

THIS OPINION WAS NOT WRITTEN FOR PUBLICATION

The opinion in support of the decision being entered today (1) was not written for publication in a law journal and (2) is not binding precedent of the Board.

Paper No. 28

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte JOHN S. FITCH
and
WILLIAM R. HAMBURGEN

Appeal No. 1998-1504
Application 08/373,718

ON BRIEF

Before BARRETT, HECKER, and LALL, *Administrative Patent Judges*.

HECKER, *Administrative Patent Judge*.

DECISION ON APPEAL

This is a decision on appeal from the final rejection of claims 1, 2, 7, 11 and 13, all claims pending in this application.

The invention relates to a semiconductor package wherein one side of the semiconductor die is left exposed, and thermally conductive fins are independently attached to the exposed side. In particular, referring to Figure 1, semiconductor die 110 is surrounded by dielectric package 130 except for its inactive surface. Thermally conductive fins 140 are independently attached to either the die or an optional metalized layer 112.

Independent claim 1 is reproduced as follows:

1. A semiconductor package, comprising:

a die including electrical circuits;

means for connecting the electrical circuits to a power source;

a package made of a dielectric material, the package having the die and the means for connecting mounted therein such that a portion of the die forms an exterior surface of the package;

a plurality of independent fins to dissipate heat into an environment external to the package, the plurality of independent fins made of a thermally conductive material; and

means for independently attaching each of the plurality of independent fins to the portion of the die which forms the exterior surface of the package to provide a direct thermal path between the die and the plurality of independent fins positioned entirely outside the package to provide a low stress thermal joint between the plurality of independent fins and the die.

Appeal No. 1998-1504
Application 08/373,718

The Examiner relies on the following references:

Pitasi	4,682,269	Jul. 21, 1987
Davidson et al.	5,216,580	Jun. 1, 1993
Lin et al.	5,450,283	Sep. 12, 1995

(filed Jan. 10, 1994)

Claims 1, 2, 7 and 13 stand rejected under 35 U.S.C. § 103 as being unpatentable over Lin in view of Pitasi.

Claim 11 stands rejected under 35 U.S.C. § 103 as being unpatentable over Lin in view of Pitasi, and further in view of Davidson.

Rather than reiterate the arguments of Appellants and the Examiner, reference is made to the brief, reply brief and answer for the respective details thereof.

OPINION

After a careful review of the evidence before us, we will not sustain the rejection of claims 1, 2, 7, 11 and 13 under 35 U.S.C. § 103.

The Examiner has failed to set forth a *prima facie* case. It is the burden of the Examiner to establish why one having ordinary skill in the art would have been led to the claimed invention by the reasonable teachings or suggestions

Appeal No. 1998-1504
Application 08/373,718

found in the prior art, or by a reasonable inference to the artisan contained in such teachings or suggestions. **In re Sernaker**, 702 F.2d 989, 995, 217 USPQ 1, 6 (Fed. Cir. 1983).

"Additionally, when determining obviousness, the claimed invention should be considered as a whole; there is no legally recognizable 'heart' of the invention." **Para-Ordnance Mfg. v. SGS Importers Int'l, Inc.**, 73 F.3d 1085, 1087, 37 USPQ2d 1237, 1239 (Fed. Cir. 1995) (*citing W. L. Gore & Assocs., Inc. v. Garlock, Inc.*, 721 F.2d 1540, 1548, 220 USPQ 303, 309 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984)).

With regard to the rejection of claim 1, the Examiner reasons that Lin discloses the claimed semiconductor package with die 18 forming an exterior surface. Since Lin discloses at column 5, lines 24-28 that a heat radiator, heat sink, cold plate or the like can be directly attached to the backside 22 of die 18, it would have been obvious to use Pitasi's heat dissipation pins 24 on Lin's die 18. (Final rejection-paragraph 3.)

