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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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*Ex parte* GEORG BRENNINGER, ALOIS AIGNER,  
and CHRISTIAN HAGER

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Appeal 2018-001295  
Application 13/407,832  
Technology Center 1700

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Before ROMULO H. DELMENDO, RAE LYNN P. GUEST, and  
MERRELL C. CASHION, JR., *Administrative Patent Judges*.

DELMENDO, *Administrative Patent Judge*.

DECISION ON APPEAL

The Applicants (“Appellants”)<sup>1</sup> appeal under 35 U.S.C. § 134(a) from the Primary Examiner’s final decision to reject claims 22–33.<sup>2</sup> We have jurisdiction under 35 U.S.C. § 6(b).

We reverse.

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<sup>1</sup> The Appellants identify the real party in interest as “Siltronic AG” (Appeal Brief filed March 27, 2017 (“Appeal Br.”) at 1). We note that the Appeal Brief was supplemented April 21, 2017 to provide a corrected Claims Appendix. For the purposes of this opinion, any reference to the Appeal Brief, other than the Claims Appendix, will be to the version filed March 27, 2017.

<sup>2</sup> Appeal Br. 1–23; Reply Brief filed November 21, 2017 (“Reply Br.”) at 1–8; Final Office Action entered August 31, 2016 (“Final Act.”) at 3–15; Examiner’s Answer entered September 22, 2017 (“Ans.”) at 3–28.

## I. BACKGROUND

The subject matter on appeal relates to an apparatus for depositing a material layer originating from process gas on a substrate wafer (Specification filed February 29, 2012 (“Spec.”) at 1, ll. 14–15). Figure 1 (partially annotated) is illustrative and is reproduced from the Drawings filed February 29, 2012, as follows:

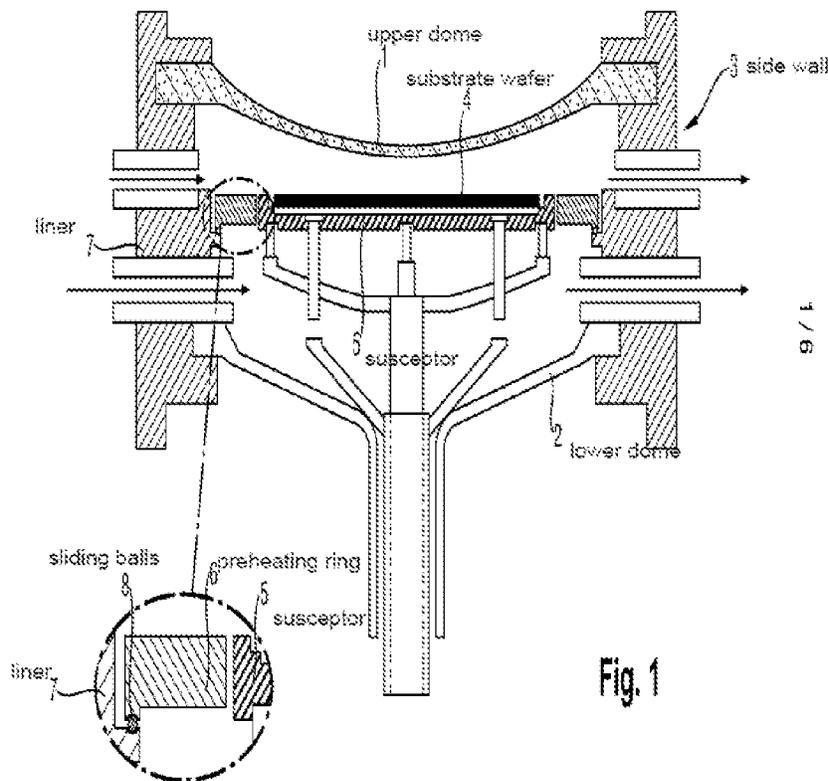
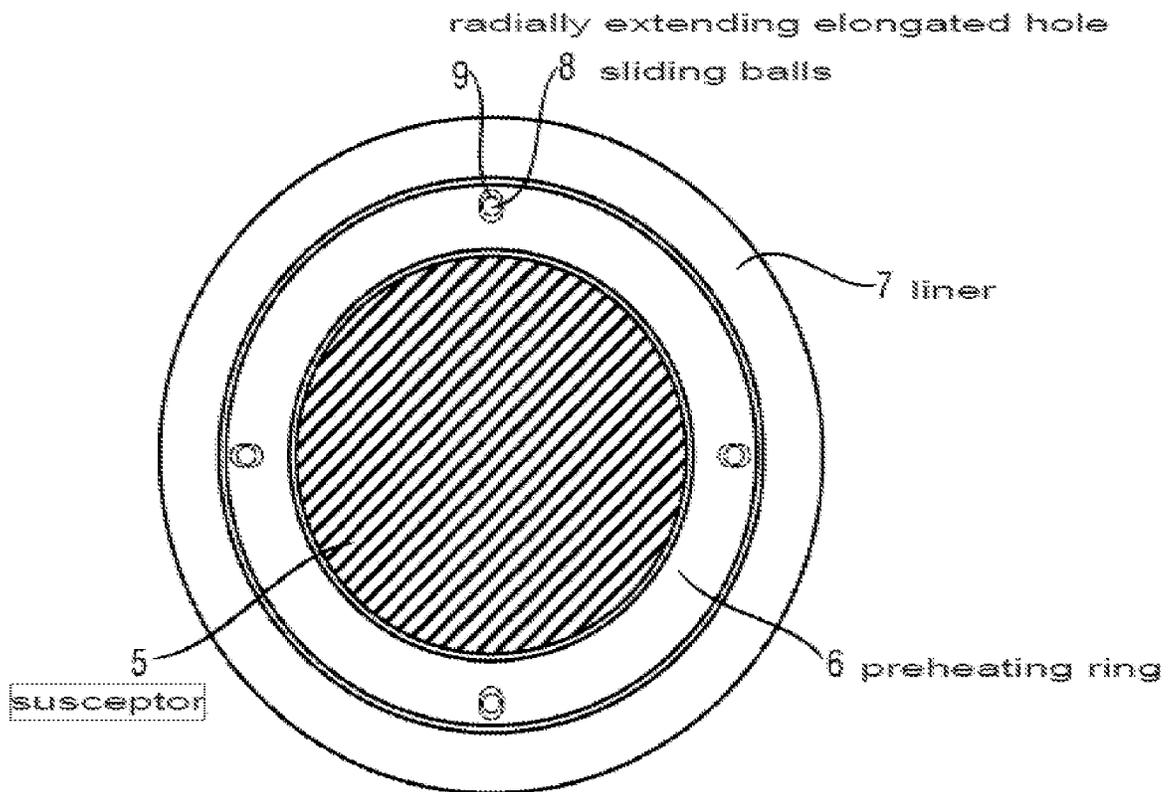


