

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(2) is not binding precedent of the Board.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. 25

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte SHYH-MING CHANG, JOW-HUEI JOU,
YU-CHI LEE and DYI-CHUNG HU

Appeal No. 1998-0096
Application 08/518,182¹

ON BRIEF

Before HAIRSTON, MARTIN and FLEMING, Administrative Patent
Judges.

HAIRSTON, Administrative Patent Judge.

DECISION ON APPEAL

This is an appeal from the final rejection of claims
7 through 19, 21 through 27, and 29 through 33. In an

¹ Application for patent filed August 23, 1995. According
to appellants, the application is a continuation of
Application 08/239,375 filed May 6, 1994, now abandoned.

amendment that preceded the final rejection, claim 19 was canceled (paper number 17). Accordingly, claims 7 through 18, 21 through 27, and 29 through 33 remain before us on appeal.

The disclosed invention relates to a method of forming a bonded structure between input/output pads on an integrated circuit element and input/output pads on a substrate. The bonded structure includes composite bumps comprising a polymer body and a conductive metal coating surrounding the polymer body which provide physical and electrical connections between the integrated circuit element input/output pads and the substrate input/output pads.

Claim 7 is illustrative of the claimed invention, and it reads as follows:

7. A method of forming a bonded structure, comprising:

providing an integrated circuit element with integrated circuit element input/output pads;

providing a substrate with substrate input/output pads;

providing a single polymer body on each said integrated circuit element input/output pad, wherein the cross section area of said single polymer body on each said integrated circuit element input/output pad has a circular shape and is smaller than that of each said integrated circuit element input/output pad;

providing a conductive metal coating upon said single

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polymer body on each said integrated circuit element
input/output pad and covering each said integrated circuit
element input/output pad wherein each said single polymer
body and said conductive metal coating comprises a composite
bump;

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bringing together said integrated circuit element and said substrate so that said composite bumps contact said substrate input/output pads and are deformed during said contact; and

bonding said composite bumps to said substrate input/output pads.

The references relied on by the examiner are:²

Kanakarajan et al. (Kanakarajan)	5,298,331	Mar. 29, 1994
Chun	5,331,235	Jul. 19, 1994 (filed Apr. 10, 1992)
Tsukagoshi et al. (Tsukagoshi) (European Patent Application)	372 880	Jun. 13, 1990
Fujimoto et al. (Fujimoto) (Japanese Patent Application)	3-62927	Mar. 19, 1991
Saito et al. (JP4-6841) (Japanese Kokai)	4-6841	Jan. 10, 1992
Saito et al. (JP4-30532) (Japanese Patent Application)	4-30532	Feb. 3, 1992
Onozaki (Japanese Patent Application)	4-151843	May 25, 1992

Claims 7, 8, 11, 15 and 18 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Fujimoto or, in the alternative, under 35 U.S.C. § 103 as being unpatentable over the combination of Fujimoto and Saito (JP4-6841).

Claims 9, 14, 16 and 17 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Fujimoto as applied to

²Copies of the translations of the Japanese references are attached.

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claims 7, 8, 11, 15 and 18 supra, and further in combination with Onozaki, or in the alternative, over the combination of Fujimoto and Saito (JP4-6841), and further in combination with Onozaki.

Claims 10 and 29 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Fujimoto as applied to claims 7, 8, 11, 15 and 18 supra, and further in combination with Kanakarajan, or in the alternative, over the combination of Fujimoto and Saito (JP4-6841) as applied to claims 7, 8, 11, 15 and 18 supra, and further in combination with Kanakarajan.

Claims 12 and 13 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Fujimoto as applied to claims 7, 8, 11, 15 and 18 supra, and further in combination with Saito (JP4-30532), or in the alternative, over the combination of Fujimoto and Saito (JP 4-6841) as applied to claims 7, 8, 11, 15 and 18 supra, and further in combination with Saito (JP4-30532).

Claims 21 through 24 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Fujimoto as applied to claims 7, 8, 11, 15 and 18 supra, and further in combination

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with Chun, or in the alternative, over the combination of
Fujimoto and Saito (JP4-6841) as applied to claims 7, 8,
11, 15 and 18 supra and further in combination with Chun.

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Claims 25 and 26 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Fujimoto as applied to claims 7, 8, 11, 15 and 18 supra, and further in combination with Tsukagoshi, or in the alternative, over the combination of Fujimoto and Saito (JP 4-6841), and further in combination with Tsukagoshi.

Claim 27 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Fujimoto as applied to claims 7, 8, 11, 15 and 18 supra, and further in combination with Tsukagoshi, or in the alternative, over the combination of Fujimoto and Saito (JP4-6841) as applied to claims 7, 8, 11, 15 and 18 supra, and further in combination with Tsukagoshi.

Claim 30 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Fujimoto and Onozaki as applied to claims 9, 14, 16 and 17 supra, and further in combination with Kanakarajan, or in the alternative, over the combination of Fujimoto, Saito (JP 4-6841) and Onozaki as applied to claims 9, 14, 16 and 17 supra, and further in combination with Kanakarajan.

