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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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*Ex parte* WILLIAM L. LUTER, VERLIN A. LAUHER,  
DICK S. WILLIAMS, HOWARD P. ZINSCHLAG,  
NEIL MIDDENDORF, and DAVID J. DUBIEL

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Appeal 2017-011112  
Application 13/651,981  
Technology Center 1700

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Before DONNA M. PRAISS, N. WHITNEY WILSON, and  
MONTÉ T. SQUIRE, *Administrative Patent Judges*.

WILSON, *Administrative Patent Judge*.

DECISION ON APPEAL

Pursuant to 35 U.S.C. § 134(a), Appellant<sup>1</sup> appeals from the Examiner's June 30, 2016, decision finally rejecting claims 1–5, 8–10, 12, and 13 as unpatentable under 35 U.S.C. § 103(a) (“Final Act.”). We have jurisdiction over the appeal under 35 U.S.C. § 6(b).

We reverse.

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<sup>1</sup> The Applicant/Appellant is GTAT IP HOLDING LLC, which is also identified as the real party in interest (Br. 2).

### CLAIMED SUBJECT MATTER

Appellant's application is directed to a Czochralski (CZ) growth system for preparing silicon wafers used in photovoltaic solar cells (Abstract, Spec. ¶ 3). The system includes a growth chamber, a feed port, and a feed chamber comprising a container for feedstock and a feeder. According to the Specification, in a CZ growth system, the silicon is melted in a crucible to its liquid state (Spec. ¶ 3). A small crystalline silicon seed with a predetermined crystalline orientation is contacted with the melt and then slowly withdrawn (*id.*). The liquid silicon freezes on the crystalline seed with the same orientation as that of the seed, so that as the seed is slowly raised away from the melt it forms a growing crystalline ingot of silicon having a final length typically of a meter or more and a diameter typically of hundreds of millimeters (*id.*).

As shown in FIG. 1, the claimed CZ system has a growth chamber comprising crucible chamber 12 which includes double walled crucible 16, which in turn comprises inner wall 20 defining inner zone 22 and outer wall 24 which defines outer zone 26 (Spec. ¶ 23). Aperture 28 in inner wall 20 provides fluid communication between inner zone 22 and outer zone 26 (*id.*). Solid silicon particles 60 are supplied by feeder 62 into outer zone 26, where they are melted by heaters 30 and 32.

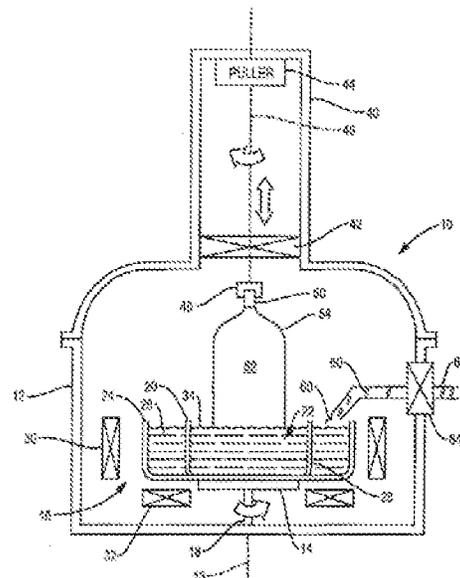


FIG. 1 shows a cross-sectional view of an embodiment of the claimed invention.

FIG. 1

Fig. 1 shows a cross-sectional view of an embodiment of the claimed invention.

Details of the claimed invention are set forth in representative claim 1, which is reproduced below from the Claims Appendix of the Brief (*emphasis added*):

1. A Czochralski growth system, comprising:  
a growth chamber comprising a crucible, at least one sidewall, a top wall, a pedestal for supporting the crucible, *a drop box fixedly mounted to an inside of the growth chamber*, and a pull mechanism for retractably supporting a seed for contacting a melt contained in the crucible, wherein the crucible comprises an inner zone positioned under the pull mechanism and an annular outer zone in fluid communication with the inner zone and disposed under a spout of the drop box;  
a feed port positioned in the at least one sidewall of the growth chamber so that feedstock enters the growth chamber having overall path of delivery of the feedstock of between 0° and about 20° from horizontal at a center of the feed port and into the outer zone of the crucible; and  
a feed chamber attached to the growth chamber at the feed port, the feed chamber comprising a feed hopper, a funnel spout for the feedstock and a feeder insertable into the growth chamber through the feed port to supply the feedstock into the growth chamber.

