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For two-letter codes and other abbreviations, refer to the "Guid-
ance Notes on Codes and Abbreviations" appearing at the begin-
ning of each regular issue of the PCT Gazette.

(54) Title: OPTICAL INSPECTION OF SOLDER JOINTS

(57) Abstract: A new method of optical inspection of populated printed circuit boards (PCB), specifically of component leads and solder joints, is provided. At least a portion of the PCB being tested is illuminated with a beam of collimated light. A light detecting device detects specular reflection from the features being examined on the PCB for diagnostically useful patterns. For example, each properly soldered gull-wing lead produces three detectable reflections, each properly soldered J-type lead produces two detectable reflections, and each properly soldered rectangular lead produces one detectable reflection. Other PCB features produce other diag-
nostically useful reflections. An anomalous reflection indicates, for example, improper soldering or a misplaced component. The invention can be configured to inspect a plurality of leads simultaneously, allowing increased throughput.



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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US02/22282

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : G06K 9/00

US CL : 382/146, 150

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 382/146, 150

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
None.

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
None.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,690,417 A (POLIDOR et al) 25 November 1997 (25.11.1997), see entire document.	1-23, 25-36
Y	US 6,084,663 A (SENG) 04 July 2000 (04.07.2000), see entire document.	1-23, 25-36
Y	US 4,821,157 A (BIRK et al) 11 April 1989 (11.04.1989), see entire document.	1-23, 25-36
Y	US 5,038,258 A (KOCH et al) 06 August 1991 (06.08.1991), see entire document.	1-23, 25-36

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent published on or after the international filing date

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"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

"X"

document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"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

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document member of the same patent family

Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

International application No.

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Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☒ Claim Nos.: 24 and 37-39
because they relate to subject matter not required to be searched by this Authority, namely:
The claims were written to include both methods and a device in the same claim.
2. ☐ Claim Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claim Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of Item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
 2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
 3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
 4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
- Remark on Protest** ☐ The additional search fees were accompanied by the applicant's protest.
☐ No protest accompanied the payment of additional search fees.