

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte QWAI H. LOW, RAMASWAMY RANGANATHAN, MANIAM
ALAGARATNAM and CHOK J. CHIA

Appeal 2007-3946
Application 10/384,892
Technology Center 2800

Decided: April 30, 2008

Before KENNETH W. HAIRSTON, JOHN A. JEFFERY, and CARLA M. KRIVAK, *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 1-19. We have jurisdiction under 35 U.S.C. § 6(b). We affirm.

STATEMENT OF THE CASE

Appellants invented a wire bonding assembly having a die connected to a package substrate. The die has an inner portion with active circuitry. Bond pads are located along the perimeter and inner portion of the die and among the active circuitry. Wires connect the bond pads to leads on the package substrate. This arrangement reduces the required die area, increases the die's padding density, and reduces the cost to form the die.¹

Claim 1 is illustrative:

1. A wire bond assembly comprising:

a die having a top surface which includes a perimeter portion, an inner portion having active circuitry thereon, and

a plurality of bond pads located in said perimeter portion and in said inner portion of said top surface among said active circuitry, among cells, transistors and circuitry;

a package substrate, said die having a bottom surface opposite the top surface, said bottom surface contacting said package substrate, wherein said die has active circuitry on the top surface among bond pads;

a plurality of leads on said package substrate; and

a plurality of wires connecting certain of said bond pads to certain of said leads.

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

Horiuchi	US 6,084,295	Jul. 4, 2000
Miyamoto	US 6,720,591 B2	Apr. 13, 2004 (filed Apr. 23, 2002)

¹ See generally Spec. 4:1-9 and 6:7-7:13.

Claims 1-19 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Horiuchi and Miyamoto.

Rather than repeat the arguments of Appellants or the Examiner, we refer to the Brief² and the Answer³ for their respective details. In this decision, we have considered only those arguments actually made by Appellants. Arguments which Appellants could have made but did not make in the Brief have not been considered and are deemed to be waived. *See* 37 C.F.R. § 41.37(c)(1)(vii).

OPINION

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 (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 (1966).

Discussing the question of obviousness of a patent that claims a combination of known elements, the U. S. Supreme Court explains:

When a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or a different one. If a person of ordinary skill can implement a predictable variation, § 103 likely bars its patentability. For the same reason, if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless

² We refer to the most recent Appeal Brief filed November 25, 2005, throughout this opinion.

³ We refer to the Examiner's Answer mailed February 24, 2006 throughout, this opinion.

its actual application is beyond his or her skill. *Sakraida [v. AG Pro, Inc.*, 425 U.S. 273 (1976)] and *Anderson's-Black Rock[, Inc. v. Pavement Salvage Co.*, 396 U.S. 57 (1969)] are illustrative—a court must ask whether the improvement is more than the predictable use of prior art elements according to their established functions.

KSR Int'l v. Teleflex, Inc., 127 S. Ct. 1727, 1740 (2007). If the claimed subject matter cannot be fairly characterized as involving the simple substitution of one known element for another or the mere application of a known technique to a piece of prior art ready for the improvement, a holding of obviousness can be based on a showing that “there was an apparent reason to combine the known elements in the fashion claimed.” *Id.* at 1740-41. Such a showing requires “some articulated 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.” *Id.* at 1741.

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 (Fed. Cir. 1992).

Regarding representative claim 1,⁴ the Examiner indicates that Horiuchi discloses all the claim limitations except for the bond pads being located “among cells, transistors and circuitry” as recited. The Examiner

⁴ Appellants argue claims 1-19 as a group (App. Br. 4-6). Accordingly, we select claim 1 as representative. *See* 37 C.F.R. § 41.37(c)(1)(vii).

finds the bond pads are located in the inner portion of the top surface among the active circuitry and states that it is well known to have active circuitry in the die of Horiuchi. The Examiner, however, relies on Miyamoto to teach the circuitry details of a die and finds it is well known for the active circuitry to include cells and transistors in order to obtain an application-specific chip package. The Examiner concludes that one skilled in the art would have included cells and transistors among the active circuitry of Horiuchi's die, as taught by Miyamoto, so as to obtain a specific chip package (Ans. 3-4).

Appellants argue the Examiner relies on hindsight to meet the limitations of claim 1 (App. Br. 5). Specifically, Appellants argue the disclosure in Horiuchi of the bond pads being in an “area-array” does not mean the bond pads are among active circuitry (App. Br. 4). Appellants, additionally, dispute that the active circuitry of Horiuchi is on a top surface (App. Br. 5).

The issue before us, then, is whether the cited prior art reasonably teaches or suggests the plurality of bond pads located on the top surface of the die among active circuitry and among the cells, transistors and circuitry. For the following reasons, we find they do.

During examination of a patent application, a claim is given its broadest reasonable construction “in light of the specification as it would be interpreted by one of ordinary skill in the art.” *In re Am. Acad. Of Sci. Tech. Ctr.*, 367 F.3d 1359, 1364 (Fed. Cir. 2004). Concerning the term “among” in the claim, the Specification discusses a preference to have the bond pads dispersed among active circuitry or to be among the cells, transistors and circuitry of the device “as opposed to being provided merely along the peripheral edge such as among metallization or bare silicon areas which do

not have any transistors or metal circuitry” (Spec. 7:-12). There is, however, no special definition for the term in the Specification, and Appellants have not provided any evidence that the term has a particular meaning to those of ordinary skill in the art. Given that the term has no special meaning or understanding with those skilled in the art, “the words of a claim ‘are generally given their ordinary and customary meaning.’” *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (en banc) (internal citations omitted).