Claims 31 through 33 stand rejected under 35 U.S.C. §

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103(a) as being unpatentable over the combination of Fujimoto and Chun as applied to claims 21 through 24 supra, and further in combination with Tsukagoshi, or in the alternative, the combination of Fujimoto, Saito (JP4-6841) and Chun as applied to claims 21 through 24 supra, and further in combination with Tsukagoshi.

Reference is made to the brief and the answer for the respective positions of the appellants and the examiner.

OPINION

We have carefully considered the entire record before us, and we will not sustain the 35 U.S.C. § 103(b) rejection of claims 7, 8, 11, 15 and 18, and the 35 U.S.C. § 103(a) rejections of claims 8 through 10, 12 through 14, 16, 17, 21 through 27, and 29 through 33. However, we will sustain the 35 U.S.C. § 103(a) rejection of claims 7, 11, 15 and 18. As indicated infra, a new ground of rejection of claims 7 through 18, 21 through 27, and 29 through 33 has been entered under the provisions of 37 CFR § 1.196(b).

The 35 U.S.C. § 102(b) Rejection of Claims 7, 8, 11 15 and 18

The 35 U.S.C. § 102(b) Rejection of

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Claims 7, 11, 15 and 18 Based on Fujimoto

To anticipate a claim, a prior art reference must disclose every limitation of the claimed invention, either explicitly or inherently. See Glaxo Inc. v. Novopharm Ltd., 52 F.3d 1043, 1047, 34 USPQ2d 1565, 1567 (Fed. Cir. 1995).

Claim 7 is directed to a method of forming a bonded structure between an integrated circuit element having input/output pads and a substrate having substrate input/output pads, which method comprises, inter alia, the steps of:

providing a single polymer body [wherein each single polymer body has a conductive metal coating thereon which comprises a composite bump] on each said integrated circuit element input/output pad, wherein the cross section area of said single polymer body on each said integrated circuit element input/output pad has a circular shape and is smaller than that of each said integrated circuit element input/output pad;

. . . .

bringing together said integrated circuit element and said substrate so that said composite bumps contact said substrate input/output pads and are deformed during said contact; . . . (emphasis added).

Fujimoto discloses a method of forming a bonded structure, comprising the steps of: providing a single polymer body 24 on each input/output pad 23 of integrated circuit element 20; providing a conductive metal coating 25 upon the polymer body and covering the input/output pads, wherein each polymer body and metal coating comprises composite bump 26; providing a nonconductive adhesive 28 made of a photocuring

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insulating resin between the integrated circuit element 20 and the substrate 30; and bringing together the integrated circuit element 20 and the substrate 30, whereby the adhesive 28 is hardened by the application of light energy 31 and the composite bumps 26 contact the substrate input/output pads 29 and are deformed (Figures 1-2). Fujimoto further discloses that metal coating 25 is made of Ti-Pd-Au, i.e., an adhesion layer, a barrier layer and a conductor layer (Translation, page 11).

The examiner has determined that the cross section area of the single polymer body of Fujimoto has "a circular shape and is smaller than each of the pads" (Answer, page 4). Appellants have not disputed such a determination, but they have argued that appellants' composite bumps have "a circular shape prior to the formation of the bonded structure while the projecting electrode of Fujimoto has an essentially square cross section prior to bonding the semiconductor element to the wiring board" (Brief, page 17).

Pending claims are to be given their broadest reasonable interpretations. In re Zletz, 893 F.2d 319, 321, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989). In interpreting claim 7, we are

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of the opinion that the composite bumps having a circular cross section must be provided on the integrated circuit element prior to bonding together the integrated circuit element and the substrate. We agree with the appellants that Fujimoto does not

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disclose the composite bumps that have a circular shape prior to the formation of the bonded structure.

Accordingly, it is evident that Fujimoto does not disclose every limitation of claim 7. Since claims 11, 15 and 18 depend from claim 7, it follows that Fujimoto does not disclose every limitation of claims 11, 15 and 18. Thus, we do not sustain the 35 U.S.C. § 102(b) rejection of claims 7, 11 15 and 18.

The 35 U.S.C. § 102(b) Rejection of Claim 8 Based on Fujimoto

Claim 8 is directed to a method of forming a bonded structure between an integrated circuit element having input/output pads and a substrate having substrate input/output pads, which method comprises, inter alia, the steps of:

providing a single polymer body [wherein each single polymer body has a conductive metal coating thereon which comprises a composite bump] on each said substrate input/output pad, wherein the cross section area of said single polymer body on each said substrate input/output pad has a circular shape and is smaller than that of each said substrate input/output pad;

. . . .

bringing together said integrated circuit element and said substrate so that said composite

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bumps contact said integrated input/output pads and are deformed during said contact; . . . (emphasis added).

