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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte TOMOYASU KAI and HIROYUKI BABA

Appeal 2015-005409
Application 12/076,127
Technology Center 1700

Before ADRIENE LEPIANE HANLON, MONTÉ T. SQUIRE, and
MICHAEL G. McMANUS *Administrative Patent Judges*.

SQUIRE, *Administrative Patent Judge*.

DECISION ON APPEAL¹

Appellants² appeal the Examiner's final rejection of claims 12, 14–17, 22, and 26–28. 35 U.S.C. § 134(a). We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

¹ In this decision, we refer to the Final Office Action appealed from, mailed June 9, 2014 (“Final Act.”), the Appeal Brief dated November 10, 2014 (“App. Br.”), the Examiner’s Answer to the Appeal Brief dated March 6, 2015 (“Ans.”), and the Appellants’ Reply Brief dated April 29, 2015 (“Reply Br.”).

² Appellants identify Lapis Semiconductor Co., Ltd. as the Real Party in Interest. App. Br. 2.

The Claimed Invention

Appellants' disclosure relates to a semiconductor manufacturing apparatus and method. Spec. ¶ 1; Abstract. Claim 12 is representative of the claims on appeal and is reproduced below from the Claims Appendix to the Appeal Brief (App. Br. 15):

12. A method of manufacturing a semiconductor substrate, comprising:

 providing a hot plate which heats and holds a substrate wafer made of sapphire, the hot plate having a hole through which both a negative pressure can be applied and a gas can be ejected, the negative pressure being applied to suck and hold a rear surface of the substrate wafer, the gas being ejected to control an increase in temperature of the substrate wafer when the hot plate heats the substrate wafer;

 providing a film forming section which forms a silicon film on a front surface of the substrate wafer while the rear surface is sucked and held by the hot plate, the substrate wafer being disposed between the hot plate and the film forming section as the film is being formed;

 detecting whether or not the hot plate is placed on the film forming section;

 detecting whether or not the substrate wafer is held by the hot plate; and

 clearing foreign particles from a conduit connected to the hole in the hot plate by ejecting the gas intermittently from the hole of the hot plate when the hot plate is placed on the film forming section but the substrate wafer is not held by the hot plate and is not disposed between the hot plate and the film forming section,

 wherein the foreign particles cleared from the conduit are reaction products that were formed when the film was being formed and that were sucked into the conduit due to the negative pressure holding the rear surface of the substrate wafer to the hot plate when the hot plate was on the film forming section.

The References

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

Nusbickel, Jr. et al., (hereinafter “Nusbickel”)	US 4,470,304	Sept. 11, 1984
Moriya et al., (hereinafter “Moriya”)	US 2005/0082000 A1	Apr. 21, 2005
Nijhawan et al., (hereinafter “Nijhawan”)	US 2007/0240631 A1	Oct. 18, 2007
Yoshie Bae	US 2008/0011738 A1 KR 2003042160 A	Jan. 17, 2008 May 28, 2003

The Rejections

On appeal, the Examiner maintains the following rejections:

1. Claims 12, 14–17, and 27 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshie in view of Nusbickel and further in view of Bae and still further in view of Nijhawan and Moriya. Ans. 2; Final Act. 2.
2. Claims 22, 26, and 28 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoshie in view of Nijhawan and Moriya. Ans. 13; Final Act. 12.

OPINION

Having considered the respective positions advanced by the Examiner and Appellants in light of this appeal record, we affirm the Examiner’s rejections for the reasons set forth in the Answer to the Appeal Brief and

Final Office Action appealed from, which we adopt as our own. We highlight and address specific findings and arguments below for emphasis.

Rejection 1

Claim 12. Appellants argue claims 12, 14–17, and 27 as a group. We select claim 12 as representative of this group and the remaining claims stand or fall with claim 12. 37 C.F.R. § 41.37(c)(1)(iv).