Figure 1 above depicts “a reactor chamber having the typical features of an apparatus for depositing a material layer originating from process gas on a substrate wafer [4,]” wherein the apparatus includes, among other elements, an upper dome 1, a lower dome 2, a side wall 3, and a susceptor 5, which is surrounded by a preheating ring 6 that lies on a liner 7 that is part of the side wall 3 (Spec. 5, ll. 20–25). As shown in the enlarged insert, sliding balls 8

are distributed over and partly embedded in the preheating ring 6's edge region as well as the liner 7 and act as spacers defining a gap  $\Delta$  between the preheating ring 6 and the liner 7 (*id.* at 5, ll. 25–27; 6, ll. 1–8; Fig. 3). A gap D (as shown in Figure 3) having a uniform width is created between the susceptor 5 and the preheating ring 6, which is kept in the centered position independently of its own thermal expansion and liner 7's thermal expansion (Spec. 6, ll. 13–15).

Figure 2 (annotated) is reproduced as follows:



**Fig. 2**

Figure 2 above shows a plan view of a susceptor 5, a preheater ring 6, and a liner 7 (*id.* at 3, l. 16), wherein sliding balls 8 are partly embedded in a radially extending elongated hole 9 (*id.* at 5, l. 32–6, l. 5). “In this way,

direct contact between the preheating ring [6] and the liner [7] is completely or almost completely prevented” and “[o]wing to the lack of contact, a relative radial movement between the preheating ring [6] and the liner [7] due to thermal expansion during the deposition of the material film no longer contributes to the formation of [undesirable] particles” (*id.* at 4, ll. 28–31).

Representative claim 22 is reproduced from the substitute Claims Appendix, as follows:

22. An apparatus for depositing a material layer originating from process gas on a substrate wafer, comprising  
a reactor chamber, which is delimited by an upper dome and a lower dome and a side wall;  
a rotatable susceptor for holding the substrate wafer during deposition of the material layer;  
a preheating ring surrounding the susceptor, the preheating ring having a circular central opening within which the rotatable susceptor rotates;  
a liner, *on which the preheating ring is supported in a centered position wherein a gap  $D$  having a uniform width is present between the preheating ring and the susceptor*; and  
a spacer between the liner and the preheating ring, the spacer keeping the preheating ring in a centered position and providing a vertical distance  $\Delta$  between the preheating ring and the liner, *the spacer comprising balls embedded partly in recesses in the preheating ring and partly in the liner, which enable a relative radial movement between the preheating ring and the liner due to thermal expansion, each ball lying in a [n] elongated recess extending in a radial direction.*

(Supplemental Appeal Brief filed April 21, 2017, Claims Appendix at 1 (italics and bracketed material added)).

