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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte JOHN VICTOR BUCCI, MARK RICHARD STACHOWIAK, and
CHARLES ALLAN STIBITZ

Appeal 2019-001863
Application 15/242,740
Technology Center 1700

Before MICHAEL P. COLAIANNI, GEORGE C. BEST, and
DEBRA L. DENNETT, *Administrative Patent Judges*.

DENNETT, *Administrative Patent Judge*.

DECISION ON APPEAL¹

Pursuant to 35 U.S.C. § 134(a), Appellant² appeals from the Examiner's decision to reject claims 1 and 4–18 of Application 15/242,740. *See* Final Act. 1. We have jurisdiction under 35 U.S.C. § 6.

For the reasons set forth below, we AFFIRM.

¹ In our Decision, we refer to Specification filed August 22, 2016 (“Spec.”) of Application 15/242,740 (“the ’740 Application”); the Final Office Action dated March 19, 2018 (“Final Act.”); the Appeal Brief filed August 20, 2018 (“Appeal Br.”); and the Examiner’s Answer dated November 2, 2018 (“Ans.”); and the Reply Brief filed December 31, 2018 (“Reply Br.”).

² We use the word “Appellant” to refer to “Applicant” as defined in 37 C.F.R. § 1.42. Appellant identifies Hemlock Semiconductor Operations LLC as the real party in interest. Appeal Br. 2.

BACKGROUND

The '740 Application relates to a method of improving polycrystalline silicon growth in a reactor. Spec. ¶ 1. According to the Specification, high purity semiconductor grade silicon is typically prepared by reducing trichlorosilane gas in the presence of hydrogen and then depositing the silicon product onto a heated silicon element. *Id.* at ¶ 2. Reactor effluent comprises up to 50 mol% trichlorosilane and dichlorosilane, of which the latter is present in varying amounts that are difficult to predict and control. *Id.* at ¶¶ 3, 4. When recycled reactor effluent is utilized as a feed, the claimed method is said to compensate for varying amounts of dichlorosilane. *Id.* at ¶¶ 17, 18.

Claim 1 is representative of the '740 Application's claims and is reproduced below from the Claims Appendix of the Appeal Brief.

1. A method of improving polycrystalline silicon growth in a reactor, comprising:

introducing a chlorosilane feed composition comprising trichlorosilane and dichlorosilane into a deposition chamber, wherein the deposition chamber contains a substrate;

blending the chlorosilane feed composition with hydrogen gas to form a feed composition;

adjusting a baseline flow of chlorosilane and hydrogen gas into the deposition chamber to achieve a pre-determined total flow and a pre-determined chlorosilane feed composition set point;

applying pressure to the deposition chamber and energy to the substrate in the deposition chamber to form polycrystalline silicon;

measuring the amount of dichlorosilane present in the chlorosilane feed composition and determining an offset value

from a target value of dichlorosilane present in the chlorosilane feed composition;

adjusting the chlorosilane feed composition set point by an amount inversely proportional to the dichlorosilane offset value; and

depositing the formed polycrystalline silicon onto the substrate.

Appeal Br. 8 (Claims App.) (emphases added).

REFERENCES

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

Name	Reference	Date
Bradley	US 3,900,660	Aug. 19, 1975
Hertlein et al. ("Hertlein")	US 8,398,946 B2	Mar. 19, 2013
Urushihara et al. ("Urushihara")	US 8,551,580 B2	Oct. 8, 2013
Harms et al. ("Harms")	WO 2010/135105 A1	Nov. 25, 2010

REJECTIONS

On appeal, the Examiner maintains the following rejections under 35 U.S.C. § 103:³

1. Claims 1, 4, 7, and 11–18 over Bradley in view of Harms (Final Act. 6–9);
2. Claims 5, 6, 8, and 9 over Bradley in view of Harms and Urushihara (*id.* at 9–10); and

³ Because this application was filed after the March 16, 2013, effective date of the America Invents Act, we refer to the AIA version of the statute.