Appellants have argued that

[i]n Claim 8 composite bumps are formed on the substrate before the bond is formed and not the integrated circuit element, as in Fujimoto and Saito (JP4-6841). . . The composite bumps of Claim 8 have a circular shape prior to the formation of the bonded structure while the projecting electrode of Fujimoto has an essentially square cross section prior to bonding the semiconductor element to the wiring board. (Brief, pages 18-19).

The examiner has replied that "[c]ontrary to appellant's [sic] assertion otherwise, claim 8 is not limited in scope to a process wherein the bumps are formed on the substrate before the bond is formed and not the integrated circuit element," (Answer, page 14). Thus, there is a disagreement between the appellants and the examiner regarding whether claim 8 calls for the composite bumps to be formed on the substrate before the bond is formed.

In interpreting claim 8, it is our opinion that the composite bumps having a circular shape must be provided on the substrate pads before the step of bringing together the substrate and the integrated circuit element. Fujimoto does not disclose the composite bumps being provided on the

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substrate pads; rather, Fujimoto discloses the composite bumps on IC element pads. Moreover, Fujimoto's composite bumps do not have a circular cross section prior to bonding together the integrated circuit element and the substrate.

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Accordingly, it is evident that Fujimoto does not disclose every limitation of claim 8. Therefore, we do not sustain the

35 U.S.C. § 102(b) rejection of claim 8.

The 35 U.S.C. § 103(a) Rejections of Claims 7, 10 through 12, 15 through 18 and 25

The 35 U.S.C. § 103(a) Rejection of Claims 7, 11, 15 and 18 Based on the Combination of Fujimoto and Saito (JP4-6841)

The examiner bears the initial burden of presenting a prima facie case of obviousness. In re Rijckaert, 9 F.3d 1531, 1532, 28 USPQ2d 1955, 1956 (Fed. Cir. 1993). A prima facie case of obviousness is established when the teachings of the prior art references would appear to have suggested the claimed invention to one of ordinary skill in the art. See In re Bell, 991 F.2d 781, 783, 26 USPQ2d 1529, 1531 (Fed. Cir. 1993).

The examiner has determined that Saito (JP4-6841) "teaches that a columnar shaped body and a spherical (hence circular) shaped cross section are equivalents in a process comprising a step of providing a metal coated polymer body composite bump similar to the process of the instant

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invention" (Answer, page 5). The examiner has concluded that it would have been obvious to substitute the spherical shaped bump of Saito for the columnar bump of Fujimoto; furthermore, the examiner has added

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that choosing a particular shape would have been "an obvious matter of design choice" (Answer, page 5).

Turning first to appellants' argument that "the composite bumps are deformed when the bond is formed rather than undergoing elastic compression, as in Fujimoto and Saito (JP 4-6841)" (Brief, pages 17, 20-21 and 23), we find it to be unpersuasive because it is not commensurate with the scope of claims 7, 11, 15 and 18 which makes no mention of "undergoing elastic compression . . ." (emphasis added). What is recited in those claims is "bringing together said integrated circuit element and said substrate so that said composite bumps contact said substrate input/output pads and are deformed during said contact, . . ." (emphasis added). That is exactly what Fujimoto discloses: composite bumps 26 are deformed during their contact with substrate input/output pads 29 (Figure 2c).

Turning next to appellants' assertions that "a nonconductive adhesive between the integrated circuit element and the substrate is not required, as in Fujimoto, . . ." and

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"the conductive metal coating does not need to be a plated coating, as in Saito (JP 4-6841). . . ." (Brief, pages 17, 20-21 and 23), we find these assertions to be unconvincing. The transitional open-ended term "comprising" in a claim does not exclude additional, unrecited elements; therefore, whether or not Fujimoto and Saito (JP4-6841) disclose more than what the claimed invention recites is irrelevant under 35 U.S.C. § 103(a).

Turning lastly to appellants' contention that the polymer body recited in claims 7, 11, 15 and 18 "can be an insulating material and does not need to be conductive, as in Saito (JP4-6841)" (Brief pages 17, 20-21 and 23), we see such a contention to be unpersuasive. The term "polymer body" includes insulating polymer and conductive polymer; therefore, the claimed "polymer body" reads on a "conductive polymer body." Furthermore, the examiner has relied on Saito (JP4-6841), not for its disclosure of the polymer body material, but, for its teaching of the equivalents of different polymer body shapes, i.e., columnar, spherical, and cylindrical shapes.

In view of the foregoing, we determine that the only

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difference between Fujimoto and the claimed invention is that Fujimoto does not disclose polymer composite bumps that have a circular cross section prior to bonding together the substrate and the integrated circuit element. Saito (JP4-6841) provides for such a deficiency, disclosing that the composite bumps have "a cylindrical shape, but this invention is not limited by these examples. Any shapes including spherical shapes and columnar shapes are, of course, applicable" (Translation, page 8). We agree with the examiner that Saito (JP4-6841) "teaches that a columnar shaped body and a spherical (hence circular) shaped cross section are equivalents. . ." (Answer, page 5). We find it abundantly clear that the combined teachings of Fujimoto and Saito (JP4-6841) would have suggested the interchangeability of the columnar-shaped polymer body with the cylindrical (or spherical)-shaped polymer body. Thus, the combination of Fujimoto and Saito (JP4-6841) would have suggested to one skill in the art the substitution of Saito's cylindrical (or spherical)-shaped polymer body for Fujimoto's columnar-shaped polymer body to arrive at the claimed invention.

