioned, the side 18 could be a straight edge, if it has a staircase shape as shown, this means that when making contact with a pad of large geometry, the probe body 11 is likely to catch on the edge of the hole via one of the steps of the staircase shape and not have a sideways bias which might occur with a straight edge in a similar circumstance.

As well as side 16 being raked back at an angle to the vertical from tip 17, also side 18 is raked back at an angle to the vertical from the tip 17. This is so that the probe body 11 does not make contact outside the tip 17 on a flat surface.

It is to be noted that the tip 17 is forward of the spring-loaded member 12 so that two such probes can come as close together as is practical at their probe body tips 17 in one horizontal direction - see Figure 7.

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The thickness of the probe body 11 determines how close two such probes can come together in an orthogonal horizontal direction when they are adjacent each other - see Figure 8.

5 In the light of the foregoing, it will be appreciated that: at least two such probes 7 can co-exist together and can be moved in both the X and Y directions such that their tips 17 can come into close proximity with each other in either the X or Y
10 direction; a motion of the tip 17 of the probe can be effected in purely the Z direction with minimum scrubbing action in the X and Y directions; and such a probe can adequately make contact with electrical pads
15 requirement to offset mechanically the centre of action of the probe tip.

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CLAIMS

1. An electrical testing probe comprising: a probe body which is generally laminar and which tapers downwardly to provide a contact portion; and a carrying member which carries said probe body.
5
2. An electrical testing probe according to claim 1, wherein said probe body is carried by said carrying member by resilient mounting means.
3. An electrical testing probe according to claim 2,
10 wherein said resilient mounting means comprises a sleeve carried by said carrying means and an elongate member extending from said probe body into said sleeve, said elongate member being held in a spring-loaded manner in said sleeve.
- 15 4. An electrical testing probe according to claim 3, wherein said carrying means carries a further sleeve, there being a further elongate member extending from said probe body, the further elongate member extending into and being slidable in said further sleeve and
20 serving to prevent rotation of said probe body with respect to said carrying means.
5. An electrical testing probe according to any preceding claim, wherein said probe body has an upper side, a first lateral side, a second lateral side and a
25 lower side, the lower side being at an angle of rake with respect to the vertical and the probe body tapering downwardly to a tip by virtue of said second lateral side and said lower side.
6. An electrical testing probe according to claim 5,
30 wherein said second lateral side is at an angle of rake

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with respect to the vertical.

7. An electrical testing probe according to claim 5 or 6, wherein said lower side has a stepped configuration.

FIG. 1.

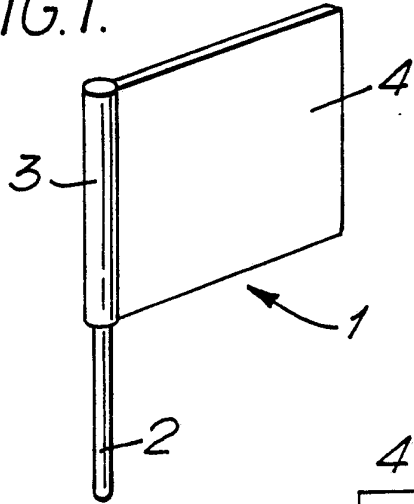


FIG. 2.

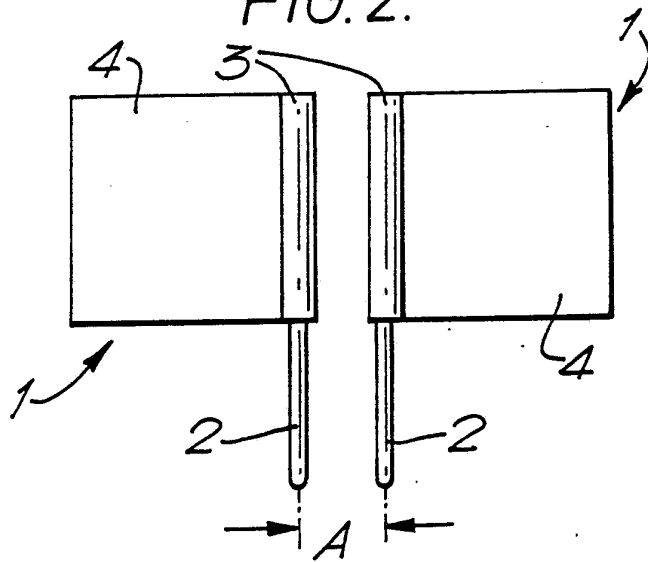


FIG. 3.