Appellants argue:

There is no evidence that Lin et al. even considered the use of multiple fins, let alone independent

fins, each of which is independently attached to the die, as recited in claim 1. Pitasi does not cure these deficiencies. Rather, Pitasi likewise teaches a single heat dissipator 14 formed as a plate 20 to which pins 24 are attached. Although Pitasi teaches the use of a plurality of independent pins, **each pin is not independently attached to the substrate 10**, but rather attached as a group via the heat dissipator 14 by adhesive layer 22. Hence, the means for independently attaching, as recited, in claim 1, and thus the recited multiple independent fins which are independently

attached to a die, are lacking in the applied art combination, both in terms of what is disclosed and what would be motivated by that which is disclosed. [Reply brief-page 5.] [Emphasis added.]

The Examiner's position is "One skilled in the thermal art would realize that a heat radiator, heat sink or cold plate can be composed of numerous parts as norm in the thermal enhancement art." (Answer-page 4.)

We understand and agree with the Examiner that a heat sink may be composed of several parts. However, as Appellants have argued, Pitasi has preassembled these parts (i.e., pins 24) and attached them to substrate 10 as a unit 14, **not independently**, as claimed. We note the operative language of claim 1 as follows:

Appeal No. 1998-1504
Application 08/373,718

means for **independently attaching** each of the plurality of independent fins **to the portion of the die** which forms the exterior surface of the package...[emphasis added]

Thus, we will not sustain the Examiner's rejection of claim 1. Since Davidson also does not cure this deficiency in the rejection, and the remaining claims on appeal contain the above limitation discussed with regard to claim 1, we will not sustain the rejection as to these claims.

Although moot, we make the following comments.

With respect to claim 2, we find that Pitasi does teach the use of a metalized layer to solder pins to a surface, and that the claim is not limited to a single layer as alleged in the brief at page 10. Also, we find no basis to limit Lin to a single heat radiator (brief-page 11), there is no hint as to a single or plural preference in Lin. However, Lin does express a preference for a thin package (column 2, lines 1-3; column 6, line 67 to column 7, line 1) which would be contrary to using fins which add substantial thickness, and weighs against the Examiner's combination. Furthermore, we find difficulty in applying Davidson which is a unitary structure of several heat pipes, making it contrary to the "means for independently attaching" of claim 1. With regard to means for connecting to a power source being located within the package (brief-page 15), we view solder bumps 26 as meeting such a limitation. Finally, we find that Pitasi's control of heat enhancement via pin density (answer-page 4) does not meet the language of claim 13's "predetermined power distribution of the die to selectively control the heat gradient of the die."

The Federal Circuit states that "[t]he mere fact

Appeal No. 1998-1504
Application 08/373,718

that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification." **In re Fritch**, 972 F.2d 1260, 1266 n.14, 23 USPQ2d 1780, 1783-84 n.14 (Fed. Cir. 1992), **citing In re Gordon**, 733 F.2d 900, 902, 221 USPQ 1125, 1127 (Fed. Cir. 1984). "Obviousness may not be established using hindsight or in view of the teachings or suggestions of the inventor." **Para-Ordnance Mfg. v. SGS Importers Int'l**, 73 F.3d at 1087, 37 USPQ2d at 1239, **citing W. L. Gore & Assocs., Inc. v. Garlock, Inc.**, 721 F.2d at 1551, 1553, 220 USPQ at 311, 312-13.

As pointed out above, Pitasi does not teach or suggest the means for independently attaching fins to a semiconductor die or equivalent thereof, a limitation of all the claims. Since there is no evidence in the record that the prior art suggested the desirability of such a modification, we will not sustain the Examiner's rejection of the claims.

Appeal No. 1998-1504
Application 08/373,718

We have not sustained the rejection of claims 1, 2, 7, 11 and 13 under 35 U.S.C. § 103. Accordingly, the Examiner's decision is reversed.

REVERSED

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LEE E. BARRETT))
Administrative Patent Judge)	
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)	BOARD OF PATENT
STUART N. HECKER)	
Administrative Patent Judge)	APPEALS AND
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)	INTERFERENCES
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PARSHOTAM S. LALL)	
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Appeal No. 1998-1504
Application 08/373,718

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