In addition, we have before us in claims 7, 11, 15 and 18

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a method of forming a bonded structure whose patentability possibly depends only on the shape of the polymer body. Mere change in shape is obvious as a matter of choice, absent persuasive evidence that the particular shape is significant and unexpected. Undoubtedly, unexpected results over the prior art may in some cases be persuasive of unobviousness; however, the burden is on appellants to show it by objective evidence. Neither data of comparative tests nor other objective evidence is offered here. What is given here is only a conclusory statement of counsel that "[t]he circular shape has distinct advantages in ease of manufacture and reliability especially for adhesion of a metal coating on the bump" (Brief, page 17). Counsel's conclusory statements do not suffice. Thus, appellants' rebuttal is not persuasive.

Accordingly, we sustain the 35 U.S.C. § 103(a) rejection of claims 7, 11, 15 and 18 based on the combination of Fujimoto and Saito (JP4-6841).

The 35 U.S.C. § 103(a) Rejection of Claim 10 Based on the Combination of Fujimoto and Kanakarajan, or in the Alternative,
the Combination of Fujimoto, Saito (JP4-6841) and Kanakarajan

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Claim 10, which depends from claim 7, further recites "wherein said polymer is polyamic acid polyamide." Fujimoto and Saito (JP4-6841) neither teach nor suggest the polymer body being polyamic acid polyamide. Kanakarajan has been relied on by the examiner for its disclosure of "a process of manufacturing flexible polyamic acid polyamide metal-clad laminates for use in flexible printed circuits and tape automated bonding applications" (Answer, page 6). While it may be well known that polyamic acid polyamide has "desirable thermal, mechanical and electrical properties," as the examiner has asserted (Answer, page 7), this does not amount to a reason why one of ordinary skill in the art would have been led to replace Fujimoto's polymer used in the composite bumps with Kanakarajan's polyamic acid polyamide laminate known for its use in flexible printed circuits and tape automated bonding applications. We fail to perceive any teaching, suggestion or motivation in the applied prior art which would have led one of ordinary skill in the art to substitute Kanakarajan's polyamic acid polyamide for Fujimoto's polymer body to arrive at the claimed invention. It is our opinion that the examiner's determination of

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obviousness is based on impermissible hindsight analysis
"wherein that which only the inventor taught is used against
its teacher." W.L. Gore & Assoc. v. Garlock, Inc., 721 F.2d
1540, 1553, 220 USPQ 303,
313 (Fed. Cir. 1983), cert. denied, 469 U.S. 851 (1984).
Consequently, the examiner has failed to establish a prima
facie case of obviousness.

Therefore, we do not sustain the obviousness rejection of
claim 10 based on the combination of Fujimoto and Kanakarajan,
or in the alternative, based on the combination of Fujimoto,
Saito (JP4-6841) and Kanakarajan.

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The 35 U.S.C. § 103(a) Rejection of Claim 12
Based on the Combination of Fujimoto and Saito (JP4-30532), or
in the Alternative, the Combination Fujimoto,
Saito (JP4-6841) and Saito (JP4-30532)

Claim 12, which depends from claim 7, further recites "a conductive adhesive between said composite bumps and said substrate input/output pads" (emphasis added).

Fujimoto and Saito (JP 4-6841), taken alone or in combination, do not teach or suggest such a limitation. In rejecting claim 12, the examiner has relied on Saito (JP4-30532) to provide such a deficiency of Fujimoto and Saito (JP4-6841); however, he has not met his burden of establishing a prima facie case of obviousness. Saito (JP4-30532) teaches that conductive adhesive 7 is provided between substrate bumps 6 and integrated circuit element 1 (Translation, pages 5-6), not between composite bumps and substrate input/output pads as claimed. The mere fact, however, that the prior art could be modified in the manner suggested by the examiner would not have made the modification obvious unless the prior art suggested the desirability of the modification. In re Gordon, 733 F.2d 900, 902, 221 USPQ 1125, 1127 (Fed. Cir. 1984). Fujimoto does not need any conductive adhesive between the

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composite bumps and the substrate input/output pads, and the applied prior art fails to suggest any motivation for, or the desirability of, providing such a conductive adhesive. In our view, the examiner's proposed modification amounts to an impermissible hindsight reconstruction of the claimed invention. Without having the benefit of appellants' disclosure, one of ordinary skill in the art would not have provided a conductive adhesive between Fujimoto's composite bumps and the substrate pads to arrive at the claimed invention.

Consequently, we do not sustain the obviousness rejection of claim 12 based on the combination of Fujimoto, Saito (JP4-30532), or in the alternative Fujimoto, Saito (JP4-6841) and Saito (JP4-30532).