## REJECTIONS

1. Claims 1, 4, and 8–10 are rejected under 35 U.S.C. § 103(a) as unpatentable over Arvidson<sup>2</sup> in view of Sahr<sup>3</sup> and Taguchi.<sup>4</sup>

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<sup>2</sup> Arvidson et al., US 2003/0159647 A1, published August 28, 2003.

<sup>3</sup> Sahr et al., US 2009/0158993 A1, published June 25, 2009.

<sup>4</sup> Taguchi et al, US 5,858,087, issued January 12, 1999.

2. Claims 2 and 3 are rejected under 35 U.S.C. § 103(a) as unpatentable over Arvidson in view of Sahr, and Taguchi, and further in view of Miyahara.<sup>5</sup>

3. Claim 5 is rejected under 35 U.S.C. § 103(a) as unpatentable over Arvidson in view of Sahr, and Taguchi, and further in view of Nakashima.<sup>6</sup>

4. Claim 12 is rejected under 35 U.S.C. § 103(a) as unpatentable over Arvidson in view of Sahr, and Taguchi, and further in view of Williams.<sup>7</sup>

5. Claim 13 is rejected under 35 U.S.C. § 103(a) as unpatentable over Arvidson in view of Sahr, and Taguchi, and further in view of Kamio.<sup>8</sup>

#### DISCUSSION

Appellant's arguments are solely directed to the rejection of claim 1 (Br. 5–12). Based upon the lack of arguments directed to the dependent claims and the subsidiary rejections, our analysis will focus on the rejection of claim 1 over Arvidson in view of Sahr and Taguchi. The remaining claims will stand or fall with claim 1. 37 C.F.R. § 41.37(c)(1)(iv) (2013).

***Non-analogous art argument.*** Appellant's first argument seeking reversal of the rejection is that Sahr is not analogous art and, therefore, not properly combinable with Arvidson and Taguchi (Br. 5–8). In order to be properly relied upon in an obviousness analysis, a prior art reference must qualify as "analogous art," i.e., it must satisfy one of the following conditions:

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<sup>5</sup> Miyahara et al., JP 09175883 A, published July 8, 2009. We will rely on the machine translation of record, as have Appellant and the Examiner.

<sup>6</sup> Nakashima et al., US 7,001,456 B2, issued February 21, 2006.

<sup>7</sup> Williams et al., US 2011/0006240 A1, published January 13, 2011.

<sup>8</sup> Kamio et al., US 5,312,600, issued May 17, 1994.

(i) the reference must be from the same field of endeavor as the claimed invention; or (ii) the reference must be reasonably pertinent to the particular problem with which the inventor is involved. *Innovention Toys, LLC v. MGA Entm't, Inc.*, 637 F.3d 1314, 1321 (Fed. Cir. 2011). “A reference is reasonably pertinent if it, as a result of its subject matter, ‘logically would have commended itself to an inventor’s attention in considering his problem.’” *K-TEC, Inc. v. Vita-Mix Corp.*, 696 F.3d 1364, 1375 (Fed. Cir. 2012) (citing *Innovention Toys*, 637 F.3d at 1321).

Appellant argues that Sahr is not from the same field as the application on appeal (and presumably both Arvidson and Taguchi), because Sahr is directed to “a completely different growth system,” because it describes a directional solidification (DS) system rather than a CZ system (Br. 5–6). According to Appellant, because the DS system creates the crystal by controlled freezing of a predetermined amount of liquid silicon, it is unconcerned with splashing while the silicon particles are introduced into the crucible, while the CZ system, on the other hand, draws up the ingot out of liquid silicon in a continuous fashion and, therefore, has to be concerned with the introduction of new feedstock (Br. 6). Therefore, Appellant contends, Sahr is not from the same field as Arvidson and Taguchi (and the application on appeal) (*id.*).

With respect to the second prong of the analogous art test (whether the reference is reasonably pertinent to the particular problem with which the inventor is involved), Appellant argues that:

Sahr’s feeder for its DSS growth system is not reasonably pertinent because Sahr’s DSS growth system neither (1) addresses the same problems associated with introducing feedstock during the growth process nor (2) has any application in the DSS growth system of Sahr itself.

(Br. 7). Appellant elaborates on this argument by asserting that the purpose of Sahr's system is to counteract volumetric shrinkage during the melting of the raw material in the melting crucible while Appellant's purpose is to prevent splashing or rebound while introducing the feedstock into the crucible during the growth phase (Br. 8). Therefore, according to Appellant, a person seeking to improve a CZ process would not look to Sahr's teachings (*id.*).

