UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte ROGER LAM, WAI MON MA,
VINCENT L. MONTALBANO, ARCH NUTTALL,
and NANDU N. RANADIVE

Appeal 2007-0998
Application 10/708,066
Technology Center 2800

Decided: June 11, 2007

Before KENNETH W. HAIRSTON, JOSEPH L. DIXON, and JOHN A. JEFFERY, *Administrative Patent Judges*.

JEFFERY, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellants appeal under 35 U.S.C. § 134 from the Examiner's rejection of claims 1-20. We have jurisdiction under 35 U.S.C. § 6(b). We affirm.

STATEMENT OF THE CASE

Appellants invented a structure for attaching a heat sink to a semiconductor chip or package via a thermal interface layer. Specifically, spacer members are adhered between the substrate and the heat sink. By adhesively bonding the spacer members to the structure, the thermal interface layer need not include adhesive. As a result, the thermal interface layer can comprise materials with higher thermal conductivity. Moreover, removing the heat sink with such a structure will not damage the chip or the module.[1] Claim 1 is illustrative:

l. A heat sink attachment structure, comprising:

an integrated circuit chip mounted on a substrate surface;

a thermal interface layer in contact with said integrated circuit chip;

a heat sink in contact with said thermal interface layer; and

at least one spacer member in contact between said substrate surface and said heat sink, wherein said at least one spacer member is provided with an adhesive material on top and bottom surfaces thereof.

The Examiner relies on the following prior art references to show unpatentability:

Toy	US 6,218,730 B1	Apr. 17, 2001
Boyer	US 6,730,993 B1	May 4, 2004 (filed Jul. 26, 2001)

The Examiner's rejections are as follows:

1. Claims 1, 4, 6, 8, 11, 14, 17, and 19 are rejected under 35 U.S.C.

[1] *See generally* Specification ¶¶ 0020-21; 0026.

§ 102(b) as being anticipated by Toy.

2. Claims 3, 5, 7, 10, 12, 13, 16, 18, and 20 are rejected under 35 U.S.C. § 103(a) as unpatentable over Toy.
3. Claims 2, 9, and 15 are rejected under 35 U.S.C. § 103(a) as unpatentable over Toy in view of Boyer.

Rather than repeat the arguments of Appellants or the Examiner, we refer to the Briefs and the Answer for their respective details. In this decision, we have considered only those arguments actually made by Appellants. Arguments which Appellants could have made but chose not to make in the Briefs have not been considered and are deemed to be waived. *See* 37 C.F.R. § 41.37(c)(1)(vii).

Regarding representative claim 1,[2] the Examiner has indicated how the claimed invention is deemed to be fully met by the disclosure of Toy (Answer 3). Appellants argue that Toy does not teach or suggest at least one spacer member *in contact between* the substrate surface *and the heat sink* as claimed (emphasis in original).

Specifically, Appellants dispute the Examiner's characterization of element 20 in Toy as a "heat sink." Appellants emphasize that element 20 is not a heat sink, but rather a lid that protects the chip. Appellants further note that Toy explicitly discloses a heat sink 50 in Fig. 1. Although Appellants acknowledge that lid 20 can act as a thermal spreader, Appellants contend that a thermal spreader is not equivalent to a heat sink. According to Appellants, a thermal spreader more evenly distributes heat via conduction

[2] Appellants argue claims 1, 4, 6, 8, 11, 14, 17, and 19 together as a group (Br. 3-5). Accordingly, we select independent claim 1 as representative. *See* 37 C.F.R. § 41.37(c)(1)(vii).

only, but a heat sink facilitates cooling by dissipating distributed heat from the structure to the ambient via conduction and convection (Br. 4-5; Reply Br. 4-5).

The Examiner argues that element 20 in Toy inherently functions as a heat sink since it not only distributes heat more evenly, but also dissipates heat to the surrounding environment. In this regard, the Examiner notes that one embodiment of Toy provides an extended surface for element 20 that dissipates heat (Answer 4-5). Appellants respond that this embodiment of Toy would not significantly increase the cooling rate with respect to smaller lids, but would rather spread heat conducted to the lid throughout a larger structure (Reply Br. 5).