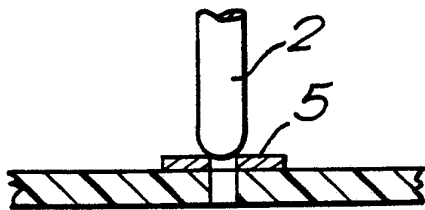
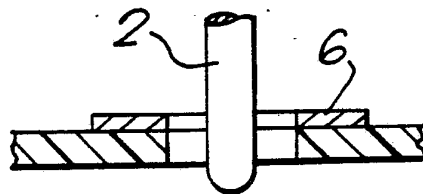


FIG. 4.



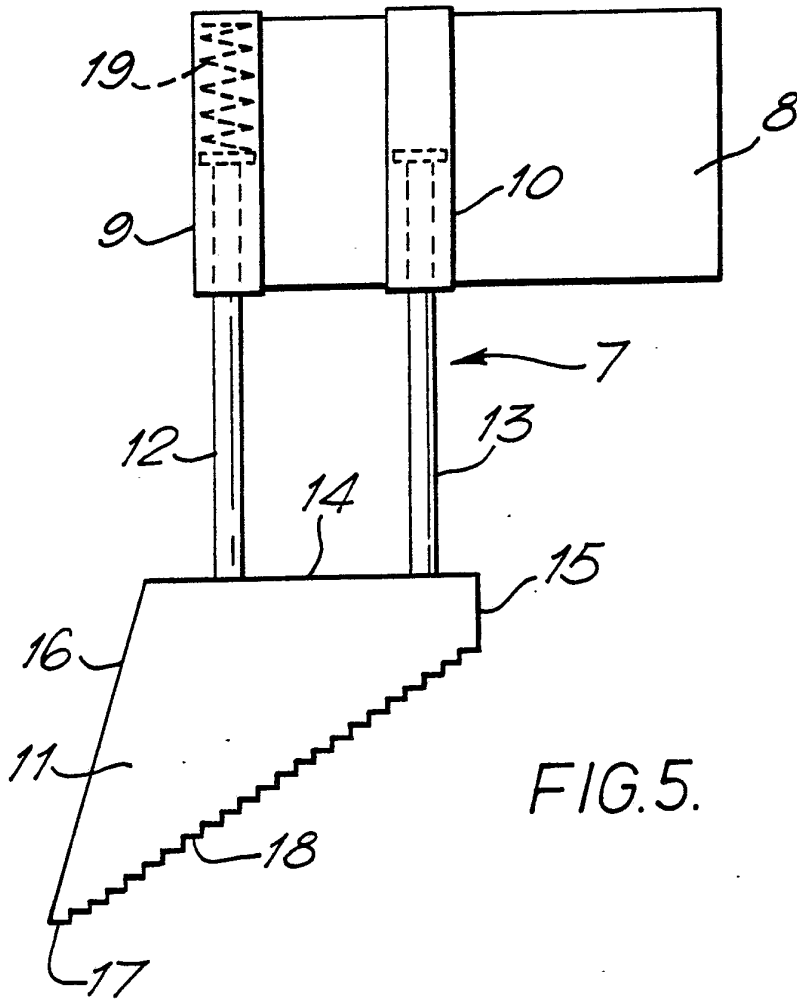


FIG. 5.