Appellant's argument is not persuasive. The Examiner finds that the problem with which the inventors were concerned was to prevent feedstock splashing resulting from an inappropriate feedstock delivery angle/slope (Ans. 5). Appellant does not directly contest this finding. The Examiner further finds that Sahr explicitly teaches that its conveying means 32 is at an angle which "effectively prevents splashing" (*id.*). Appellant does not refute this finding either.

Accordingly, Appellant has not demonstrated reversible error in the Examiner's determination that Sahr is reasonably pertinent to the particular problem with which Appellant was concerned (i.e. limiting splashing) and, therefore, is analogous art.

***The prior art does not teach every limitation of the claimed invention.*** Appellant further argues that the cited art does not teach, suggest, or otherwise render obvious several limitation recited in claim 1, including the presence of "a drop box **fixedly mounted to the inside of the growth chamber**" (Br. 9–10). The Examiner finds that Arvidson's lance **208**, which is attached to feed tube **207** corresponds to the claimed drop box (Final Act. 5, citing Arvidson ¶¶ 170–178, Fig. 2). The Examiner further finds that:

[A]s shown in fig 2, the primary reference to Arvidson ([0171]) teaches that lance 208 is attached to the feed tube 207 in the sidewall of the growth chamber 101. It is further noted that [0171] of Arvidson describes that a charge isolation lock 210 is used for isolating the feedstock housing 209 from the growth chamber 101 through the feed tube 207, during pulling an ingot from the crucible 104. Per this particular teaching[] of Arvidson, one [having] ordinary skill in the art would readily be able to recognize that the lance 208 attached to the feed tube 207 is fixedly mounted to an inside of the growth chamber 101, when pulling the ingot from the crucible 104; e.g., Arvidson does teach the instantly claimed drop box fixedly mounted to an inside of the growth chamber.

(Ans. 7–8). In essence, the Examiner finds that lance **208** is mounted to feed tube **207**, which in turn is fixed to the inside of growth chamber **101**.

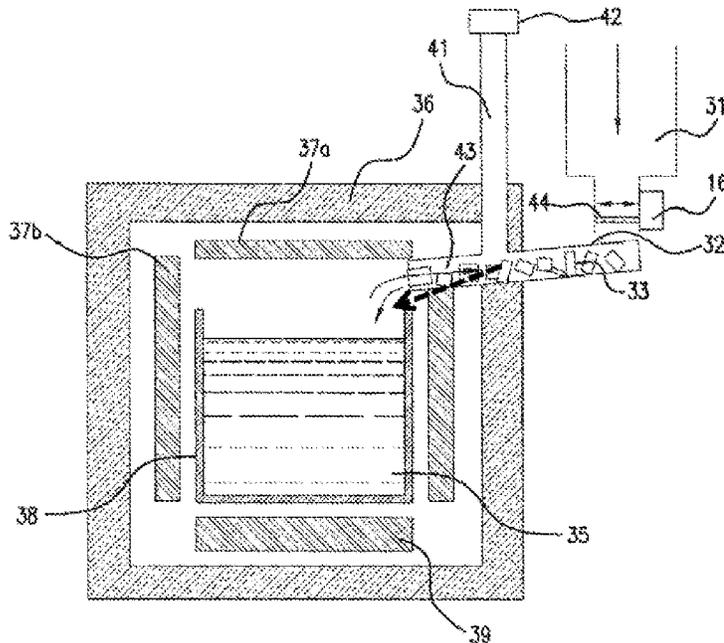
Appellant does not challenge this finding. Instead, Appellant argues that because Arvidson teaches that lance **208** is mounted to feed tube **207**, it cannot be said to be “fixedly mounted to an inside of the growth box” (Br. 9). This argument is not persuasive.

It is well established that “the PTO must give claims their broadest reasonable construction consistent with the specification. Therefore, we look to the specification to see if it provides a definition for claim terms, but otherwise apply a broad interpretation.” *In re ICON Health & Fitness, Inc.*, 496 F.3d 1374, 1379 (Fed. Cir. 2007) (citation omitted). In this instance, the Examiner has found that lance **208** is fixedly mounted to the inside of the growth chamber, via its connection to feed tube **207**. Appellant has not pointed to anything in the claim language or the Specification which would require interpreting the claim language to mandate a direct connection between the drop box and the inside of the growth chamber. Accordingly, any connection which results in the drop box being fixedly mounted to an

inside of the growth chamber — such as the one the Examiner finds is disclosed by Arvidson— satisfies this limitation. Therefore, Appellant has not shown reversible error in the Examiner’s determination that the cited art teaches this limitation.