For the reasons that follow, we affirm.

ISSUES

(1) Have Appellants established that the Examiner erred in interpreting lid 20 as a "heat sink" as recited in representative claim 1?

(2) Have Appellants persuasively rebutted the Examiner's prima facie case of obviousness for claims 2, 3, 5, 7, 9, 10, 12, 13, 15, 16, 18, and 20?

FINDINGS OF FACT

At the outset, we note that the Examiner's findings regarding the specific teachings of Toy and Boyer (Answer 3-4) are not in dispute except with respect to the Examiner's interpretation of lid 20 in Toy as a "heat sink" noted above. Accordingly, we will adopt the Examiner's factual findings regarding the cited references as they pertain to the undisputed claim limitations.

Toy discloses an electronic chip assembly comprising a single chip module with chip device 16 connected to substrate 10 and lid 20. Heat sink 50 is mounted to the lid 20 via conductive adhesive 51 (Toy, col. 5, ll. 42-44; Fig. 1).[3] Lid 20 is made of a material with high thermal conductivity (e.g., aluminum) (Toy, col. 2, ll. 1-2) and can have integral standoffs 21 (Toy, col. 5, ll. 63-66; col. 6, l. 9). In one embodiment, lid 20 has a greater horizontal extent than the lid in Fig. 4 and also functions as a thermal spreader (Toy, col. 8, ll. 4-6; Figs. 4-5).

PRINCIPLES OF LAW

Anticipation is established only when a single prior art reference discloses, expressly or under the principles of inherency, each and every element of a claimed invention as well as disclosing structure which is capable of performing the recited functional limitations. *RCA Corp. v. Applied Digital Data Systems, Inc.*, 730 F.2d 1440, 1444, 221 USPQ 385, 388 (Fed. Cir. 1984); *W.L. Gore and Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 1554, 220 USPQ 303, 313 (Fed. Cir. 1983).

In rejecting claims under 35 U.S.C. § 103, it is incumbent upon the Examiner to establish a factual basis to support the legal conclusion of obviousness. *See In re Fine*, 837 F.2d 1071, 1073, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988). In so doing, the Examiner must make the factual determinations set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 17, 148 USPQ 459, 467 (1966). Furthermore, "'there must be some articulated

[3] Although the heat sink 50 is illustrated only in Fig. 1 of Toy, the heat sink is nevertheless included in other embodiments shown in Figs. 2-5 (Toy, col. 5, ll. 55-58).

reasoning with some rational underpinning to support the legal conclusion of obviousness' . . . . [H]owever, the analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ." *KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1741, 82 USPQ2d 1385, 1396 (2007) (quoting *In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006)).

If the Examiner's burden is met, the burden then shifts to the Appellants to overcome the prima facie case with argument and/or evidence. Obviousness is then determined on the basis of the evidence as a whole and the relative persuasiveness of the arguments. *See In re Oetiker*, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992).

ANALYSIS

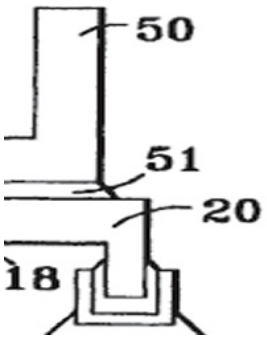
The Anticipation Rejection

We will sustain the Examiner's anticipation rejection of representative claim 1. We agree with the Examiner that the lid 20 inherently functions as a "heat sink" as claimed notwithstanding Toy's providing a separate heat sink 50.

First, lid 20 is made of a material with high thermal conductivity, such as aluminum (Toy, col. 2, ll. 1-2). Second, although lid 20 functions as a thermal spreader (Toy, col. 8, ll. 5-6), it also would inherently dissipate heat to the ambient in view of (1) the lid's structure itself, and (2) its relationship to other components in the assembly.

