Paper No. 18

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte PETER J. BROFMAN, SHAJI FAROOQ,
JOHN U. KNICKERBOCKER, SCOTT I. LANGENTHAL,
SUDIPTA K. RAY and KATHLEEN A. STALTER

Appeal No. 2002-1182
Application 09/233,385

ON BRIEF

Before ABRAMS, MCQUADE, and NASE, Administrative Patent Judges.

MCQUADE, Administrative Patent Judge.

DECISION ON APPEAL

Peter J. Brofman et al. appeal from the final rejection of claims 50 through 61. Claims 1 through 49, the only other claims pending in the application, stand withdrawn from consideration pursuant to 37 CFR § 1.142(b).

THE INVENTION

The subject matter on appeal pertains to a "device for preventing short circuits between solder joints in flip chip

packaging" (specification, page 1).[1] Representative claims 50 and 51 read as follows:

50. A flip chip electronic module comprising
a semiconductor chip;
a substrate for mounting said chip; and
a dielectric interposer disposed between said chip and substrate having a plurality of apertures, said apertures traversing a thickness of said interposer, and solder elements deposited within said apertures, said solder elements being cone shaped prior to thermal reflow,
wherein said module is thermally reflowed such that said chip and said substrate are electrically and mechanically interconnected by said solder elements and said solder elements are not in contact with an adjacent solder element.

51. The module of claim 50 wherein said solder elements are coated with tin.

THE PRIOR ART

The references relied on by the examiner to support the final rejection are:

Pasch et al. (Pasch)	5,111,279	May 5, 1992
Rostoker et al. (Rostoker)	5,569,963	Oct. 29, 1996
Dalal et al. (Dalal)	5,729,896	Mar. 24, 1998

[1] Flip chip packaging involves technology wherein "[b]roadly stated, one or more integrated circuit chips are mounted above a single or multi-layer ceramic substrate and pads on the chip are electrically and mechanically connected to corresponding pads on the substrate by a plurality of electrical connections such as solder bumps" (specification, page 1).

THE REJECTIONS

Claims 50 and 53 through 61 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Pasch in view of Rostoker.

Claims 51 and 52 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Pasch in view of Rostoker and Dalal.

Attention is directed to the appellants' main and reply briefs (Paper Nos. 10 and 13) and to the examiner's answer (Paper No. 11) for the respective positions of the appellants and the examiner with regard to the merits of this rejection.[2]

DISCUSSION

I. Grouping of claims

On page 5 in the main brief, the appellants state that the following claim groups stand or fall together: claims 50 and 53 through 61; and claims 51 and 52. As these groups correspond to the claim groupings in the two appealed rejections, we have selected claims 50 and 51 as being representative of their groupings and shall decide the appeal as to the respective rejections on the basis of these claims alone. See 37 CFR

[2] The explanation of the second rejection on pages 5 and 6 in the answer indicates that the reference to claims 52 and 53, rather than claims 51 and 52, in the accompanying statement of the rejection was inadvertent. The content of the briefs shows that the appellants were not misled or otherwise prejudiced by the inaccuracy.

§ 1.192(c)(8). In other words, claims 53 through 61 stand or fall with claim 50, and claim 52 stands or falls with claim 51.

II. The merits

Pasch, the examiner's primary reference, discloses a flip chip structure which is described in terms of its method of assembly as follows:

> FIG. 3 illustrates the present, inventive technique of assembling flip-chips 30. . . . [T]he flip-chip assembly 30 includes one or more silicon chips 32 (two of such chips are illustrated) ultimately mounted in face-to-face relationship to a larger silicon chip or substrate 14 in the following manner. Solder balls 36 are formed on the face 32A of the chip 32, and solder balls 38 are formed on the face 34A of the substrate 34 in corresponding positions. . . .
>
> Prior to soldering the chips 32 to the substrate 34, a preformed planar [dielectric] structure 40 . . . of similar planar dimension as the chip 32, is interposed between the chips 32 and the substrate 34. The planar structure 40 is provided with though holes 42 in positions corresponding to the positions of the solder balls 26 [sic, 36] and 38, respectively. Inasmuch as the solder balls 36 are typically located just within the perimeter of the chips 32, the through holes 42 would be located just within the perimeter of the planar structure 40 [column 3, line 51, through column 4, line 7].