The Merriam-Webster’s Online Dictionary defines “among” as “in company or association with[.]” Merriam-Webster’s Online Dictionary, 10th ed., <http://www.merriam-webster.com/cgi-bin/dictionary?book=Dictionary&va=among> (last visited Apr. 8, 2008). We, therefore find the phrase “a plurality of bond pads located . . . in said inner portion of said top surface among said active circuitry, among cells, transistors and circuitry” to require the bond pads to be located on the top surface in the company of the active circuitry and in the company of the cells, transistors and circuitry. We also find the phrase, “said die has active circuitry on the top surface among the bond pads” to require the active circuitry to be on the top surface of the die in the company of the bond pads. Given these interpretations of the above-recited language, we turn to the prior art.

Horiuchi discloses a wire bond assembly having a semiconductor chip (die) 10 with a top surface and a bottom surface contacting a package substrate 5 (Horiuchi, col. 3, ll. 30-31; Fig. 1). The die of Horiuchi has a top surface with a perimeter and inner portion, and bond pads or electrode terminals located on the die in an area-array (Horiuchi, col. 3, ll. 41-42 and

col. 7, ll. 41-46; Fig. 1). Similar to the area-array in Figures 8 and 9 of Horiuchi, which show the pattern of the conductor portions on the substrate, the area-array pattern of the bond pads on the die of Horiuchi will cover the perimeter and inner portion of the top surface of the die (Horiuchi, Figs. 1, 8 and 9). While the circuitry details of Horiuchi's die are not shown, the die must include active circuitry to perform its role as a semiconductor device. Horiuchi also discloses a plurality of leads 22 on the package substrate and a plurality of wires 20 connecting the bond pads located on the die to the leads (Horiuchi, col. 3, ll. 41-47; Fig. 1).

Miyamoto teaches known circuitry details by those skilled in the art of an application-specific die (Miyamoto, col. 9, l. 47 – col. 10, l. 50; Fig. 5). As shown in Figure 5, this die contains active circuitry (e.g., 80-82), cells (e.g., 72-74), transistors (e.g., 64-66) and circuitry (e.g., 69, 78, 84) (Miyamoto, col. 9, l. 55 - col. 10, l. 38; Fig. 5). The bond pads (BP) of Miyamoto are disclosed as part of the uppermost wiring designated by reference numeral 4 (Miyamoto, col. 9, ll. 18-24; Figs. 4 and 5).

In our view, the collective teachings of Horiuchi and Miyamoto provide a rationale for combining known elements such that the plurality of bond pads are located in the perimeter and inner portions “of said top surface among said active circuitry, among cells, transistors and circuitry” and “said die has active circuitry on the top surface among bond pads” as recited in claim 1. Miyamoto provides the necessary teaching to demonstrate commonly known features of a die, including cells, transistors, and circuitry, used by those skilled in the art to build an application-specific die (Miyamoto, col. 9, l. 18 - col. 10, l. 38; Fig. 5). One skilled in the art would have, therefore, recognized that the components of known dies, such as the

cells, transistors, and circuitry shown in Miyamoto, can be integrated with Horiuchi to yield a predictable application-specific integrated chip.

Furthermore, and consistent with the Specification's description that the bond pads are dispersed in areas with metal circuitry (Spec. 7:8-12), Miyamoto shows that such a predictable arrangement would have the bond pads located on the top surface in the company of or among the active circuitry (e.g., 80-82) as claimed (Miyamoto, Figs. 4-5). We acknowledge that the bond pads and the active circuitry may not be at the uppermost surface or at precisely the same part of the top surface. However, giving the phrase "on the top surface" its broadest reasonable interpretation consistent with the Specification, the top surface includes portions below the uppermost surface. Also, giving the term "among" its broadest reasonable interpretation consistent with the Specification, the bond pads of Miyamoto are also located in the company of cells (e.g., 72-74), transistors (e.g., 64-66), and circuitry (e.g., 69, 78, 84) (Miyamoto, Figs. 4 and 5). We, thus, find that Miyamoto teaches the bond pads are located on the top surface of the die among active circuitry and among the cells, transistors, and circuitry.

While Appellants' arguments focus on Horiuchi (App. Br. 4-5), the Examiner clarifies that the *prima facie* case of obviousness relies on the combined teachings of Horiuchi and Miyamoto and not Horiuchi alone to meet the limitation of "among said active circuitry, among cells, transistors and circuitry" (Ans. 8). We agree. Horiuchi is silent regarding the circuitry of the die and whether the bond pads are located among active circuitry, the cells, transistors and circuitry as claimed. To teach the above limitation, we rely on Miyamoto and the above-stated rationale for combining its teachings with Horiuchi.

We also find Appellants' comment regarding the die in Horiuchi being inverted⁵ unpersuasive in rebutting the prima facie case of obviousness. First, claim 1 does not specifically recite the orientation of the die. Second, even though the die is inverted, Horiuchi discloses in Figure 1 the bond pads are on the top surface as claimed. Miyamoto, as explained previously, also discloses the bond pads and the active circuitry on the top surface of the die. Moreover, as previously discussed, Miyamoto discloses the bond pads are in the top surface in the company of the active circuitry and in the company of or among the cells, transistors and circuitry (Miyamoto, Figs. 4-5). Thus, regardless of the orientation of Horiuchi's die, we find the references in combination teach the limitations of claim 1.

For the foregoing reasons, Appellants have not shown error in the Examiner's obviousness rejection of representative claim 1 based on the collective teachings of Horiuchi and Miyamoto. Accordingly, we sustain the rejection of claim 1 and claims 2-19, which fall with claim 1.

DECISION

We have sustained the Examiner's rejection with respect to all claims on appeal. Therefore, the Examiner's decision rejecting claims 1-19 is affirmed.

No period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv) (2006).

⁵ See App. Br. 5.

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AFFIRMED

gvw

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