As best seen in Fig. 1, the heat sink 50 is mounted to the lid 20 via conductive adhesive 51 (Toy, col. 5, ll. 42-44; Fig. 1). Significantly, the lid

extends farther horizontally as compared to the heat sink. As a result, at least the edges of lid 20 (i.e., those portions that are not covered by the heat sink 50) are exposed to the ambient. In our view, this direct exposure of the lid's edges to the ambient would inherently dissipate heat to the ambient at least at these regions. The relevant portion of Fig. 1 of Toy detailing this region has been enlarged below for clarity.



Enlarged Detail View of Relevant Portion of Fig. 1 of Toy

In short, although Toy provides a heat sink 50, the lid 20 also functions inherently as a heat sink as claimed since it (1) spreads heat more evenly via conduction, and (2) dissipates heat to the ambient. For this reason alone, we conclude that the Examiner's finding that the lid fully meets a "heat sink" as claimed is reasonable.

The embodiment of Fig. 5 of Toy -- an embodiment where lid 20 has even a greater horizontal extent than the lid in Fig. 4 -- only reinforces this conclusion. Appellants' contention that such an extension would not significantly increase the cooling rate over smaller lids is merely speculative without evidentiary support. Mere lawyer's arguments and conclusory statements that are unsupported by factual evidence are entitled to little

probative value. *In re Geisler*, 116 F.3d 1465, 1470, 43 USPQ2d 1362, 1365 (Fed. Cir. 1997); *see also In re De Blauwe*, 736 F.2d 699, 705, 222 USPQ 191, 196 (Fed. Cir. 1984). In any event, increasing the horizontal extent of the lid in the embodiment of Fig. 5 would increase the lid's surface area -- surface area that, at least in part, dissipates heat to the ambient as indicated above.

Since we find the Examiner's interpretation of "heat sink" as reasonable, and all other limitations of representative claim 1 are fully met by Toy, we will sustain the Examiner's rejection of that claim. Since Appellants have not separately argued the patentability of claims 4, 6, 8, 11, 14, 17, and 19, these claims fall with representative claim 1. *See In re Nielson*, 816 F.2d 1567, 1572, 2 USPQ2d 1525, 1528 (Fed. Cir. 1987); *see also* 37 C.F.R. § 41.37(c)(1)(vii).

The Obviousness Rejections

We will also sustain the Examiner's obviousness rejections of (1) claims 3, 5, 7, 10, 12, 13, 16, 18, and 20 over the teachings of Toy, and (2) claims 2, 9, and 15 over Toy in view of Boyer.

We find that the Examiner has established at least a prima facie case of obviousness of those claims that Appellants have not persuasively rebutted. Specifically, the Examiner has (1) pointed out the teachings of Toy, (2) noted the perceived differences between Toy and the claimed invention, and (3) reasonably indicated how and why the reference would have been modified to arrive at the claimed invention (Answer 3-4). Once the Examiner has satisfied the burden of presenting a prima facie case of obviousness, the burden then shifts to Appellants to present evidence or

arguments that persuasively rebut the Examiner's prima facie case. Here, Appellants merely noted that the Examiner failed to make a prima facie case of anticipation based on Toy for the independent claims; therefore the obviousness rejection based on Toy is likewise erroneous. For the reasons previously discussed, however, we find the Examiner's reliance on Toy reasonable and representative claim 1 fully met by the reference. Therefore, Appellants have not shown error in the rejections of representative claims 2 and 3. Since Appellants have not persuasively rebutted the Examiner's prima facie case of obviousness, the obviousness rejections are therefore sustained.

CONCLUSIONS OF LAW

On the record before us, Appellants have not established that the Examiner erred in interpreting lid 20 as a "heat sink" as recited in representative claim 1. Moreover, Appellants have not persuasively rebutted the Examiner's prima facie case of obviousness for claims 2, 3, 5, 7, 9, 10, 12, 13, 15, 16, 18, and 20.

DECISION

We have sustained the Examiner's rejections with respect to all claims on appeal. Therefore, the Examiner's decision rejecting claims 1-20 is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED

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