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Declarations under Rule 4.17:

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))

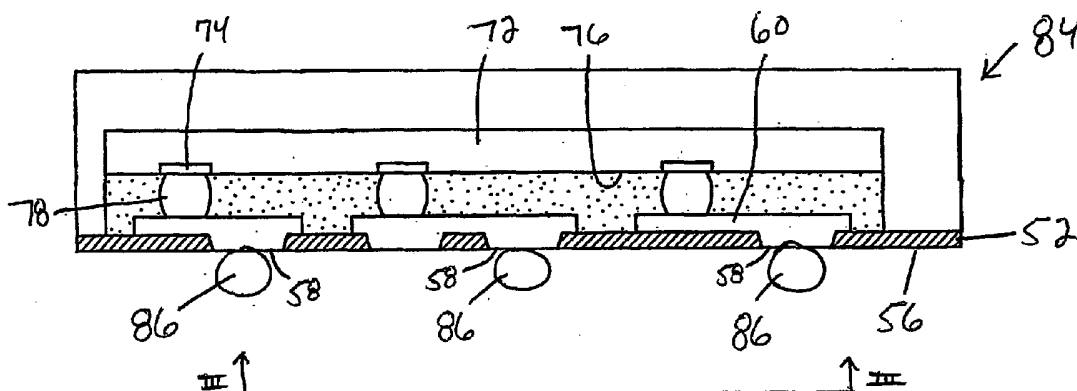
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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: MICROELECTRONIC PACKAGE STRUCTURE WITH SPHERICAL CONTACT PINS



(57) Abstract: A microelectronic package includes a microelectronic element having faces and contacts, and a flexible substrate spaced from and overlying a first face of the microelectronic element, the flexible substrate having conductive pads facing away from the first face of the microelectronic element. The package includes a plurality of spheres attached to the conductive pads of the flexible substrate and projecting away from the first face of the microelectronic element, each sphere having a contact surface remote from the conductive pads, the contact surfaces of the spheres including a contact metal devoid of solder. The package also includes a plurality of support elements disposed between the microelectronic element and the substrate for supporting the flexible substrate over the microelectronic element, the spheres being offset from the support elements.

INTERNATIONAL SEARCH REPORT

International application No
US2005/022750

A. CLASSIFICATION OF SUBJECT MATTER
H01L23/498 H01L21/48

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)
H01L

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 practical, search terms used)

EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2004/110319 A1 (FUKUTOMI NAOKI 'JP! ET AL) 10 June 2004 (2004-06-10) paragraph '0128!; figure 2	1,6-22, 24,30
Y	US 5 912 505 A (ITOH ET AL) 15 June 1999 (1999-06-15)	9,24
A	the whole document	2,25,31
Y	US 6 573 458 B1 (MATSUBARA HIDESHI ET AL) 3 June 2003 (2003-06-03) column 4, line 8 - column 5, line 56; figures 1,2	1,6-22, 24,30
Y	US 6 077 380 A (HAYES ET AL) 20 June 2000 (2000-06-20) *See Fig. 8 and accompanying description*	9,24
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☒ 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 document 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

21 February 2006

Date of mailing of the international search report

10/03/2006

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INTERNATIONAL SEARCH REPORT

II International application No
JS2005/022750

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5 186 381 A (KIM ET AL) 16 February 1993 (1993-02-16) the whole document -----	9
Y	US 3 900 153 A (BEERWERTH ET AL) 19 August 1975 (1975-08-19) the whole document -----	15

INTERNATIONAL SEARCH REPORT

national application No.
PCT/US2005/022750

Box 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 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 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.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1,6-23,30,31

Contact surfaces of said spheres comprise a contact metal devoid of solder.

2. claims: 2-5,24-29

A second sphere is formed on the first sphere.

Reasons.

1.From D1 (see below; paragraph 128; figure 2) a microelectronic package is known comprising:
a microelectronic element having faces and contacts;
a flexible substrate 6,9 spaced from and overlying a first face of said microelectronic element, said flexible substrate having conductive pads facing away from said first face of said microelectronic element;
a plurality of balls 7 attached to said conductive pads of said flexible substrate and projecting away from the first face of said microelectronic element, each said ball having a contact surface remote from said conductive pads, and
a plurality of support elements 8 disposed between said microelectronic element and said substrate for supporting said flexible substrate over said microelectronic element; said balls being offset from said support elements.
The subject-matter of claim 1 differs therefrom in that:
the balls are spheres;
said contact surfaces of said balls comprise a contact metal devoid of solder.

The subject-matter of claim 24 differs therefrom in that:
the balls are spheres;
a second ball is formed on the first ball.

The feature of using a sphere for an electrical contact between a microelectronic element and a substrate is however known from D2-D4. There is no common inventive concept provided by "sphere". The remaining features above solve different problems (viz. good contact to test board (page 11, lines 20-30); accommodating non-planar contact pads (page 9, second paragraph), and solve no common inventive concept, contrary to Rule 13.

Therefore the groups of non-unitary inventions are:

1. Claims 1, 6-23, 30, 31. Contact surfaces of said spheres comprise a contact metal devoid of solder.
2. Claims 2-5, 24-29. A second sphere is formed on the first sphere.

2.Reference is made to the following documents:

D1:US-A-2004/0110319
D2:US-A-5912505
D3:US-A-6573458
D4:US-A-6077380

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

US2005/022750

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2004110319 A1	10-06-2004	US 2002094606 A1	18-07-2002
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