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- (81) **Designated States (unless otherwise indicated, for every kind of national protection available):** AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.
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- Published:**  
 — with international search report (Art. 21(3))
- (88) **Date of publication of the international search report:**  
 18 April 2013

(54) **Title:** ELECTROMAGNETIC SHIELDING STRUCTURES FOR SHIELDING COMPONENTS ON A SUBSTRATE

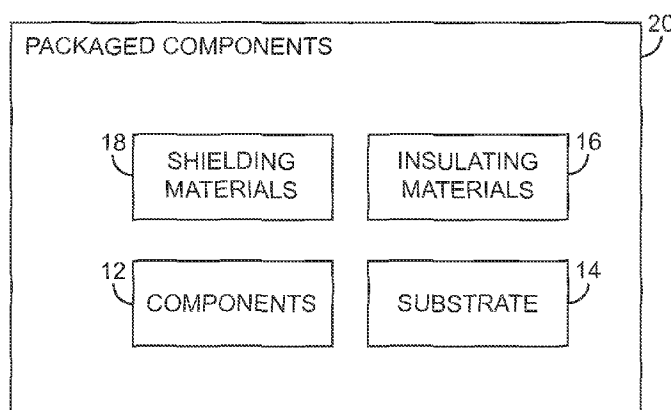


FIG. 2

(57) **Abstract:** Electronic components on a substrate may be shielded using electromagnetic shielding structures. Insulating materials may be used to provide structural support and to help prevent electrical shorting between conductive materials and the components. The shielding structures may include compartments formed using metal fences that surround selected components or by injection molding plastic. The shielding structures may be formed using metal foil wrapped over the components and the substrate. Electronic components may be tested using test posts or traces to identify components that are faulty. The test posts or traces may be deposited on the substrate and may be used to convey test signals between test equipment and the components. After successful testing, the test posts may be permanently shielded. Alternatively, temporary shielding structures may be used to allow testing of individual components before an electronic device is fully assembled.

# INTERNATIONAL SEARCH REPORT

International application No  
PCT/US2012/041256

A. CLASSIFICATION OF SUBJECT MATTER  
INV. H05K1/02 H05K9/00  
ADD.

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)  
H05K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No.  |
|-----------|------------------------------------------------------------------------------------|------------------------|
| X         | US 5 689 878 A (DAHRINGER DONALD WILLIAM [US] ET AL) 25 November 1997 (1997-11-25) | 1,2,<br>4-12,<br>14-17 |
| A         | the whole document                                                                 | 3                      |
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| A         | the whole document                                                                 | 2                      |
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|           | the whole document                                                                 |                        |



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 but published on or after the international filing date

"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)

"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

"&" document member of the same patent family

Date of the actual completion of the international search

13 September 2012

Date of mailing of the international search report

11/01/2013

Name and mailing address of the ISA/

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# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US2012/041256

## Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

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

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims 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. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

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

see additional sheet

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 fees, this Authority did not invite payment of additional fees.
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.:

see annex

### Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

**FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210**

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-17

A printed circuit board and method for forming electromagnetic shielding structures characterized in that a metal foil is wrapped over the electronic component.

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2. claims: 18-28

Electromagnetic shielding structures and forming method characterized by a heat-shrunk insulating structure covering the electronic components and formed by heating and molding tools.

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3. claims: 29-34

A method of forming electromagnetic shielding structures characterized by a cutting tool removing the sacrificial or excess region.

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4. claims: 35-40, 45-51

A method characterized by leaving a tip portion of a test post exposed from dielectric material for electrically contacting the tip portion to test the electronic component or to test an electronic component by contacting the metal traces through an opening in the dielectric layer.

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5. claims: 41-44

A method characterized by a dielectric material covering a test post.

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6. claims: 52-55

A method of forming an electrical system characterized by a conductive layer covering only partly the electronic components.

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7. claims: 56-59

A printed circuit board characterized by a metal foil lid on metal fence structures surrounding the electronic components.

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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2012/041256

| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s) | Publication<br>date         |
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