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EXAMINER	
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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte BAYARD K. JOHNSON

Appeal 2017-005840
Application 13/464,203[1]
Technology Center 1700

Before LINDA M. GAUDETTE, JENNIFER R. GUPTA, and SHELDON M. McGEE, *Administrative Patent Judges*.

McGEE, *Administrative Patent Judge*.

DECISION ON APPEAL

Pursuant to 35 U.S.C. § 134, Appellant seeks our review of the Examiner's rejections adverse to the patentability of claims 1–6 under 35 U.S.C. § 103(a).

We have jurisdiction under 35 U.S.C. § 6.

We affirm.

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[1] Appellant identifies GTAT IP Holding LLC as the real party in interest. Br. 2.

SUBJECT MATTER

The appealed subject matter concerns methods of growing a silicon ingot comprising a dopant via a continuous Czochralski growth method. Spec. ¶¶ 2, 25; Fig. 6. Figure 6 of the application is reproduced below:

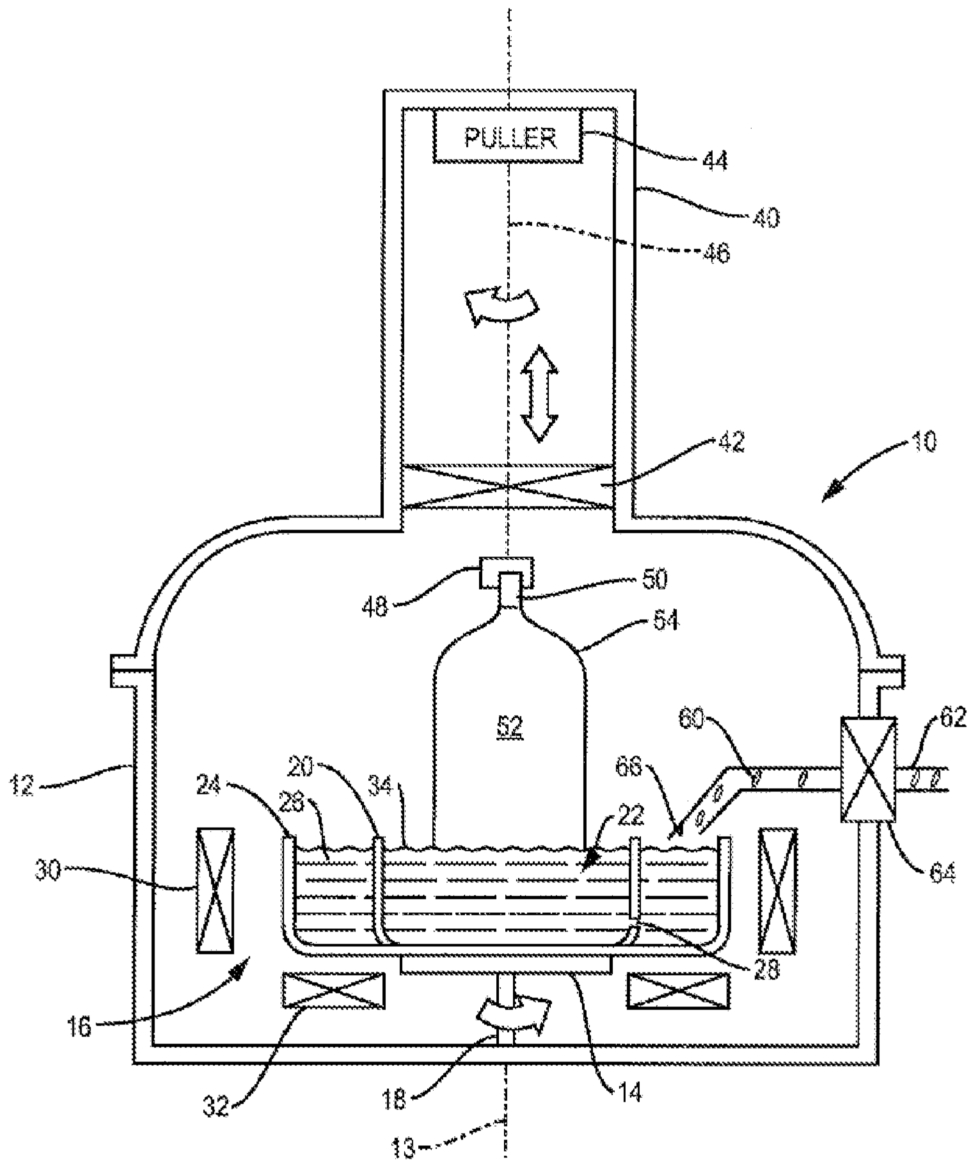

FIG. 6

Figure 6 depicts a cross-sectional view of the Czochralski growth system. Spec. ¶ 14.