Appellant also argues that the claimed combination does not teach “an overall path of delivery of the feedstock between 0° and 20° **from horizontal at a center of the feed port and into the outer zone of the crucible**” (Br. 10–11). The Examiner finds that this feature is taught by Sahr (Final Act. 4–5).

Appellant argues that “at no time does Sahr disclose that its overall path of delivery between a center of the feed port and crucible 38 (shown by the dotted arrow in Appellant’s annotated figure from Sahr below) is between 0° and 20°” (Br. 12):



A version of Sahr's FIG. 5<sup>9</sup> annotated by Appellant to show the overall path of delivery of the feedstock.

According to Appellant, paragraph 54 of Sahr discloses that the conveying means can be positioned closer to the center of the crucible without discussion of the angle of the overall path of delivery (Br. 12). Regarding Sahr's disclosure of horizontal displacement, Appellant contends that "even if the conveying means is completely horizontal, that does not mean that the overall path of delivery from the feed port to the crucible is between 0° and 20°" because "conveying means 32 could be introduced above the crucible in a position that would still result in an overall path of delivery of more than 20°" (Br. 12).

The Examiner finds that the claimed feature is taught by Sahr to prevent melt splashing by displacing conveying means 32 or 11 (feed port) "at a horizontal position," which the Examiner equates to meaning "0° from horizontal" (Final Act. 4–5, citing Sahr FIGS. 1–6, ¶¶ 23, 45, 54, 56).

The Examiner has the initial burden of establishing a *prima facie* case of obviousness based on an inherent or explicit disclosure of the claimed subject matter under 35 U.S.C. § 103. *In re Oetiker*, 977 F.2d 1443, 1445 (Fed. Cir. 1992) ("[T]he examiner bears the initial burden, on review of the prior art or on any other ground, of presenting a *prima facie* case of unpatentability."). To establish a *prima facie* case of obviousness, the Examiner must show that each and every limitation of the claim is described or suggested by the prior art or would have been obvious based on the knowledge of those of ordinary skill in the art. *In re Fine*, 837 F.2d 1071,

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<sup>9</sup> Appellant states this drawing is a marked up version of Sahr's Fig. 1 (Br. 12). The Examiner correctly notes that this is Fig. 5 of Sahr (Ans. 9).

1074 (Fed. Cir. 1988). In this instance, the preponderance of the evidence of record does not support the Examiner's finding that Sahr teaches an overall path of delivery of the feedstock having an angle of between 0° and 20°, as set forth in claim 1.<sup>10</sup>

The claim language states that the “overall path of delivery of the feedstock” is “between 0° and 20° from horizontal at a center of the feed port and into the outer zone of the crucible.” The Examiner relies on the disclosure of Sahr's ¶¶ 45, 54, and 56 as teaching that Sahr's conveying means 32 is in a horizontal position (Final Act. 4–5). However, we are persuaded by Appellant's argument that what these paragraphs state is merely that conveying means 32 can be “displaced in a horizontal direction.” That is, Sahr does not disclose that conveying means 32 is horizontal (or at a slope of no more than 20°), but only that the position of the conveying means can be moved from side to side, so that the end of conveying means can be closer or farther from the edge of the crucible.

Accordingly, we reverse the rejection of claim 1. As none of the art relied on in the remaining rejections addresses this issue, we also reverse those rejections for the same reason.

## CONCLUSION

We REVERSE the rejection of claims 1, 4, and 8–10 under 35 U.S.C. § 103(a) as unpatentable over Arvidson in view of Sahr and Taguchi.

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<sup>10</sup> Sahr states that Fig. 3–6 are schematics, and does not indicate that they are to scale. The drawing show some slope to conveying means 32, but does not provide a persuasive basis for concluding that this slope is less than 20°.

We REVERSE the rejection of claims 2 and 3 under 35 U.S.C. § 103(a) as unpatentable over Arvidson in view of Sahr, and Taguchi, and further in view of Miyahara.

We REVERSE the rejection of claim 5 under 35 U.S.C. § 103(a) as unpatentable over Arvidson in view of Sahr, and Taguchi, and further in view of Nakashima.

We REVERSE the rejection of claim 12 under 35 U.S.C. § 103(a) as unpatentable over Arvidson in view of Sahr, and Taguchi, and further in view of Williams.

We REVERSE the rejection of claim 13 under 35 U.S.C. § 103(a) as unpatentable over Arvidson in view of Sahr, and Taguchi, and further in view of Kamio.

REVERSED