The Examiner finds that the prior art combination of Yoshie, Nusbickel, Bae, Nijhawan, and Moriya suggests all of claim 12’s steps and concludes that the combination would have rendered claim 12 obvious. Ans. 2–8. The Examiner finds that the combination of Yoshie, Nusbickel, and Bae suggests nearly all of claim 12’s limitations, but that it does not explicitly teach “the step of clearing foreign particles includes intermittently ejecting the gas from the hole of the hot plate” and “that the foreign particles cleared from the conduit are reaction products that were formed when the film was being formed and that were sucked into the conduit due to the negative pressure holding the rear surface of the substrate wafer to the hot plate.” *Id.* at 6, 7; Yoshie, Abstract, Fig. 12, ¶¶ 4, 5, 62, 72–93; Nusbickel, col. 5, ll. 30–46; Bae, Abstract. The Examiner, however, relies on Nijhawan and Moriya for suggesting these missing limitations.

In particular, the Examiner finds that Moriya teaches “that by subjecting the reaction chamber to intermittent ‘shock waves’ from a purge gas of N₂, the number of desorbed particles decreases even further with each subsequent pulse.” Ans. 6 (citing Moriya, Fig. 9, Embodiment 6, ¶¶ 71–76). The Examiner finds further that, as exemplified in Nijhawan’s and Moriya’s teachings, “the adsorption of reaction products onto interior surfaces of a vacuum system during film growth [was] well-known in the art” at the time

of the invention. *Id.* at 7 (citing Nijhawan, ¶¶ 30–32, Fig. 2A; Moriya, Figs. 6–9, 13–15, ¶¶ 71–76, 92–101).

Based on the above findings regarding the teachings of the prior art, the Examiner finds that an ordinary artisan at the time of the invention would have reasonably expected that “at least some reaction products would [have been] sucked into the introduction tube by means of the suction/discharge hole during film growth” because

Yoshie teaches the steps of utilizing a negative pressure to suck and hold the rear surface of a substrate wafer to the hot plate during the film forming step, . . . [which] necessarily result[s] in reaction products being sucked into the conduit due to the negative pressure . . . [and] in the expulsion of reaction products from the film forming step when utilizing the step of clearing foreign particles from the conduit as per the teachings of Nijhawan and Moriya.

Ans. 7, 8.

Appellants argue that the Examiner’s rejection should be reversed because: (1) Nusbickel is non-analogous art; (2) Bae does not disclose the “step of detecting whether or not the substrate wafer is held by the hot plate”; and (3) neither Nijhawan nor Moriya teaches or suggests the “clearing foreign particles” step or “recognizes the problem that is solved by the [claimed] invention.” App. Br. 7–11.

We are not persuaded by Appellants’ arguments. Based on the record before us, the Examiner’s obviousness conclusion and finding that the combination of Yoshie, Nusbickel, Bae, Nijhawan, and Moriya suggests all of claim 12’s limitations (Ans. 2) are supported by a preponderance of the evidence and based on sound technical reasoning. Yoshie, Abstract, Fig. 12, ¶¶ 4, 5, 62, 72–93; Nusbickel, col. 5, ll. 30–46; Bae, Abstract; Nijhawan, ¶¶

30–32, Fig. 2A; Moriya, Figs. 6–9, 13–15, ¶¶ 71–76, 92–101, Embodiment 6, Embodiment 12. Appellants fail to direct us to sufficient evidence or provide an adequate technical explanation to show why the Examiner’s findings and conclusions lack a rational underpinning or are otherwise based on some other reversible error.

We do not find Appellants’ argument that Nusbickel is non-analogous art (App. Br. 7) persuasive because it too narrowly construes the scope of Nusbickel’s disclosure, particularly the relevance to the problem in which the claimed invention is involved. *See In re Bigio*, 381 F.3d 1320, 1325 (Fed. Cir. 2004). As the Examiner found (Ans. 23), Nusbickel teaches a method of tracking the motion of a “hot plate **10**” and a plurality of techniques which permit the location of the hot plate to be monitored (Nusbickel, col. 5, ll. 30–46) that relate directly to the “detecting whether or not the hot plate” is in a particular location limitation of and problem addressed by claim 12.