Pasch adds that "the holes 42 in the planar structure 40 assist in maintaining registration of the solder balls 36 and corresponding solder balls 38, respectively, and hence alignment of the chips 32 with respect to the substrate 34" (column 4, lines 38 through 42), and that "the through holes 42 form a

generally cylindrical 'mold' of predetermined dimension wherein the solder joints are formed" (column 5, lines 54 through 57).

Determining that Pasch does not respond to the limitations in claim 50 requiring the solder elements deposited within the apertures to be "cone shaped prior to thermal reflow," the examiner turns to Rostoker.

Rostoker also pertains to flip chip technology and encompasses the disclosure of Pasch.[3] Rostoker additionally teaches a flip chip embodiment 1100a (see Figure 11b) comprising a silicon die or chip 1110, a dielectric interposer 1120 having through holes 1150a and 1150b, a substrate 1130 and reflowed solder bump contacts 1142a and 1142b in the through holes electrically and mechanically connecting the die and substrate. Rostoker's description of this embodiment indicates that the reflowed solder bump contacts were formed from aligned solder ball contacts initially located on the die and substrate and positioned to extend into the interposer through holes prior to reflow.

[3] According to the Rostoker patent (see column 1, lines 6 through 18; and column 8, line 12 et seq.), the Pasch patent is one of its parents.

In proposing to combine Pasch and Rostoker to reject claim 50, the examiner finds that "Rostoker discloses the solder as a conical shape in Fig 11b" (answer, pages 4 and 6), and concludes somewhat cryptically that it would have been obvious "to establish a desired shape during the reflow process of the assembly wherein the reflow would increase the diameter of the solder at the ends and thin out the middle to increase the electrical connection" (answer, page 4) and that it would have been an obvious matter of design choice "to establish a desired shape prior to the reflow process of the assembly wherein the reflow would increase the diameter of the solder at the ends and thin out the middle to increase the electrical connection" (answer, page 6).

This position is flawed for at least two reasons. First, the examiner's explanation of the proposed reference combination, which presumably involves solder elements which are "cone shaped prior to thermal reflow" as recited in claim 50, is unduly vague and ambiguous. Second, the examiner's conclusions rest on the erroneous finding that Rostoker's Figure 11b shows solder having a conical shape. As correctly pointed out by the appellants, Figure 11b illustrates the reflowed solder bump contacts as having a generally "hourglass" shape rather than a conical shape.

Be all this as it may, however, both Pasch and Rostoker establish that the flip chip electronic module recited in claim 50 lacks novelty. Each of these references discloses a flip chip module composed of a semiconductor chip, a substrate, and a dielectric interposer having apertures, all as recited in claim 50. Each also discloses that the module is thermally reflowed such that the chip and substrate are electrically and mechanically interconnected by solder elements which are not in contact with an adjacent solder element as recited in claim 50. Although neither teaches that the solder elements are "cone shaped prior to thermal reflow" as recited in the claim,[4] this limitation addresses the process by which the claimed thermally reflowed module is made and, on the record before us, does not distinguish the claimed module from that disclosed by either Pasch or Rostoker. In this regard, it is the patentability of the product claimed, and not of the recited process limitations, which must be established. See In re Hallman, 655 F.2d 212, 215, 210 USPQ 609, 611 (CCPA 1981); In re Brown, 459 F.2d 531, 535, 173 USPQ 685, 688 (CCPA 1972). The patentability of a claimed

[4] The appellants' specification indicates that "[t]he cone shape solder 637 permits a reduced force for a given I/O pad to allow for some non-planarity between the chip [i.e., the die], the interposer, and the substrate" (specification, page 11).

product does not depend on its method of production; if the claimed product is the same as a prior art product, the claim is unpatentable even though the prior art product was made by a different process. See In re Thorpe, 777 F.2d 695, 697, 227 USPQ 964, 966 (Fed. Cir. 1985).

