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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte GIORGIO MARIOTTINI, SAMEER VADHAVKAR,
WAYNE HUANG, ANILKUMAR CHANDOLU, and MARK BOSSLER

Appeal 2019-002806
Application 15/684,054
Technology Center 2800

Before JEFFREY B. ROBERTSON, MONTÉ T. SQUIRE, and
BRIAN D. RANGE, *Administrative Patent Judges*.

SQUIRE, *Administrative Patent Judge*.

DECISION ON APPEAL¹

Appellant² appeals under 35 U.S.C. § 134(a) from the Examiner's decision to finally reject claims 1–12, which are all of the claims pending in this application. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

¹ In this Decision, we refer to the Specification filed Aug. 23, 2017 (“Spec.”); Final Office Action dated Apr. 16, 2018 (“Final Act.”); Advisory Action dated July 3, 2018 (“1st Advisory Act.”); Appeal Brief filed Sept. 17, 2018 (“Br.”); Advisory Action dated Oct. 17, 2018 (“2nd Advisory Act.”); and Examiner's Answer dated Dec. 20, 2018 (“Ans.”). There is no reply brief.

² We use the word “Appellant” to refer to “applicant” as defined in 37 C.F.R. § 1.42(a). Appellant identifies Micron Technology, Inc. as the real party in interest. Br. 2.

CLAIMED SUBJECT MATTER

Appellant's disclosure relates to semiconductor devices, and in particular, to under-bump metal (UBM) structures for die-to-die and/or package-to-package interconnects, and methods for manufacturing such devices. Spec. ¶ 2; Abstract. Claim 1, the sole independent claim, illustrates the claimed subject matter on appeal and is reproduced below from the Claims Appendix to the Appeal Brief:

1. A method comprising:

forming a collar from an anti-wetting material, *wherein the collar surrounds at least a portion of a sidewall of an under-bump metal (UBM) structure without covering a top surface of the UBM structure*, wherein the UBM structure comprises a first conductive material and a second conductive material disposed over the first conductive material, and *wherein the collar surrounds at least a portion of the first conductive material* and a portion of the second conductive material; and

disposing a solder material on the top surface of the UBM structure, wherein the solder material does not readily wet to the anti-wetting material when the solder material is in liquid phase.

Br. 8 (key disputed claim language italicized and bolded).

REFERENCES

The Examiner relies on the following prior art references as evidence in rejecting the claims on appeal:

Name	Reference	Date
Akram	US 5,736,456	Apr. 7, 1998
Ho et al. ("Ho")	US 2010/0109159 A1	May 6, 2010
Hwang et al. ("Hwang")	US 2014/0363970 A1	Dec. 11, 2014

REJECTIONS

On appeal, the Examiner maintains (Ans. 3) the following rejections:

1. Claims 1–5 are rejected under 35 U.S.C. § 103 as being unpatentable over Hwang in view of Ho (“Rejection 1”). Final Act. 3–5.
2. Claims 6–12 are rejected under 35 U.S.C. § 103 as being unpatentable over Hwang in view of Ho as applied to claim 1 above, and further in view of Akram (“Rejection 2”). *Id.* at 6–8.

OPINION

Having considered the respective positions advanced by the Examiner and Appellant in light of this appeal record, we affirm the Examiner’s rejections based on the fact-finding and reasoning set forth in the Answer, Final Office Action, and Advisory Actions, which we adopt as our own. We add the following primarily for emphasis.

Rejection 1

The Examiner rejects claims 1–5 under § 103 as obvious over the combination of Hwang and Ho (Final Act. 3–5), which we refer to as Rejection 1. In response to the Examiner’s rejection, Appellant presents argument for the patentability of claim 1 but does not present separate argument for the patentability of remaining claims 2–5. Br. 5–6. We select claim 1 as representative and claims 2–5 stand or fall with claim 1. 37 C.F.R. § 41.37(c)(1)(iv).