Appellants’ contention that Bae does not disclose the step of detecting whether or not the substrate wafer is held by the hot plate (App. Br. 8) is unpersuasive because, as the Examiner found (Ans. 24), Bae necessarily discloses this step. In particular, Bae discloses a semiconductor fabricating apparatus having “a plurality of detecting sensors,” which determine the “precise settlement position of the [semiconductor] wafer.” Abstract. As the Examiner correctly points out (Ans. 24), the step of determining the settlement position of the wafer, as taught by Bae, necessarily and logically involves detecting whether or not the wafer itself is present, which reads on claim 12’s “detecting whether or not the substrate wafer is held by the hot

plate” limitation. Appellants’ argument exposes no reversible error in the Examiner’s findings and analysis in this regard.

Appellants’ arguments that neither Nijhawan nor Moriya teaches or suggests the “clearing foreign particles” claim step or recognizes the problem that is solved by the claimed invention (App. Br. 9) are equally unpersuasive. For one thing, the Supreme Court has stated that it is error to “look only to the problem the patentee [or applicant] was trying to solve.” *KSR Int’l Co. v. Teleflex, Inc.*, 550 U.S. 398, 420 (2007).

Appellants also attack the references individually rather than the collective teachings of the prior art as a whole. One cannot show non-obviousness by attacking references individually where the rejections are based on combinations of references. *See In re Keller*, 642 F.2d 413, 425 (CCPA 1981) (“[T]he test [for obviousness] is what the combined teachings of the references would have suggested to those of ordinary skill in the art.”). Appellants’ argument focuses primarily on what Appellants contend Nijhawan and Moriya teach individually, and not the teachings of the prior art combination as a whole and what the combined teachings of the references would have suggested to one of ordinary skill in the art.

On the contrary and as the Examiner found (Ans. 24–27), it is the combined teachings of the cited references as a whole that would have suggested the “clearing foreign particles” limitation to one of ordinary skill in the art. In particular, as found by the Examiner (Ans. 25), Yoshie’s process includes a vacuum port **21** and vacuum channel **22** and results in reaction products being sucked into the vacuum port **21** due to the applied negative pressure. Yoshie, Fig. 12, ¶¶ 83, 84. As further found by the Examiner (Ans. 25), Nijhawan teaches that it is desirable to deliver a purge

gas to a vacuum chamber **215** through a gas distribution plate **221** and then out through an annular pumping channel **240** in order to remove entrained particles, and that the gas distribution plate **221** includes a plurality of holes or openings which are cleared of foreign particles by means of the expelled purge gas. Nijhawan, Fig. 2A, ¶¶ 25–31. As the Examiner also found (Ans. 25, 26), Moriya teaches that adsorbed particles in a reaction chamber may be removed by purging with nitrogen gas. Moriya, Figs. 6–9, 13–15, ¶¶ 71–76, 92–101, Embodiment 6, Embodiment 12. We discern no reversible error in the Examiner’s factual findings in this regard.

Moreover, in light of the prior art’s combined teachings, we concur with the Examiner’s findings (Ans. 26) that an ordinary artisan would have readily recognized the desirability of purging Yoshie’s process components and would have been motivated to apply similar gas purging techniques as taught by Nijhawan and Moriya in order to clear foreign particles that may have been sucked into Yoshie’s vacuum channel **22** by the negative pressure utilized to hold the substrate **1** against the hot plate **3** during film growth.

We do not find Appellants’ arguments that: (1) Nijhawan and Moriya relate to cleaning a reaction chamber and not to “gas passageways” or gas conduits connected to the chamber and (2) “Moriya’s use of shock waves to clean an element in a vacuum chamber would not have suggested using intermittent ejection of gas to clean a conduit” (App. Br. 9–11) persuasive for the well-stated reasons provided by the Examiner at page 26 and 27 of the Answer. In particular, as noted by the Examiner (Ans. 26), the gas conduits and passageways that are connected to the reaction chamber or vacuum are all necessarily part of the same system and would be purged together to avoid contamination.