3. Claims 6, 9, and 10 over Bradley in view of Harms and Hertlein (*id.* at 10–11).

DISCUSSION

Ground 1: Rejection of claims 1, 4, 7, and 11–18 as obvious over Bradley in view of Harms

The Examiner determines that claims 1, 4, 7, and 11–18 would have been obvious over Bradley in view of Harms. Final Act. 6–9. Appellant argues the claims as a group based on limitations recited in claim 1. Appeal Br. 3–6. We select claim 1 as representative. Claims 4, 7, and 11–18 stand or fall with claim 1. *See* 37 C.F.R. § 41.37(c)(1)(iv).

Regarding claim 1, the Examiner finds that Bradley discloses a method of improving polycrystalline growth in a reactor comprising the steps of: (i) introducing a chlorosilane feed composition into a deposition chamber; (ii) blending the chlorosilane feed with hydrogen gas; (iii) adjusting a baseline flow of chlorosilane and hydrogen gas into the deposition chamber; (iv) applying pressure and energy to a substrate in the deposition chamber to form polycrystalline silicon; and (v) depositing the formed polycrystalline silicon onto the substrate. Final Act. 6. The Examiner finds that although Bradley teaches that the chlorosilane feed composition includes dichlorosilane with trichlorosilane, Bradley does not teach the measuring and adjusting steps of claim 1. *Id.* at 7

The Examiner finds that Harms teaches that “the yield and purity of the silicon product” during polysilicon formation is “dependent on feed rates of gases, temperature, pressures and [that] even small deviations from optimum values can cause [a] drop in yield.” *Id.* (citing Harms 2:5–10).

The Examiner finds that Harms's polysilicon forming method analyzes and measures the amounts each of a gaseous feed stream's components, including dichlorosilane, and adjusts the relative amounts of the gaseous components of the feed stream based on the analysis and measurements. Final Act. 7 (citing Harms 4:5–15).

The Examiner determines, *inter alia*, that it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Bradley to provide Harms's real time control and optimization of the polysilicon yield. Final Act. 7. According to the Examiner, "the amount of dichlorosilane and the feed composition is specifically understood and recognized as a result effective variable." *Id.*

Appellant's argument for patentability of claim 1 asserts that the combined teachings of Bradley and Harms "at least fail to disclose" (Appeal Br. 5) the limitation "adjusting the chlorosilane feed composition set point by an amount inversely proportional to the dichlorosilane offset value." *Id.* at 8 (Claims App.). Appellant contends that neither Bradley nor Harms "recognize the problem of silicon decomposition due to too much dichlorosilane in the feed stream or the associated solution." Appeal Br. 5. According to Appellant, Harms

merely discloses that a Raman spectroscopy signal from each of the components in the feed stream is acquired and analyzed to determine the presence and concentration of each of the gaseous components and to detect any deviations from predetermined values and adjusting the feed rate of any of the gaseous components that deviate from the predetermined values.

Id.

Appellant's arguments that Bradley and Harms fail to recognize that excessive dichlorosilane in the feed stream causes the problem of silicon

decomposition fail to persuade us that the Examiner reversibly errs in rejecting claim 1 as obvious. *See* Appeal Br. 5.

To render an invention obvious, the prior art does not have to address the same problem addressed by a patent applicant. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 419–20 (2007) (“In determining whether the subject matter of a patent claim is obvious, neither the particular motivation nor the avowed purpose of the patentee controls. What matters is the objective reach of the claim. If the claim extends to what is obvious, it is invalid under § 103.”). “One of ordinary skill in the art need not see the identical problem addressed in a prior art reference to be motivated to apply its teachings.” *Cross Med. Prods., Inc. v. Medtronic Sofamor Danek, Inc.*, 424 F.3d 1293, 1323, (Fed. Cir. 2005) (citing *In re Oetiker*, 977 F.2d 1443, 1448 (Fed. Cir. 1992); *see also KSR*, 550 U.S. at 418 (“[T]he [obviousness] 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.”).

For purposes of § 103, a reference stands for all of the specific teachings thereof as well as the inferences one of ordinary skill in the art would have reasonably been expected to draw therefrom. *In re Fritch*, 972 F.2d 1260, 1264–65 (Fed. Cir. 1992). The question under 35 U.S.C. § 103 is not merely what the references teach, but what they would have suggested to one of ordinary skill in the art at the time the invention was made. All disclosures of the prior art must be considered. *In re Lamberti*, 545 F.2d 747, 750 (CCPA 1976).