The 35 U.S.C. § 103(a) Rejection of Claims 16 and 17
Based on the Combination of Fujimoto and Onozaki, or in the
Alternative, the Combination of Fujimoto,
Saito (JP4-6841) and Onozaki

Claims 16 and 17, which depend from independent claim 7, further recite "wherein said bonding is provided by thermocompression bonding," and "wherein said bonding is provided by application of heat energy," respectively.

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Fujimoto and Saito (JP4-6841), taken alone or in combination, do not teach or suggest such limitations. The examiner has relied on Onozaki to provide for the deficiencies of Fujimoto and Saito (JP4-6841), but has failed to establish a prima facie case of obviousness. While Fujimoto discloses that the polymer composite bumps of the integrated circuit element are pressed onto the substrate pads and the integrated circuit element is bonded to the substrate with insulating adhesive therebetween, Onozaki teaches bonding IC metallic bumps 4 to substrate metallic bumps 7 with conductive adhesive 5 therebetween by heat energy and thermocompression processes. Onozaki, therefore, does not teach the use of heat energy and thermocompression processes for bonding insulating adhesive such as that of Fujimoto. Moreover, Onozaki's bumps are made of high melting point metals, such as Cu, Ti, etc. (not polymer as claimed), and the purpose of Onozaki's invention is to prevent the bumps from being crushed during heat energy and thermocompression processes for sufficiently ensuring the height of the bonding part (Translation, pages 4 through 6). Thus, Onozaki teaches away from the use of bumps having a polymer body which are deformed at the time of bonding as

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claimed.

In combining Fujimoto, Saito (JP4-6841) and Onozaki, the examiner has failed to recognize that all of the relevant teachings of the cited references must be considered in determining what they would have fairly taught one having ordinary skill in the art. He has picked enough teachings from Onozaki regarding heat energy and thermocompression processes, ignoring the fact that Onozaki teaches away from the use of bump electrodes having a polymer body deformed when bonded together, and the fact that Onozaki does not teach the use of heat energy and thermocompression processes for bonding insulating adhesive. Furthermore, there is no suggestion, teaching or motivation in the applied prior art that would have led one of ordinary skill in the art to modify Fujimoto and Saito (JP4-6841) by employing heat energy and thermocompression processes for bonding the bonded structure to arrive at the claimed invention. In our opinion, it is only through impermissible hindsight analysis that the examiner has come up with the proposed modification.

Therefore, we do not sustain the obviousness rejection of claims 16 and 17 based on the combination of Fujimoto and

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Onozaki, or in the alternative the combination of Fujimoto, Saito (JP4-6841) and Onozaki.

The 35 U.S.C. § 103(a) Rejection of Claim 25 Based on the Combination of Fujimoto and Tsukagoshi, or in the Alternative, the Combination Fujimoto, Saito (JP4-6841) and Tsukagoshi

Claim 25, which depends from claim 7, further recites, inter alia, "wherein said conductive metal coating consists of aluminum." Fujimoto and Saito (JP4-6841), taken alone or in combination, do not teach the conductive metal coating consisting of aluminum. Tsukagoshi discloses aluminum-coated polymeric particles 8 (page 6, lines 35-58) that are dispersed in an adhesive component to be used as bonding material between an IC element and a substrate (page 7, lines 40-41). There is no teaching, suggestion or motivation in the applied prior art regarding the substitution of Fujimoto's bump conductive layer 25 -- which is made of Cr-Au, Ti-Pd-Au, or the like -- with Tsukagoshi's aluminum layer 9 of very fine particles 8. In our view, the examiner's proposed modification amounts to an impermissible hindsight reconstruction of the claimed invention. Without having the benefit of appellants' disclosure, one of ordinary skill in

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the art would not have substituted Tsukagoshi's aluminum layer 9 of very fine particles 8 for Fujimoto's bump conductive layer 25.

Accordingly, we do not sustain the obviousness rejection of claim 25 based on the combination of Fujimoto and Tsukagoshi, or in the alternative based on the combination of Fujimoto, Saito (JP4-6841) and Tsukagoshi.

The 35 U.S.C. § 103(a) Rejection of Claims 8, 13, 26 and 29

The 35 U.S.C. § 103(a) Rejection of Claim 8 Based on
the Combination of Fujimoto and Saito (JP4-6841)

In interpreting claim 8, it is our view that the composite bumps must be provided on the substrate pads before the step of bringing together the substrate and the integrated circuit element. We agree with the appellants' argument that the "composite bumps are formed on the substrate before the bond is formed and not the integrated circuit element, as in Fujimoto and Saito (JP 4-6841)" (Brief, page 18). The differences between the device resulting from the applied prior art and the claimed invention still exist. As such, the examiner has failed to establish a prima facie case of obviousness.

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Accordingly, we do not sustain the obviousness rejection of claim 8 based on the combination of Fujimoto and Saito (JP4-6841).

