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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(U))
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(Ui))

Published:

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

(88) Date of publication of the international search report:

9 October 2008

(54) Title: ARRAY-PROCESSED STACKED SEMICONDUCTOR PACKAGES

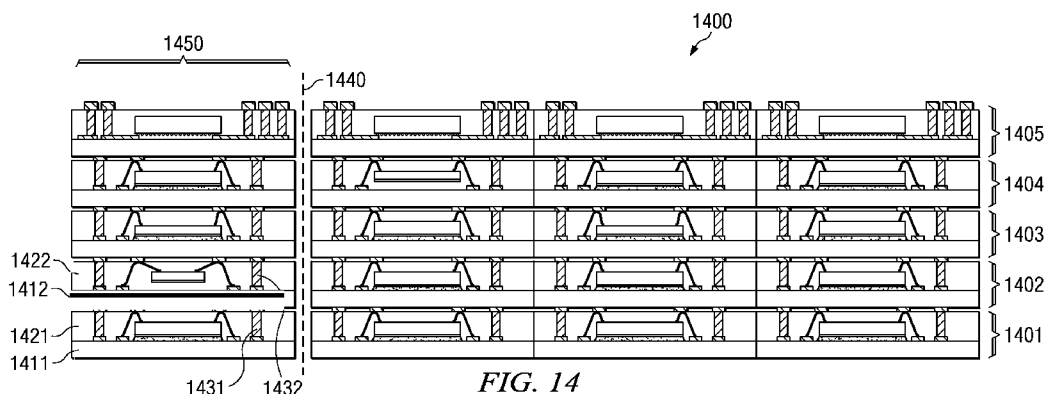


FIG. 14

(57) Abstract: One embodiment of the invention is a semiconductor system (1400) of arrays (1401, 1402, etc.) of packaged devices. Each array includes a sheet-like substrate (1411, 1412, etc.) made of insulating material integral with conductive horizontal lines and vertical vias, and terminals on the surfaces. Semiconductor components, which may include more than one active or passive chips, or chips of different sizes, are attached to the substrate; the electrical connections may include flip-chip, wire bond, or combination techniques. Encapsulation compound (1412, 1422, etc.), which adheres to the substrate, embeds the connected components. Metal posts (1431, 1432, etc.) traverse the encapsulation compound vertically, connecting the substrate vias with pads on the encapsulation surface. The pads are covered with solder bodies used to connect to the next-level device array so that a three-dimensional system of packaged devices is formed.

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INTERNATIONAL SEARCH REPORT

International application No

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A CLASSIFICATION OF SUBJECT MATTER

IPC HOIL 23/02(2006 01),23/48(2006 01),23/52(2006 01),23/04(2006 01),23/12(2006 01),23/538(2006 01),21/44(2006 01),21/48(2006 01),21/50(2006 01)

USPC 257/678,685,686,690,698,E23 003,E23 011,E23 173,E23 174,438/106, 107, 109, 126,127

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 257/678, 685, 686, 690, 698, E23 003, E23 011, E23 173, E23 174, 438/106, 107, 109, 126, 127

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)

Search EAST Database

C DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No
X	US Pub 2005/0184377 A1 (TAKEUCHI et al) 25 August 2005 (25 08 2005), Figs 1 and 13	1-5
Y	US Pub 2006/0128060 A1 (KURITA) 15 June 2006 (15 06 2006), Figs 1-3 and [0029-0051]	6-12
Y	US Pub 2005/016781 1 A1 (FRECH et al) 04 August 2005 (04 08 2005), Fig 3	6-12

☐ 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

"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

01 August 2008 (01 08 2008)

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12 AUG 2008

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INTERNATIONAL SEARCH REPORT

International application No

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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
Please See Continuation 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 additional fees, this Authority did not invite payment of any 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
- 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

INTERNATIONAL SEARCH REPORT

International application No
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BOX III. OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claim(s) 1-5, drawn to semiconductor device

Group II, claim(s) 6-12, drawn to a method of making a semiconductor device

The inventions listed as Groups I and II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons. Group I claims pertain to a semiconductor device while the Group II claims pertain to a method of making the semiconductor device and also including additional technical features such as reflowing metal. The terminals of Group I invention could be attached by another process such as compression bonding instead of reflowing.