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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte NAOTOSHI MORITA and RYOSUKE KAMEYAMA

Appeal 2010-005475
Application 11/392,768
Technology Center 3700

Before JENNIFER D. BAHR, STEFAN STAICOVICI, and
GAY ANN SPAHN, *Administrative Patent Judges*.

SPAHN, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Naotoshi Morita and Ryosuke Kameyama (Appellants) seek our review under 35 U.S.C. § 134 of the Examiner's rejection of claims 1-11 and 14-17. Appellants cancelled claims 12 and 13. We have jurisdiction under 35 U.S.C. § 6(b).

We REVERSE.

The Claimed Subject Matter

The claimed subject matter relates to "an electrostatic chuck which is useful, for example, in fixing, flatness correction and transporting a semiconductor wafer in an apparatus adapted for fabricating a semiconductor wafer, such as an etching apparatus, an ion implanter, or an electron beams exposing apparatus." Spec. 1, para. [01]. Claims 1 and 3 are independent and claim 3, reproduced below, with emphasis added, is illustrative of the subject matter on appeal.

> 3. An electrostatic chuck comprising:
> a metal base having at least one through hole;
> a ceramic body covering said through hole;
> a suction electrode provided in said ceramic body; and
> a heating element provided in said ceramic body,
> *wherein said heating element is not present in a projection region of each of said at least one through hole defined by projecting said through hole toward said ceramic body* and wherein
> a lower surface of said ceramic body covers said at least one through hole and said ceramic body comprises:
> a concave portion formed in the lower surface of said ceramic body and in communication with said at least one though hole of said metal base, wherein an upper end of said concave portion is at a position that is lower than that of the heating element;
> a metallization layer formed in said concave portion;
> a conductive pattern connected to said metallization layer, and
> a via penetrating through a portion of said ceramic body and connecting said heating element and said conductive pattern.

The Rejections

The following Examiner's rejections, under 35 U.S.C. § 103(a), are before us for review:

I. claims 3, 9, 15, and 17 as unpatentable over Kanno '617 (US 6,825,617 B2, issued Nov. 30, 2004) and Okajima '537 (US 2003/0075537 A1, published Apr. 24, 2003), as evidenced by Kanno '233 (US 6,646,233 B2, issued Nov. 11, 2003);

II. claim 15 as unpatentable over Kanno '617, Okajima '537, and Logan (US 5,191,506, issued Mar. 2, 1993), as evidenced by Kanno '233;

III. claim 11 as unpatentable over Kanno '617, Okajima '537, and Matsuda (US 2005/0152089 A1, published Jul. 14, 2005), as evidenced by Kanno '233;

IV. claims 1, 4-8, 14, and 16 as unpatentable over Kanno '617, Okajima '537, and Okajima '308 (US 2004/0108308 A1, published Jun. 10, 2004), as evidenced by Kanno '233;

V. claims 16 as unpatentable over Kanno '617, Okajima '537, Okajima '308, and Logan, as evidenced by Kanno '233; and

VI. claims 2 and 10 as unpatentable over Kanno '617, Okajima '537, Okajima '308, and Matsuda, as evidenced by Kanno '233.

OPINION

Rejection I – Obviousness based on Kanno '617 and Okajima '537, as evidenced by Kanno '233

The Examiner finds that Kanno '617 as evidenced by Kanno '233 substantially discloses the subject matter of independent claim 3, but fails to "teach the heating element not being present in a projection region defined by the through hole for the heating elements." Ans. 4-6. The Examiner also

finds the "providing a projection region in which a heating element is not present . . . is known in the art" as evidenced by, for example, Okajima '537 which teaches "the terminals (6B) being provided in orifices within the structure (2) with the heating elements (3) not being present in a projection region defined by extending the orifices towards the substrate (2)," and "the advantage of providing a heating element in a different plane for other heating elements prevents cold spots on the mounting face." Ans. 7. The Examiner concludes that it would have been obvious to one of ordinary skill in the art to modify Kanno '617 as evidenced by Kanno '233 so that the heating element is not present in a projection region of the at least one through hole as taught by Okajima '537 "in order to prevent cold spots on the mounting face, thereby increasing the overall temperature uniformity of the ceramic plate." *Id*.

Appellants note that the Examiner applied Figures 1, 4, and 6 of Okajima '537. App. Br. 16. Okajima '537's Figure 6 depicts heating apparatus 10B in cross-sectional view taken along line VI-VI of Figure 4, wherein disk-shaped substrate 2 is supported on hollow supporting member 11. Okajima '537, paras. [0024], [0028], [0064], [0073], [0074] and Figs. 4 and 6. Appellant argues that "[i]f the inner space 12 of Okajima [']537 is regarded as the claimed through hole, the second heating element 4 is present in a projection region of inner space 12, which is different from the claimed invention." App. Br. 17.