The 35 U.S.C. § 103(a) Rejection of Claim 13 Based on the Combination of Fujimoto and Saito (JP4-30532), or in the Alternative, the Combination Fujimoto, Saito (JP4-6841) and Saito (JP4-30532)

Claim 13, which depends from claim 8, further recites "a conductive adhesive between said composite bumps and said integrated circuit input/output pads." Fujimoto and Saito (JP4-6841), taken alone or together, do not teach or suggest "a conductive adhesive between said composite bumps and said integrated circuit input/output pads" (emphasis added). Saito (JP4-30532) teaches away from the use of bump electrodes having a polymer body deformed when bonded together. Saito (JP4-30532) teaches the steps of providing bump electrodes 6 on substrate 2 (Figure 5) and bringing together the IC element 1 and substrate 2 so that the bump electrodes contact. The purpose of the invention in Saito (JP4-30532) is to keep the height of the projecting electrode bump "constant, and connection is stable for face down bonding" (Translation, pages 7 and 10).

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Saito (JP4-30532) teaches that the bump electrodes are made of a conductive metal material, such as Au, Ag, Cu, etc. -- not polymer as claimed (Translation, page 7).

The teachings of prior art references are to be viewed as they would have been viewed by one of ordinary skill.

Kimberly-Clark v. Johnson & Johnson, 745 F.2d 1437, 1454, 223 USPQ 603, 614 (Fed. Cir. 1984); In re Mercier, 515 F.2d 1161, 1165,

185 USPQ 774, 778 (CCPA 1975). In combining Fujimoto and Saito (JP 4-6841) with Saito (JP 4-30532), the examiner has failed to recognize that all of the relevant teachings of the cited references must be considered in determining what they fairly teach to one having ordinary skill in the art. He has picked enough teachings from Saito (JP4-30532) regarding providing bump electrodes 6 on substrate 2 (Figure 5) and bringing together the IC element 1 and substrate 2 so that the bump electrodes contact, ignoring the fact that Saito (JP4-30532) teaches away from the use of bump electrodes having a polymer body deformed when bonded together. In our opinion, the examiner's proposed modification amounts to an impermissible hindsight reconstruction of the claimed

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invention. Without having the benefit of appellants' disclosure, one of ordinary skill in the art would not have provided a conductive adhesive between Fujimoto's composite bumps and the integrated circuit pads.

Accordingly, we do not sustain the obviousness rejection of claim 13 based on the combination of Fujimoto, Saito (JP4-6841) and Saito (JP4-30532).

The 35 U.S.C. § 103(a) Rejection of Claim 26 Based on the Combination of Fujimoto and Tsukagoshi, or in the Alternative, the Combination Fujimoto, Saito (JP4-6841) and Tsukagoshi

Claim 26, which depends from claim 8, further recites inter alia, "wherein said conductive metal coating consists of aluminum." Fujimoto and Saito (JP4-6841), taken alone or in combination, do not teach or suggest that the composite bumps are provided on the substrate pads before the step of bringing together the substrate and the integrated circuit element as called for in claim 8. Tsukagoshi does not cure such deficiencies.

Accordingly, we do not sustain the obviousness rejection of claim 26 based on the combination of Fujimoto and Tsukagoshi, or

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in the alternative based on the combination of Fujimoto, Saito (JP4-6841) and Tsukagoshi.

The 35 U.S.C. § 103(a) Rejection of Claim 29 Based on the Combination of Fujimoto and Kanakarajan, or in the Alternative,

Based on the Combination of Fujimoto, Saito (JP4-6841) and Kanakarajan

Claim 29, which depends from claim 8, further recites "wherein said polymer is polyamic acid polyimide." Fujimoto and Saito (JP4-6841), taken alone or in combination, do not teach or suggest that the composite bumps are provided on the substrate pads before the step of bringing together the substrate and the integrated circuit element as called for in claim 8. Kanakarajan does not make up for such deficiencies.

Accordingly, we do not sustain the obviousness rejection of claim 29 based on the combination of Fujimoto and Kanakarajan, or in the alternative, based on the combination of Fujimoto, Saito (JP4-6841) and Kanakarajan.

The 35 U.S.C. § 103(a) Rejections of Claims 9, 14, 27 and 30

The 35 U.S.C. § 103(a) Rejection of Claims 9 and 14 Based on the Combination of Fujimoto and Onozaki, or in the Alternative, the Combination of Fujimoto, Saito (JP4-6841) and Onozaki

Claim 9 and its dependent claim 14 recite, inter alia,

the steps of:

providing a single polymer body on each said integrated circuit element input/output pad and each said substrate input/output pad, wherein the cross section area of said single polymer body. . . has a circular shape. . . ;

. . . .

bringing together said integrated circuit element and said substrate so that said composite bumps contact and are deformed during said contact; . . . (emphasis added).

Fujimoto does not disclose that the composite bumps having a polymer body are provided on both "integrated circuit element input/output pad and substrate input/output pad. . . , " and "the integrated circuit element and said substrate. . . " are brought together "so that said composite bumps contact and are deformed during said contact. . ." (emphasis added). Saito (JP4-6841) does not cure such deficiencies.

