

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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*Ex parte* KUM FOO LEONG,  
SIEW FONG TAI,  
and CHEE KEY CHUNG

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Appeal 2008-1786  
Application 10/610,168  
Technology Center 2800

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Decided: July 28, 2008

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Before BRADLEY R. GARRIS, CHUNG K. PAK, and  
ROMULO H. DELMENDO, *Administrative Patent Judges*.

GARRIS, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellants appeal under 35 U.S.C. § 134 from the Examiner's decision rejecting claims 1, 3-13 and 27-40. We have jurisdiction under 35 U.S.C. § 6.

We REVERSE.

Appellants claim a ball grid array device comprising an array of pads having a barrier layer thereon wherein the pads and/or barrier layer are made of a material that forms an intermetallic material with a solder. (Claims 1, 28, 38.) The materials of the barrier layer and pads form first and second intermetallic compounds with the solder at first and second rates to thereby form a finger extending into the solder ball of the ball grid array device (claim 28). Such fingers are said to isolate fatigue and brittle cracks so that the solder ball will remain commutatively coupled (Spec. para. bridging 9-10).

Representative claims 1, 28, and 38, which are all the independent claims on appeal, are reproduced from the claim appendix of the Appeal Brief as follows:

1. A ball grid array device comprising:

a substrate, further including:

a first major surface; and

a second major surface; and

an array of pads positioned on one of the first major surface or the second major surface, at least some of the pads including a barrier layer thereon, the barrier layer made of a material that forms an intermetallic material with a solder, the barrier layer having a plurality of openings therein over the surface of at least one of the array of pads.

28. The ball grid array device comprising:

a substrate, further including:

a first major surface; and

a second major surface;

an array of pads positioned on one of the first major surface or the second major surface, at least some of the pads including a barrier layer. [sic]

a solderball formed on the pads having a barrier layer, wherein the barrier layer has a plurality of openings therein, the barrier layer material forming a first intermetallic compound with the solder at a first rate, and the pad material forming a second intermetallic compound with the solder at a second rate, and

wherein one of the first intermetallic compound and the second intermetallic compound forms a finger extending from the plurality of openings in the barrier layer and into the solderball further from the barrier than the other of the first intermetallic compound and the second intermetallic compound.

38. The ball grid array device comprising:

a substrate, further including:

a first major surface; and

a second major surface; and

an array of pads positioned on one of the first major surface or the second major surface, at least some of the pads including:

a first material capable of forming a first intermetallic material with a solder; and

a second material capable of forming a second intermetallic material with a solder, the first and second material at the exposed surface of the pad.

The references set forth below are relied upon by the Examiner as evidence of anticipation and obviousness:

Riseman	3,617,816	Nov. 2, 1971
Farnworth	6,980,017 B1	Dec. 27, 2005

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Independent claims 1 and 38, as well as dependent claims 3, 4, 8, 13, 37, and 39, are rejected under 35 U.S.C. § 102(e) as being anticipated by Farnworth.

Independent claim 28, as well as dependent claims 5-7, 27, 29-33, 35, 36 and 40, are rejected under 35 U.S.C. § 102(e) as being anticipated by or alternatively under 35 U.S.C. § 103(a) as being obvious over Farnworth.

Finally, dependent claims 9-12 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Farnworth, and claims 7 and 34 are correspondingly rejected over Farnworth in view of Riseman.

For the reasons which follow, we cannot sustain any of these rejections.

In the § 102 rejection of independent claims 1 and 38, the Examiner finds that Farnworth discloses “a BGA device having substrate 12B (figs. 7A-7G), a first major surface and a second major surface; and an array of pads 54B (figs 7A-7C) positioned on one of the major surfaces; and at least some pads 54B including a barrier layer 46B (fig. 7B-7C) made of a material capable of forming an intermetallic material with the solder 16 (fig. 9C)” (Ans. 3). This finding is erroneous in a number of respects.

First, the Farnworth disclosure generally and the Figure 7 disclosure specifically are not directed to a BGA device but instead to an interconnect for making temporary electrical connections with bumped contacts on semiconductor components such as BGA devices (Abstract, col. 1, ll. 7-16; col. 9, ll. 46-50).

Second, and more importantly, the record contains no support for the Examiner’s finding that Farnworth’s layer 46B is “made of a material capable of forming an intermetallic material with a solder 16” (Ans. 3). To

the contrary, the record reflects that the material of layer 46B is not capable of forming an intermetallic material with solder 16. This is because the material of layer 46B is disclosed as not solder wettable (col. 7, ll. 7-11) which undermines the Examiner's finding as explained by Appellants (App. Br. 9). This finding is similarly undermined by the fact that the specific material such as titanium disclosed by Farnworth for making layer 46B does not include the specific material such as nickel disclosed by Appellants for making the claim 1 barrier layer. Finally, the solder of Farnworth's bumped contacts 16 only temporarily engages layer 46B of interconnect 10 via an external biasing force (col. 6, ll. 33-39). This is entirely dissimilar from the solder reflow conditions used by Appellants to form the intermetallic material of the claimed invention (Spec., para. bridging 5-6).

Since Farnworth does not expressly teach forming the claimed intermetallic material and does not use the barrier layer material or the conditions used by Appellants in forming the claimed intermetallic material, unacceptable speculation appears to be the basis for the Examiner's finding that the material of patentee's layer 46B is capable of forming an intermetallic material with solder. *See In re Warner*, 379 F.2d 1011, 1017 (CCPA 1967), *cert. denied*, 389 U.S. 1057 (1968) (a prior art rejection must rest on a factual basis not speculation).

The above discussed erroneous findings are relied upon by the Examiner in rejecting all three independent claims on appeal (regarding independent claims 1 and 38, *see* the last two full paras. at Ans. 3; regarding independent claim 28, *see* the para. bridging Ans. 5-6). For this reason alone, the rejections of these independent claims and of the claims which

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depend therefrom cannot be sustained. Therefore, we reverse each of the § 102 and § 103 rejections advanced by the Examiner in this appeal.

The decision of the Examiner is reversed.

REVERSED

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