## II. REJECTIONS ON APPEAL

On appeal, the Examiner maintains two rejections under pre-AIA 35 U.S.C. § 103(a) as follows:

- A. Claims 22–33 as unpatentable over Ose,<sup>3</sup> Lee,<sup>4</sup> and Duong et al.<sup>5</sup> (“Duong”); and
- B. Claims 26–29 as unpatentable over Ose, Lee, Duong, and Riker et al.<sup>6</sup> (“Riker”).

(Ans. 3–28; Final Act. 3–15.)

## III. DISCUSSION

### 1. *The Examiner’s Position*

The Examiner finds that Ose describes an apparatus having most of the limitations recited in claim 22, including a concentric preheating ring and liner (Ans. 3 (relying on, e.g., Ose’s discussion of Japanese Patent Application Laid-Open No. 78863/1995 in ¶ 4 and Figs. 5A and 5B)). The Examiner acknowledges, however, that this previously-known apparatus does not include a spacer comprising distributed sliding balls **8** that are partly embedded in both the preheating ring **6** and the liner **7**, as required by claim 22 (Ans. 3). To resolve this difference, the Examiner relies on Lee, which the Examiner finds as teaching a spacer in the form of alignment balls **156** partly embedded between a susceptor **120** and a shadow frame **130** in

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<sup>3</sup> US 2005/0106524 A1, published May 19, 2005.

<sup>4</sup> Korean Patent Publication 10-2007-0003172, published January 5, 2007 (machine-generated translation).

<sup>5</sup> US 2009/0283036 A1, published Nov. 19, 2009.

<sup>6</sup> US 7,942,969 B2, issued May 17, 2011.

the form of a ring for the purpose of maintaining (i) the shadow frame **130** in a centered position relative to the susceptor **120** and (ii) a distance  $\Delta$  between the shadow frame **130** and the susceptor **120**'s bottom surface (*id.* at 4).

Specifically, the Examiner finds that Ose teaches that prior art apparatuses with concentric preheating rings and liners suffer from problems associated with misalignment of the preheating ring relative to the liner, thereby causing contact between the susceptor and the preheating ring, which contact generates undesirable particles that contaminate the wafer (*id.* at 10–11). Thus, the Examiner finds that Ose identifies an art-recognized need to solve a problem in the prior art in which concentric preheating rings are used, although Ose proposes a solution that involves an eccentric preheating ring (*id.* at 11). The Examiner finds that Lee discloses an alternative solution—i.e., partly embedded align balls—that would also solve the misalignment problem described in Ose (*id.*).

Based on these findings, the Examiner concludes that a person having ordinary skill in the art would have been prompted to implement Lee's align balls to solve the misalignment problem identified in Ose (*id.* at 4, 11). The Examiner also determines that although Lee does not specifically teach a radially extending elongated recess, Duong's teachings would have prompted a person having ordinary skill in the art to provide such a radially extending elongated recess to allow the preheating ring to move in the radial direction relative to the susceptor to ensure accurate alignment (*id.* at 4–5).

## 2. *The Appellants' Contentions*

The Appellants contend that Ose teaches away from an apparatus with a concentric preheating ring because it teaches that such an apparatus is

prone to misalignment, which would cause the preheating ring and the susceptor to collide during the latter's rotation, thereby producing particles that will contaminate the wafer (Appeal Br. 2). The Appellants urge that Ose teaches avoiding such conventional, concentric preheating rings by using, instead, eccentric preheating rings as shown in Ose's Figure 2 to coincide with any improperly-centered susceptor (*id.* at 2–5). As to Lee, the Appellants argue that Lee is not analogous art because it is not directed to a chemical vapor deposition (CVD) reactor that includes a preheating ring and a rotating susceptor (*id.* at 6, 8–11). Furthermore, the Appellants argue that Lee teaches using balls positioned in circular recesses rather than elongated recesses and, therefore, cannot accommodate thermal expansion—a problem that is not present in Lee (*id.* at 7). As to Duong, the Appellants also argue that this reference is not analogous art (*id.* at 8–11). In addition, the Appellants argue that Duong teaches elongated recesses with elongated rollers for receiving and fixing an extension of a button to secure a shadow frame tightly onto a susceptor, and, therefore, round balls in an elongated recess would not be suitable as they would move in numerous directions (*id.* at 7). The Appellants urge that the Examiner's reliance on Lee and Duong to arrive at the claimed invention could only have been formulated by impermissible “picking and choosing” using the claims themselves as a template (*id.* at 22).

### 3. *Opinion*

For the reasons given below, we disagree with the Appellants that Lee and Duong are non-analogous art. Nevertheless, we concur with the Appellants that the Examiner's analysis does not adequately account for the limitations “the spacer comprising balls embedded partly in recesses in the

preheating ring and partly in the liner, which enable a relative radial movement between the preheating ring and the liner due to thermal expansion, each ball lying in a[n] elongated recess extending in a radial direction” recited in claim 22.