The Examiner determines that the combination of Hwang and Ho suggests a method satisfying all of the limitations of claim 1 and concludes the combination would have rendered the claim obvious. Final Act. 3–4 (citing Hwang ¶¶ 21, 22, 25, 26, 29, Figs. 1E, 1F; Ho ¶¶ 25, 29, 53, Fig. 1).

Appellant argues the Examiner's rejection of claim 1 should be reversed because the cited art does not teach or suggest the "wherein the collar surrounds at least a portion of a sidewall of an under-bump metal (UBM) structure without covering a top surface of the UBM structure" and "wherein the collar surrounds at least a portion of the first conductive material" recitations of the claim. Br. 5. In particular, Appellant contends Hwang does not disclose a collar that "surrounds at least a portion of the first conductive material." *Id.* at 5. Appellant further contends that because Ho discloses a layer 140 that fully encapsulates the bump 130 and the UBM layer 120 without any surfaces exposed to the atmosphere, it does not teach or suggest a collar which "surrounds at least a portion of a sidewall of an under-bump metal (UBM) structure *without covering* a top surface of the UBM structure," as recited in the claim. *Id.* at 5.

Appellant also contends the Examiner's rejection of claim 1 should be reversed because the combination of Hwang and Ho does not disclose or suggest "a molded material formed on the substrate and having substantially vertical surfaces defining a cavity." *Id.* at 6.

We do not find Appellant's contentions persuasive of reversible error in the Examiner's rejection. Rather, on the record before us, we find a preponderance of the evidence and sound technical reasoning support the Examiner's findings and determination that the combination of Hwang and Ho suggests a method satisfying all of the limitations of claim 1 and conclusion that the combination would have rendered the claim obvious. Hwang ¶¶ 21, 22, 25, 26, 29, Figs. 1E, 1F; Ho ¶¶ 25, 29, 45, 53, Fig. 1.

Regarding the recitation "wherein the collar surrounds at least a portion of a sidewall of an under-bump metal (UBM) structure without

covering a top surface of the UBM structure,” as the Examiner finds (Ans. 4; Final Act. 3), Hwang discloses UBM structures having multiple layers, including a first UBM layer 14, a second UBM layer 16, and a protection layer 22, and forming a collar 22a, which surrounds the sidewall of the second UBM layer 16 without covering the top surface of the UBM structure. Hwang ¶¶ 21, 22, 24, Figs. 1E, 1F.

Regarding the recitation “wherein the collar surrounds at least a portion of the first conductive material,” as the Examiner finds (Ans. 5; Final Act. 3), Ho discloses a UBM structure having multiple layers, including a bump 130, a UBM layer 120, and a collar 140, which surrounds at least a portion of the first conductive material 121 and the second conductive material 122. Ho ¶¶ 25, 29, 45, Fig. 1. As the Examiner also finds (Ans. 5–7), although Ho describes a preferred embodiment wherein the collar 140 fully encapsulates the UBM structure, including the bump 130 and the UBM layer 120 without any surfaces exposed to the atmosphere (Ho ¶ 29, Fig. 1), the reference also teaches that the collar 140 may or may not cover the top surface of the bump 130 (Ho ¶ 45).

Appellant’s arguments do not reveal reversible error in the Examiner’s factual findings and analysis in this regard. Appellant’s contentions at page 5 of the Appeal Brief are not persuasive because Appellant attacks the references individually rather than the combined teachings of the prior art as a whole. One cannot show non-obviousness by attacking references individually where the rejection is based on a combination of references. *In re Keller*, 642 F.2d 413, 425 (CCPA 1981). Appellant’s contentions are premised on what Appellant contends Hwang and Ho each teaches individually, and not the combined teachings of the

references as a whole and what the combined teachings would have suggested to one of ordinary skill in the art.