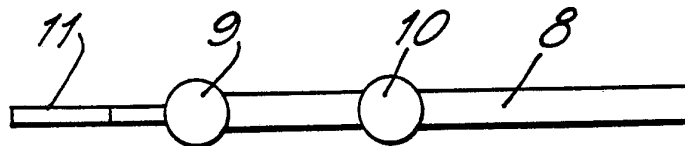
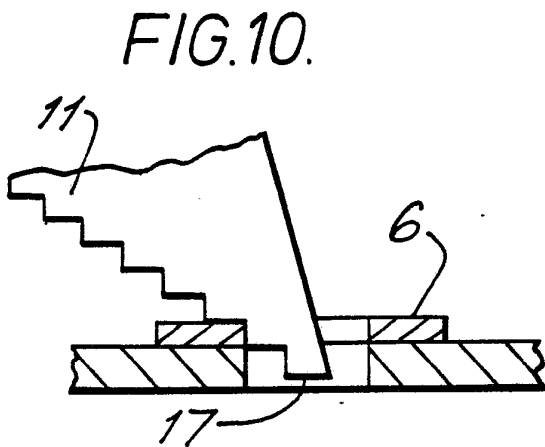
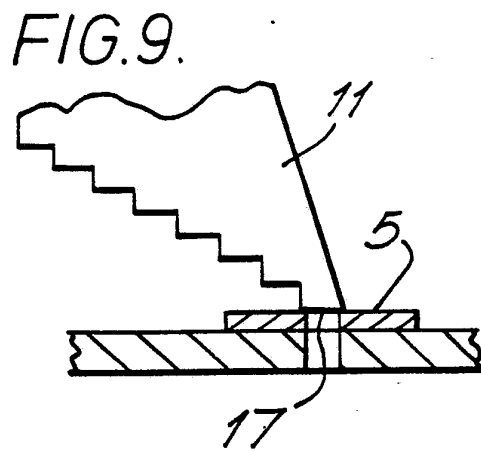
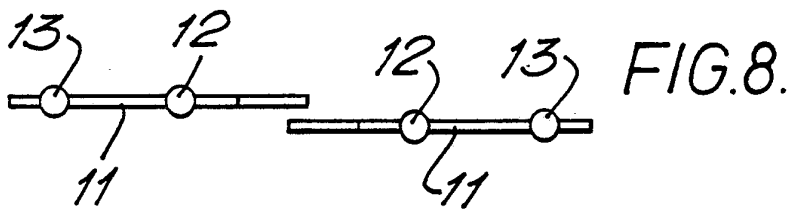
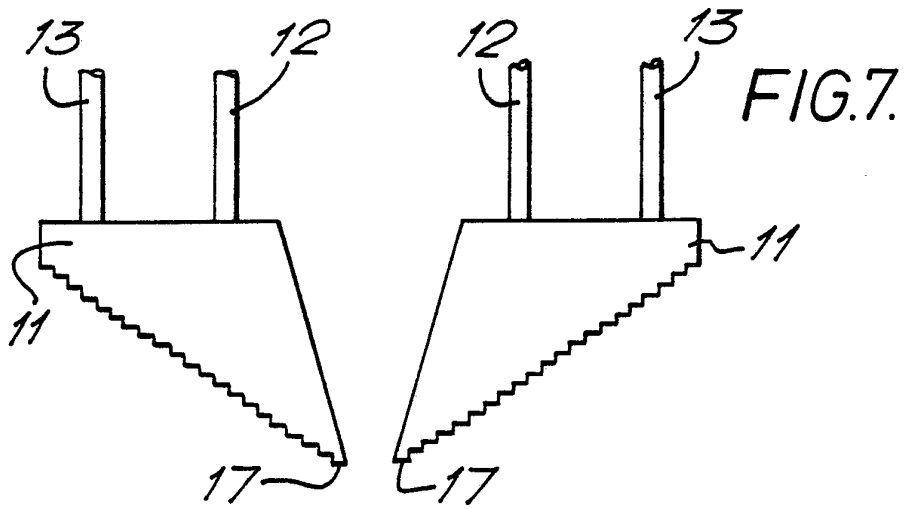


FIG. 6.



INTERNATIONAL SEARCH REPORT

International Application No **PCT/GB 89/01473**

I. CLASSIFICATION OF SUBJECT MATTER (If several classifications apply, indicate all) ¹				
According to International Patent Classification (IPC) or to both National Classification and IPC				
IPC5: G 01 R 1/067, H 01 R 11/18				
II. FIELDS SEARCHED				
Classification of IPC				
IPC5 G 01 R, H 01 R, H 05 K				
III. DOCUMENTS CONSIDERED TO BE RELEVANT²				
Category ³	Citation of Document, if with indication where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³		
X	US, A, 4773877 (G. KRÜGER ET AL) 27 September 1988, see the whole document	1-3,7		
A	--	4-6		
X	US, A, 4251772 (D.A. WURSHAM ET AL) 17 February 1981, see the whole document	1,2,5,6		
X	US, A, 3851249 (J.L. ROCH) 26 November 1974, see abstract	1,2,5,6		
<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none; vertical-align: top;"> <p>¹⁰ Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </td> <td style="width: 50%; border: none; vertical-align: top;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"Z" document member of the same patent family</p> </td> </tr> </table>			<p>¹⁰ Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>	<p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"Z" document member of the same patent family</p>
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IV. CERTIFICATION				
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III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
X	US, A, 4045737 (C.W. COBERLY) 30 August 1977, see abstract --	1,2,5,6
X	US, A, 4245189 (R.O. WAHL ET AL) 13 January 1981, see abstract -- -----	1-3

**ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO. PCT/GB 89/01473**

SA 33043

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 4773887	27/09/88	NONE	
US-A- 4251772	17/02/81	NONE	
US-A- 3851249	26/11/74	NONE	
US-A- 4045737	30/08/77	NONE	
US-A- 4245189	13/01/81	EP-A-B- 0021697 JP-A- 56004295	07/01/81 17/01/81

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