Although “adjusting the chlorosilane feed composition set point by an amount inversely proportional to the dichlorosilane offset value,” as recited

in claim 1, is not explicitly disclosed in either Bradley or Harms, the prior art would have suggested the requisite adjustment amount. Appeal Br. 8 (Claims App.). Harms explicitly discloses that it is desirable “to monitor all of the reactants involved in substantially real time so that deviations from optimal values could be detected and corrected quickly.” Harms 2:9–11. As the Examiner persuasively reasoned, if the amount of dichlorosilane increases by a recognized and measured value from the optimum feed concentration, this increase reasonably suggests the claimed offset value. Ans. 11. One of ordinary skill in the art at the time of the invention would have found it obvious “to adjust that feed concentration by a correlated decrease,” i.e., an amount inversely proportional to the measured increase, “so as to bring the concentration to the optimum target value.” *Id.*

Therefore, Harms’s recognition of offset values and adjusting the composition to correct these deviations would have suggested the disputed limitation recited in claim 1. Comparing Harms’s disclosure with claim 1, we find that the claim encompasses the prior art.

Appellant, furthermore, has not demonstrated any unexpected result from adjusting the chlorosilane feed composition set point by an amount inversely proportional to the dichlorosilane offset value. *See* Appeal Br. 5–6; Reply Br. 2–3.

Appellant distinguishes the instant claims, which are allegedly “directed to a feed forward strategy,” from Harms, which “discloses a feedback control strategy.” Appeal Br. 5. We note, however, that the rejected claims are not limited to a feed forward control strategy. *See id.* at 8 (Claims App.).

Appellant's Reply Brief contains new arguments (i.e., that the claims are distinguished from the prior art because Harms assumes a constant dichlorosilane concentration (Reply Br. 2)) which could have been, but were not presented in the Appeal Brief. Under regulations governing appeals to the Board, a new argument not timely presented in the Appeal Brief will not be considered when filed in a Reply Brief, absent a showing of good cause explaining why the argument could not have been presented in the Appeal Brief. *See* 37 C.F.R. § 41.41(b)(2); *see also* *Optivus Tech., Inc. v. Ion Beam Applications S.A.*, 469 F.3d 978, 989 (Fed. Cir. 2006) (argument raised for the first time in the Reply Brief is considered waived); *Ex parte Borden*, 93 USPQ2d 1473, 1474 (BPAI 2010) (informative) (“[T]he reply brief [is not] an opportunity to make arguments that could have been made in the principal brief on appeal to rebut the Examiner’s rejections, but were not.”); 37 C.F.R. § 41.37). Because the record contains no such showing, we will not consider the new argument in the Reply Brief.

We sustain the rejection of claim 1 as obvious over Bradley. For the same reasons, we sustain the rejection of claims 4, 7, and 11–18.

Ground 2: Rejection of claims 5, 6, 8, and 9 as obvious over Bradley in view of Harms and Urushihara

The Examiner finds that claims 5, 6, 8, and 9 are unpatentable over Bradley in view of Harms and Urushihara. Final Act. 9–10.

Appellant merely argues that the Examiner’s assertions do not cure the deficiencies in Ground 1 (obviousness over Bradley and Harms). Appeal Br. 6.

Having found no deficiencies in Bradley and Harms in Ground 1, *supra*, we sustain the rejection of claims 5, 6, 8, and 9 as obvious over Bradley in view of Harms and Urushihara.

Ground 3: Rejection of claims 6, 9, and 10 as obvious over Bradley in view of Harms and Hertlein

The Examiner finds that claims 6, 9, and 10 are unpatentable over Bradley in view of Harms and Hertlein. Final Act. 10–11.

Appellant merely argues that the Examiner’s assertions do not cure the deficiencies in Ground 1 (obviousness over Bradley and Harms). Appeal Br. 6.

Having found no deficiencies in Bradley and Harms in Ground 1, *supra*, we sustain the rejection of claims 6, 9, and 10 as obvious over Bradley in view of Harms and Hertlein.

CONCLUSION

In summary:

Claims Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
1, 4, 7, 11–18	103	Bradley, Harms	1, 4, 7, 11–18	
5, 6, 8, 9	103	Bradley, Harms, Urushihara	5, 6, 8, 9	
6, 9, 10	103	Bradley, Harms, Hertlein	6, 9, 10	
Overall Outcome			1, 4–18	

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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