Since lack of novelty is the ultimate or epitome of obviousness (see In re Fracalossi, 681 F.2d 792, 794, 215 USPQ 569, 571 (CCPA 1982), we shall sustain the standing 35 U.S.C. § 103(a) rejection of claim 50, and claims 53 through 61 which stand or fall therewith, as being unpatentable over Pasch in view of Rostoker.[5]

We also shall sustain the standing 35 U.S.C. § 103(a) rejection of claim 51, and claim 52 which stands or falls

[5] Upon return of the application to the technology center, the examiner should reassess whether the appellants' specification provides written descriptive support for the subject matter recited in claim 61. This claim, which was added to the application subsequent to filing (see Paper No. 7), recites "solder elements deposited on said substrate, said solder elements being cone shaped prior to thermal reflow." Although the remarks accompanying the submission of the claim (as well as those appearing on page 12 in the main brief) state that this subject matter finds support in the specification at page 10, lines 14 through 30, such support is not readily apparent. In the event the examiner determines that the specification does indeed lack written descriptive support for claim 61, an appropriate rejection under 35 U.S.C. § 112, first paragraph, should be entered.

therewith, as being unpatentable over Pasch in view of Rostoker and Dalal.

Dalal discloses a flip chip employing solder elements 41 coated with tin 43. Dalal's description of the advantages afforded by this composition (see column 6, line 59 et seq.) would have provided the artisan with ample motivation or suggestion to use same in the Pasch (or Rostoker) flip chip module, thereby arriving at the subject matter recited in claim 51. The appellants' contention that the rejection is unsound because Dalal does not make up for the failure of Pasch and/or Rostoker to teach or suggest solder elements which are "cone shaped prior to thermal reflow" as recited in parent claim 50 is unpersuasive for the reasons discussed above.

SUMMARY

The decision of the examiner to reject claims 50 through 61 under 35 U.S.C. § 103(a) is affirmed; however, since the basic thrust of the affirmance differs from the rationale advanced by the examiner in support of the rejections, we hereby designate the affirmance as a new ground of rejection pursuant to 37 CFR § 1.196(b) to allow the appellants a fair opportunity to react thereto (see In re Kronig, 539 F.2d 1300, 1302-03, 190 USPQ 425, 426-27 (CCPA 1976)).

This decision contains a new ground of rejection pursuant to 37 CFR § 1.196(b)(amended effective Dec. 1, 1997, by final rule notice, 62 Fed. Reg. 53,131, 53,197 (Oct. 10, 1997), 1203 Off. Gaz. Pat. & Trademark Office 63, 122 (Oct. 21, 1997)). 37 CFR § 1.196(b) provides that, "A new ground of rejection shall not be considered final for purposes of judicial review."

37 CFR § 1.196(b) also provides that the appellant, WITHIN TWO MONTHS FROM THE DATE OF THE DECISION, must exercise one of the following two options with respect to the new ground of rejection to avoid termination of proceedings (§ 1.197(c)) as to the rejected claims:

> (1) Submit an appropriate amendment of the claims so rejected or a showing of facts relating to the claims so rejected, or both, and have the matter reconsidered by the examiner, in which event the application will be remanded to the examiner. . . .
>
> (2) Request that the application be reheard under § 1.197(b) by the Board of Patent Appeals and Interferences upon the same record. . . .

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

AFFIRMED; 37 CFR § 1.196(b).

NEAL E. ABRAMS Administrative Patent Judge	)	
	)	BOARD OF PATENT
	)	APPEALS AND
JOHN P. MCQUADE Administrative Patent Judge	)	INTERFERENCES
JEFFREY V. NASE Administrative Patent Judge	)	

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