Onozaki teaches bonding metallic bumps 4 of the integrated circuit element to metallic bumps 7 of the substrate with bonding layer 5 between the metallic bumps by the process of thermocompression. However, Onozaki's bumps are made of high melting point metals, such as Cu, Ti, etc. (not polymer as claimed), and the purpose of Onozaki's

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invention is to prevent the bumps from being crushed during bonding for sufficiently ensuring the height of the bonding part (Translation, pages 4 and 6). Thus, Onozaki teaches away from the use of polymer bumps which are deformed at the time of bonding.

In combining Fujimoto, Saito (JP4-6841) and Onozaki, the examiner has failed to recognize that all of the relevant teachings of the cited references must be considered in determining what they fairly teach to one having ordinary skill in the art. He has picked enough teachings from Onozaki regarding bonded together the bumps on both the integrated circuit element and the substrate, ignoring the fact that Onozaki teaches away from the use of bump electrodes having a polymer body deformed when bonded together. In our opinion, the examiner's proposed modification amounts to an impermissible hindsight reconstruction of the claimed invention. Therefore, the examiner has failed to establish a prima facie case of obviousness.

Accordingly, we do not sustain the obviousness rejection of claims 9 and 14 based on the combination of Fujimoto and Onozaki, or in the alternative the combination of Fujimoto,

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Saito (JP4-6841) and Onozaki.

The 35 U.S.C. § 103(a) Rejection of Claim 27 Based on the Combination of Fujimoto and Tsukagoshi, or in the Alternative, the Combination Fujimoto, Saito (JP4-6841) and Tsukagoshi

As discussed supra regarding claim 9, Fujimoto does not disclose that the composite bumps having a polymer body are provided on both "integrated circuit element input/output pad and substrate input/output pad," and "the integrated circuit element and said substrate" are brought together "so that said composite bumps contact and are deformed during said contact" (emphasis added). Both Saito (JP4-6841) and Tsukagoshi do not make up for such deficiencies. With respect to claim 27, which depends from claim 9, it follows that the examiner has failed to establish a prima facie case of obviousness.

Accordingly, we do not sustain the obviousness rejection of claim 27 based on the combination of Fujimoto and Tsukagoshi, or in the alternative based on the combination of Fujimoto, Saito (JP4-6841) and Tsukagoshi.

The 35 U.S.C. § 103(a) Rejection of Claim 30 Based on the Combination of Fujimoto, Onozaki and Kanakarajan, or in the Alternative, the Combination of Fujimoto, Saito (JP4-6841), Onozaki and Kanakarajan

Claim 30, which depends from claim 9, further recites

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"wherein said polymer is polyamic acid polyimide." Fujimoto, Saito (JP4-6841), and Onozaki, taken singly or together, do not teach that the polymer is polyamic acid polyimide.

As the examiner stated, Kanakarajan's disclosure relates to "a process of manufacturing flexible polyamic acid polyimide metal-clad laminates for use in flexible printed circuits and tape automated bonding applications" (Answer, page 6). As such,

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Kanakarajan does not disclose that polyamic acid polyimide is to be used in composite bumps. We fail to perceive any teaching, suggestion or motivation in the applied prior art which would have led one of ordinary skill in the art to substitute Kanakarajan's polyamic acid polyimide for Fujimoto's polymer body to arrive at the claimed invention. It is our opinion that the examiner's determination of obviousness is based on impermissible hindsight analysis.

Accordingly, we do not sustain the obviousness rejection of claim 30 based on the combination of Fujimoto, Onozaki and Kanakarajan, or in the alternative the combination of Fujimoto, Saito (JP4-6841), Onozaki and Kanakarajan.

The 35 U.S.C. § 103(a) Rejections of Claims 21 through 24 and 31 through 33

The 35 U.S.C. § 103(a) Rejection of Claims 21 through 24 Based on the Combination of Fujimoto and Chun, or in the Alternative, the Combination of Fujimoto, Saito (JP4-6841) and Chun

Claim 21 and its dependent claims 22 through 24 are directed to a method of forming a bonded structure, comprising inter alia "bonding said structure by means of a tape automated bonding process." Fujimoto and Saito (JP4-6841), taken alone or in combination, do not teach a tape automated

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bonding process for bonding solder bumps of an IC element to those of another IC element or to the TAB leads. Appellants have argued that "[a]lthough Chun describes the use of tape automated bonding it is used in combination with a solder to form the bond" (Brief, page 37). We agree with appellants. We perceive no reason why one of ordinary skill in the art would have been motivated to substitute Chun's solder bumps for Fujimoto's polymer bumps, utilizing the tape automated bonding process. Even assuming arguendo that there was motivation for such a substitution, the device resulting from the combined prior art references would have been different from the claimed invention because the composite bumps would have been made of solder rather than polymer as claimed.

Accordingly, we do not sustain the obviousness rejection of claims 21 through 24 based on the combination of Fujimoto and Chun, or in the alternative, the combination of Fujimoto, Saito (JP4-6841) and Chun.