Lee and Duong both relate to chemical vapor deposition apparatuses in which material is deposited on a wafer (Lee at 2; Duong ¶¶ 2–9). Thus, these references relate to subject matters that fall squarely within the Appellants’ own description of the “Field of the Invention” (Spec. 1, ll. 14–16). *In re Bigio*, 381 F.3d 1320, 1325 (Fed. Cir. 2004) (same field of endeavor test involves comparing the structure and function disclosed by the applicant with the prior art structure and expected function based on structural similarity). *See also Wyers v. Master Lock Co.*, 616 F.3d 1231, 1238 (Fed. Cir. 2010) (the Supreme Court of the United States instructed the scope of analogous art must be looked at broadly).

Having determined that Lee and Duong are analogous art, we next consider whether the Examiner articulated a sufficient reason in support of a conclusion that a person having ordinary skill in the art would have combined the references in the manner claimed by the Appellants. As we indicated above, the Examiner relies on Duong for the “each ball lying in a[n] elongated recess extending in a radial direction” limitation (Ans. 4–5) (citing Duong Fig. 4C and ¶ 53). Duong’s Figure 4C is reproduced as follows:

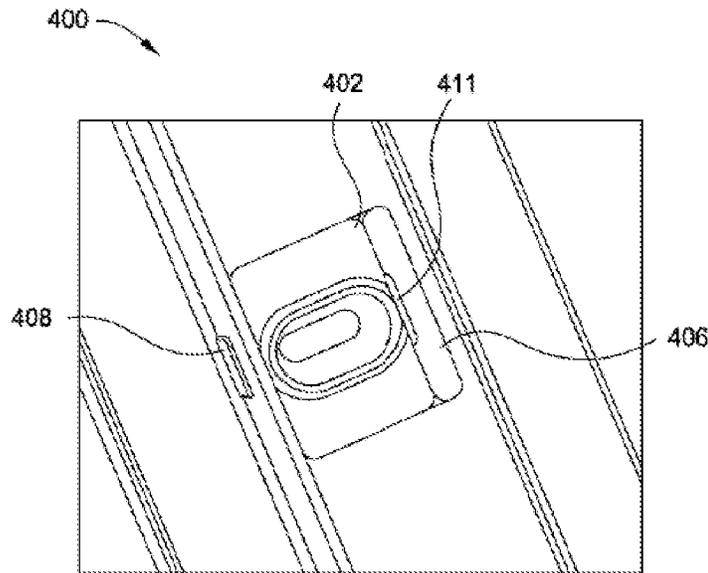


FIG. 4C

Duong's Figure 4C above depicts part of a substrate processing chamber including a shadow frame **400** with an alignment insert **402** with an elongated cavity, which is shaped to receive an alignment button (not shown), to permit the shadow frame **400** to be properly aligned on a susceptor (not shown) (Duong ¶¶ 9, 54). But as the Appellants point out (Appeal Br. 7), Duong's alignment insert and corresponding button are designed to secure, tightly, the shadow frame onto the susceptor (Duong ¶ 52). Specifically, in Duong, the alignment button **204** is tightly secured by alignment rods or rollers **208** as it is inserted into the cavity, as illustrated in, e.g., Figures 2B and 2C (*id.* ¶ 45).

The problem with the rejection is that the Examiner does not direct us to any reason—other than impermissible hindsight based upon the Appellants' disclosure—why Duong would have suggested to one of ordinary skill in the art that the elongated direction of the cavity shown

therein would be suitable to permit radial movement to compensate for thermal expansion when Duong teaches tight securement. Although Ose identifies a problem in the prior art by teaching that the susceptor and the preheat ring may contact each other in an undesirable way during wafer processing in the case of a heat treatment apparatus as a result of misalignment caused by errors in manufacturing and assembly, Ose proposes a solution (i.e., to form the preheat ring such that its inner peripheral center is eccentric to its outer periphery) that is divergent from that provided in Lee or Duong (Ose ¶¶ 6–9, 13, 14, 40).

In Lee, align balls **156**, acting in concert with the corresponding align grooves **160** and multiple rollers **164**, prevent “the error of the deposition caused by the minute misalignment of the align ball (**156**) and shadow mask (**130**)” (Lee 6; Fig. 6b). Modifying Lee by providing an elongated recess as shown in Duong and a ball that would be free to move radially within the elongated recess would be inconsistent with Lee’s goal of eliminating any “minute misalignment.” In our view, if Duong were to be combined with Lee at all, the resulting combination would not have the elongation in the radial direction.

For these reasons, we cannot uphold either rejection.

#### IV. SUMMARY

Rejections A and B are not sustained. Therefore, the Examiner’s final decision to reject claims 22–33 is reversed.

REVERSED