The growth method of claim 1 is illustrative, and is copied below with key limitations at issue in this appeal italicized:

> 1. A method of growing a silicon ingot comprising a dopant material having a segregation coefficient of *k,* the method comprising the steps of:
>
> i) providing a crucible [16] having an inner growth zone [22] *in fluid communication with* [28] an outer feed zone [26];
>
> ii) providing an initial charge in the inner growth zone and the outer feed zone, the *initial charge in the inner growth zone comprising silicon and the dopant material* and the *initial charge in the outer feed zone comprising silicon and no dopant material*;
>
> iii) melting the silicon and dopant material in the inner growth zone to form a melted mixture and the silicon in the outer feed zone to form a silicon melt, the melted mixture and the silicon melt having upper melt surfaces at substantially similar heights, wherein the inner growth zone has a cross-sectional surface area A_s at the upper melt surface of the melted mixture and the crucible has a total cross-sectional surface area A_t at the upper melt surface area of the melted mixture and the silicon melt;
>
> iv) growing the silicon ingot from the inner growth zone; and
>
> v) removing the grown silicon ingot comprising the dopant material in an axially substantially constant concentration,
>
> wherein *the method is a continuous Czochralski growth method* comprising the step of *delivering a feed comprising silicon and no dopant material into the silicon melt in the outer feed zone* in an amount M_F, while growing the silicon ingot to an amount M_x, and wherein
>
> $$(dM_F/dM_x) = 1 - k(A_t/A_s)$$
>
> wherein the continuous Czochralski growth method is performed without supplying additional dopant material while growing the silicon ingot to an amount M_x.

App. Br. 12–13 (emphasis added).

OPINION

In rejecting claims 1–6 under 35 U.S.C. § 103(a) over the combined teachings of Furukawa[2] and Yamashita,[3] the Examiner finds that Furukawa discloses a method of growing a silicon ingot in accordance with every element recited in claim 1, but does not explicitly disclose the initial compositions of the charges in the claimed inner growth and outer feed zones. Final Act. 2–5. To address this deficiency, the Examiner finds that Yamashita's method of growing a silicon semiconductor crystal uses a multi-chamber crucible containing an initial charge of doped silicon material in its inner chamber and an initial charge of un-doped silicon in its outer chamber. *Id.* at 3. In view of Yamashita's stated object to grow a semiconductor crystal with a controlled and/or relatively constant resistivity, the Examiner concludes that it would have been obvious to modify Furukawa's method to include Yamashita's initial charge compositions in Furukawa's inner growth and outer feed zones. *Id.*

Appellant presents arguments against the rejection as a group. Br. 7–10. We, therefore, select claim 1 and decide the appeal on the basis of this claim alone. 37 C.F.R. § 41.37(c)(1)(iv).

Appellant contends that the combined references fail to teach a continuous Czochralski growth method where a feed comprising silicon and no dopant is delivered into the silicon melt in the outer feed zone which also comprises silicon and no dopant. Br. 7–9. We are not persuaded by this argument.

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[2] Jun Furukawa, et al., US 2006/0254499 A1, published Nov. 16, 2006.
[3] Youji Yamashita, et al., US 5,021,225, issued June 4, 1991.

Although claim 1 states that the initial charge in the outer feed zone comprises silicon and no dopant, we agree with the Examiner (Final Act. 5–6; Ans. 3) that, once melted, this "silicon melt" is not required by the claims to always be dopant-free. Rather, claim 1 expressly recites that the inner growth zone which contains silicon and a dopant material is "in fluid communication with" the outer feed zone. This "fluid communication" is achieved by means of an aperture, such as aperture 28 in Figure 6, which allows the melted mixture in the inner growth zone and the silicon melt in the outer feed zone to "have upper melt surfaces at substantially similar heights" as recited in claim 1. Spec. ¶¶ 36, 38. Thus, we agree with the Examiner's rationale (Final Act. 6), unchallenged by Appellant, that "the [melted] mixture in the inner zone and the [silicon] melt in the out[er] zone would communicate with each other through the at least one aperture [in the] wall due to the inherent fluidity of the melt." *See also* Ans. 4. Due to this fluid communication between the inner and outer zones, it is reasonable to expect that, once the melting step was carried out, some of the dopant from the initial charge in the inner growth zone's "melted mixture" would travel through the aperture into the "silicon melt" of the outer feed zone. Therefore, because the claims do not require the silicon melt in the outer feed zone to remain dopant-free, Appellant has identified no error in the rejection by asserting that the references fail to teach such a feature. *In re Self*, 671 F.2d 1344, 1348 (CCPA 1982) ("[A]ppellant's arguments fail from the outset because . . . they are not based on limitations appearing in the claims.").

Appellant also contends that there would have been no motivation for the skilled artisan to combine the teachings of Furukawa, which teaches a continuous process, with Yamashita, directed to a batch process, because "the steps associated with the two processes are completely different." Br. 10. This argument fails to persuade us of error in the rejection. As correctly noted by the Examiner (Ans. 6), the rejection relies on the teachings of Yamashita merely for the initial charge compositions for both the inner and outer crucible zones. Final Act. 3. Yamashita discloses that using "doped melt and undoped melt . . . in the inner and outer chambers" of a crucible, respectively, is part of a process which enables the resistivity of the crystal to "be controlled to be within a desired range." Yamashita 4:5–19. Even though Yamashita's Czochralski technique for preparing semi-conductor crystals is carried out in batches, the skilled artisan would have recognized that utilizing Yamashita's initial charge compositions in other Czochralski processes, such as Furukawa's continuous Czochralski process, may predictably yield similar improvements in the resultant crystal's resistivity. "[I]f a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007).

DECISION

The Examiner's final decision to reject claims 1–6 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)(1).

AFFIRMED