As the Examiner finds and explains (Ans. 4–7), Hwang is relied upon in the rejection for teaching or suggesting the recitation “wherein the collar surrounds at least a portion of a sidewall of an under-bump metal (UBM) structure without covering a top surface of the UBM structure” (Hwang ¶¶ 21, 22, 24, Figs. 1E, 1F), while Ho is relied upon in the rejection for teaching or suggesting the “wherein the collar surrounds at least a portion of the first conductive material” recitation of the claim (Ho ¶¶ 25, 29, 45, Fig. 1).

Appellant’s contentions at page 5 of the Appeal Brief regarding the Ho reference are also misplaced because Ho’s teachings are not limited to the disclosures in its preferred embodiments. *See In re Mills*, 470 F.2d 649, 651 (CCPA 1972) (“[A] reference is not limited to the disclosure of specific working examples.”); *see also In re Susi*, 440 F.2d 442, 445-46 (CCPA 1971) (explaining that disclosure of particular preferred embodiments does not teach away from a prior art reference’s broader disclosure).

As the Examiner finds (Ans. 5), Ho explicitly teaches that the layer 140 may or may cover the top surface of the UBM structure. *See* Ho ¶ 45 (disclosing that “layer **140** may or may not cover the top surface **131** of the Ag bump **130**”). Although paragraph 29 of Ho discusses an embodiment wherein the layer 140 “[p]referably” fully encapsulates the UBM structure without any surfaces exposed to the atmosphere, such disclosure is merely a preferred embodiment and, without more, does not negate or take away from Ho’s additional disclosure that the layer 140 may or may not cover the top surface of UBM structure in paragraph 45 of the reference. *See In re Preda*,

401 F.2d 825, 826 (CCPA 1968) (explaining that a prior art reference’s disclosure must be considered for all that it teaches, including “the inferences which one skilled in the art would reasonably be expected to draw therefrom”).

Appellant’s contentions that “the combination of Hwang and Ho fails to disclose or suggest all of the features of claim 1” (Br. 6) and a person skilled in the art would not have been “motivated to modify the combination of Hwang and Ho” (*id.* at 6) are not persuasive because they are conclusory and, without more, do not reveal reversible error in the Examiner’s factual findings and analysis in this regard. Attorney argument is not evidence. *In re De Blauwe*, 736 F.2d 699, 705 (Fed. Cir. 1984); *see also In re Lovin*, 652 F.3d 1349, 1356–57 (Fed. Cir. 2011) (holding that a “naked assertion” that the references fail to disclose or suggest a claim limitation is not an argument in support of separate patentability).

Appellant’s contention that the combination of Hwang and Ho fails to disclose or suggest “a molded material formed on the substrate and having substantially vertical surfaces defining a cavity” (Br. 6) is equally unpersuasive because it too is conclusory and, as the Examiner points out (Ans. 4), based on limitations not recited in the claims. *See In re Van Geuns*, 988 F.2d 1181, 1184–85 (Fed. Cir. 1993) (“[L]imitations are not to be read into the claims from the specification.”).

Accordingly, we affirm the Examiner’s rejection of claims 1–5 under 35 U.S.C. § 103 as obvious over the combination of Hwang and Ho.

Rejection 2

In response to the Examiner’s rejection of claims 6–12 under § 103 as obvious over the combination of Hwang, Ho, and Akram (Final Act. 6–8),

which we refer to as Rejection 2, Appellant does not present any new or additional substantive arguments in the Appeal Brief, and apparently intends to rely on the same arguments previously presented above in response to the Examiner's rejection of claim 1.

Accordingly, based on the fact-finding and reasoning provided by the Examiner at pages 3–7 of the Answer and pages 3–8 of the Final Office Action, and for principally the same reasons discussed above for affirming the Examiner's rejection of claim 1, we affirm the Examiner's rejection of claims 6–12 under 35 U.S.C. § 103 as obvious over the combination of Hwang, Ho, and Akram.

CONCLUSION

In summary:

Claim(s) Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
1–5	103	Hwang, Ho	1–5	
6–12	103	Hwang, Ho, Akram	6–12	
Overall Outcome			1–12	

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