Moreover, we concur with the Examiner's findings and reasoning that although there may exist more efficient or preferred means for clearing foreign particles, shock waves flowing through a tube as taught by Moriya (Moriya, ¶¶ 71–76, 86, Embodiment 6) would also have been reasonably expected by one of ordinary skill to produce some degree of particle removal. *Cf. In re Susi*, 440 F.2d 442, 445 (CCPA 1971) (explaining that preferred embodiments do not constitute a teaching away from a reference's broader disclosure or non-preferred embodiments).

Claim 27. Appellants present additional arguments for the separate patentability of claim 27. In particular, Appellants argue that the Examiner's rejection of claim 27 should be reversed because the prior art does not suggest

that the step in claim 12 of clearing foreign particles “is conducted subsequent to the step of detecting whether or not the substrate wafer is held by the hot plate and before the hot plate, conduit, and film forming section are used to form a film on the next substrate wafer.”

App. Br. 12.

We do not find this argument persuasive because it is conclusory and a naked assertion that the prior art fails to teach or suggest a claim limitation is not argument in support of separate patentability. *Cf. In re Lovin*, 652 F.3d 1349, 1356–57 (Fed. Cir. 2011); *see also* 37 C.F.R. § 41.37(c)(1)(iv).

Moreover, we find that a preponderance of the evidence and sound technical reasoning supports the Examiner's finding (Ans. 11–13) that the prior art suggests all of claim 27's limitations and stated reasoning for why one of ordinary skill in the art would have been motivated to combine these teachings to arrive at the claimed invention. Yoshie, Abstract, Fig. 12, ¶¶ 4,

5, 62, 72–93; Nusbickel, col. 5, ll. 30–46; Bae, Abstract; Nijhawan, ¶¶ 30–32, 36–52, Fig. 2A; Moriya, Figs. 6–9, 13–15, ¶¶ 71–76, 92–101, Embodiment 6, Embodiment 12; Ans. 12, 28 (explaining that it would have been within the capabilities of one of ordinary skill in the art to repeat the claimed process for each subsequent wafer and motivated to do so to avoid cross-contamination between different wafers).

Appellants’ argument that the Examiner improperly and inappropriately invoked the “design choice” doctrine is unpersuasive for the well-stated reasons provided by the Examiner at pages 27 and 28 of the Answer. Appellants’ argument is conclusory and does not expose any reversible error in the Examiner’s analysis and findings in this regard.

Accordingly, we affirm the Examiner’s rejection of claims 12, 14–17, and 27 under 35 U.S.C. § 103(a) as unpatentable over the combination of Yoshie, Nusbickel, Bae, Nijhawan, and Moriya.

Rejection 2

Appellants argue claims 22, 26, and 28 as a group. We select claim 22 as representative and claims 26 and 28 stand or fall with claim 22. 37 C.F.R. § 41.37(c)(1)(iv).

The Examiner finds that the combination of Yoshie, Nijhawan, and Moriya suggests all of claim 22’s limitations and concludes that the combination would have rendered claim 22 obvious. Ans. 12–21.

Appellants argue that this rejection should be reversed for essentially the same reasons set forth above with respect to claim 12. Accordingly, we do not find these arguments persuasive for the same reasons discussed above in affirming the Examiner’s rejection of claim 12.

Moreover, based on the record before us, we find that the Examiner's findings that the combined teachings of Yoshie, Nijhawan, and Moriya suggest all of claim 22's limitations and stated rationale for why one of ordinary skill in the art would have combined these teachings to arrive at the claimed invention (Ans. 12–21) are supported by a preponderance of the evidence and based on sound technical reasoning.

Accordingly, we affirm the Examiner's rejection of claims 22, 26, and 28 under 35 U.S.C. § 103(a) as unpatentable over the combination of Yoshie, Nijhawan, and Moriya.

DECISION/ORDER

The Examiner's rejections of claims 12, 14–17, 22, and 26–28 are affirmed.

It is ordered that the Examiner's decision 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).

AFFIRMED