Nor do we sustain the obviousness rejection of claims 31 through 33, which depend ultimately from claim 21, as being unpatentable over the combination of Fujimoto, Chun and Tsukagoshi, or in the alternative, over the combination of

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Fujimoto, Saito (JP4-6841), Chun and Tsukagoshi, because Tsukagoshi does not make up for the deficiencies of Fujimoto, Saito (JP4-6841), and Chun, as discussed above regarding claims 21 through 23.

Rejection under 37 CFR § 1.196(b)

Pursuant to the provisions of 37 CFR § 1.196(b), we hereby enter the following new grounds of rejection:

Claims 7 through 18, 21 through 27, and 29 through 33 are rejected for failure to comply with the written description requirement of the first paragraph of 35 U.S.C. § 112. In particular, we find that the originally filed application disclosure does not support the recitations "the cross section area of said single polymer body. . .has a circular shape and is smaller than that of each said integrated circuit element input/output pad; . . ." (claims 7 and 9), "the cross section area of said single polymer body. . .has a circular shape and is smaller than that of each said substrate input/output pad; . . ." (claim 8), "said composite bumps have a circular cross section; . . ." (claim 21), "the cross section area of said single polymer body. . .is smaller than that of each said integrated circuit element input/output pad. . ." (claim 22),

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and "the cross section area of said single polymer body. . . is smaller than that of each said substrate input/output pad; . . ."
." (claims 9 and 23).

The test for determining compliance with the written description requirement is whether the originally filed specification disclosure reasonably conveys to one of ordinary skill in the art that applicant had possession of the subject matter later claimed. In re Kaslow, 707 F.2d 1366, 1375, 217 USPQ 1089, 1096 (Fed. Cir. 1983). In re Edwards, 568 F.2d 1349, 1351, 196 USPQ 465, 467 (CCPA 1978) ("The function of the description requirement is to ensure that the inventor had possession, as of the filing date of the application relied on, of the specific subject matter later claimed by him"). Here, appellants have failed to comply with such a requirement. The only portion of the specification (page 8) disclosing the dimensions of the composite bumps is as follows:

The input/output pads are formed of a metal such as aluminum with a diameter of about 90 microns. Each composite bump comprises a single polymer body 32 and a conductive metal coating 36 covering the polymer body. . . . The polymer body has a thickness of between about 5 and 25 microns.

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The above excerpt does not implicitly or explicitly disclose that the cross section area of the single polymer body or composite bumps has a circular shape and is smaller than that of each pad.

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We are mindful that application drawings may provide the written description requirement as required by the first paragraph of 35 U.S.C. § 112. See Vas-Cath Inc. v. Mahurkar, 935 F.2d 1555, 1564, 19 USPQ2d 1111, 1117 (Fed. Cir. 1991). Here, all appellants' Figures 1-10 illustrate polymer body and composite bumps that have an arc-shaped (not circular) vertical cross section area. Moreover, there is nothing in those drawings which disclose that the cross section area of the single polymer body is smaller than that of the pads. On the contrary, these drawings illustrate that the vertical cross section area of the single polymer body is larger than that of the pads. With respect to the size and shape of the horizontal cross section area of the polymer body and the composite bumps, appellants' drawings implicitly or explicitly illustrate none.

DECISION

The decision of the examiner rejecting claims 7, 11, 15 and 18 under 35 U.S.C. § 103(a) is affirmed. However, the decision of the examiner rejecting claims 7, 8, 11, 15 and 18 under 35 U.S.C. § 102(b) and claims 8 through 10, 12 through 14, 16,

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17, 21 through 27 and 29 through 33 under 35 U.S.C. § 103(a) is reversed. Accordingly, the decision of the examiner is affirmed-in-part.

In addition, this decision contains a new ground of rejection of claims 7 through 18, 21 through 27, and 29 through 33 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, "A new ground of rejection shall not be considered final for purposes of judicial review."

Regarding any affirmed rejection 37 CFR § 1.197(b) provides:

(b) Appellant may file a single request for rehearing within two months from the date of the original decision. . . .

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

(1) Submit an appropriate amendment of the

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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. . . .

Should the appellants elect to prosecute further before the Primary Examiner pursuant to 37 CFR § 1.196(b)(1), in order to preserve the right to seek review under 35 U.S.C. §§ 141 or 145 with respect to the affirmed rejection, the effective date of the affirmance is deferred until conclusion of the prosecution before the examiner unless, as a mere incident to the limited prosecution, the affirmed rejection is overcome.

If the appellants elect prosecution before the examiner and this does not result in allowance of the application, abandonment or a second appeal, this case should be returned to the Board of Patent Appeals and Interferences for final action on the affirmed rejection, including any timely request for rehearing thereof.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR

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§ 1.136(a).

AFFIRMED-IN-PART
37 CFR § 1.196(b)

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KENNETH W. HAIRSTON))
Administrative Patent Judge)	
)	
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)	BOARD OF PATENT
JOHN C. MARTIN))
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)	
)	INTERFERENCES
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