The Examiner responds that Okajima '537 "teaches the terminals (6B) being provided in orifices/sockets/connections within the substrate (2) with the heating element (3) not being present in a projection region defined by extending the orifices towards the substrate (2) of that particular heating

element." Ans. 19-10. Emphasis omitted. The Examiner notes that since the heating element 3 of Okajima '537 is not "near the orifice/sockets/ connections within the substrate (2), the heating element clearly and explicitly is not present in a projection region of the through hole (i.e.[,] orifices/sockets/connections within the substrate 2) toward the ceramic body or alumina nitride substrate (2)." Ans. 20. Emphasis omitted.

Appellants reply that claim 3 requires the at least one through hole in the metal base to define the projection region and thus, Appellant argues that the Examiner's use of Okajima '537's "orifices/sockets/connections within the substrate 2" to define the projection region does not satisfy the language of claim 3. Reply Br. 10.

As Appellants correctly point out, the only through hole in Okajima '537's base (supporting member 11) is inner space 12. *Id*. If Okajima '537's through hole (inner space 12) is projected toward the ceramic body (substrate 2) to define a projection region in accordance with the language of claim 3, then portions of second heating element 4 are located within the projection region so that Okajima '537 does not satisfy claim 3's requirement that the heating element not be present in the projection region.

Accordingly, we do not sustain the Examiner's rejection of independent claim 3, and claims 9, 15, and 17 dependent thereon, under 35 U.S.C. § 103(a) as unpatentable over Kanno '617 and Okajima '537, as evidenced by Kanno '233.

Rejections II and III – Obviousness based on Kanno '617, Okajima '537, and Logan, as evidenced by Kanno '233, and Kanno '617, Okajima '537, and Matsuda, as evidenced by Kanno '233, respectively

Because the Examiner's rejection of claim 15 as unpatentable over Kanno '617, Okajima '537, and Logan, as evidenced by Kanno '233, and the

Examiner's rejection of claim 11 as unpatentable over Kanno '617, Okajima '537, and Matsuda, as evidenced by Kanno '233, both rely upon the erroneous finding that Okajima '537 discloses that "said heating element is not present in a projection region of each of said at least one through hole," we do not sustain these rejections for the same reasons as discussed *supra* with respect to independent claim 3.

Rejection IV – Obviousness based on Kanno '617, Okajima '537, and Okajima '308, as evidenced by Kanno '233

Independent claim 1 is directed to an electrostatic chuck including, *inter alia*, that:

> a heating value per unit area in a projection region of each of said at least one through hole is 50% or less of a heating value per unit area in an outer region, wherein said projection region is a region defined by projecting said through hole toward said ceramic body, and said outer region is a region determined by magnifying said projection region at a similarity ratio of three while setting an areal center of gravity of said projection region as a center of similarity, but excluding an interior of said projection region.

The Examiner finds that the combination of Kanno '617 and Okajima '537, as evidenced by Kanno '233, substantially discloses the subject matter of independent claim 1, except for the above-quoted limitation which the Examiner finds to be well known in the art as exemplified by Okajima '308. Ans. 10. The Examiner also finds that Okajima '308 discloses a ceramic plate having heating surface for heating an object to be heated with the surface having through holes 6, 34, wherein the through holes either penetrate the heating surface in a vertical direction or have a depth in the heating surface. Ans. 10-11 (citing Okajima '308, p. 2, para. [0028]). The

Examiner specifically points to Okajima '308's Figure 10 as depicting a wiring pattern of heating elements 37e-37g for each through hole/projection 34, wherein multiple rows of wiring parts having curved portions for avoiding the holes and becoming sequentially larger as the avoidance parts 45-47 move away from the holes 34 so that the heat amount in the avoidance parts is made to be the same as that of their surroundings in order for a hot spot to never occur to improve thermal uniformity. Ans. 11. The Examiner concludes that it would have been obvious to one of ordinary skill in the art to modify the heater/hole relationship of the electrostatic chuck of Kanno '617 and Okajima '537, as evidenced by Kanno '233, with the heating element avoidance part configuration around the holes to provide the heat amount in the avoidance parts being made to be [the] same as that of their surroundings in order that a hotspot never occurs, and with the U-shaped convex side facing heating elements to also prevent the generation of cold spots to improve the overall thermal uniformity of the entire plate. Ans. 11-12.

Appellants argue that Okajima '308 "is silent with respect to a ceramic plate with a metal base," does not address the "problem of local temperature rise of a ceramic base in the projection area of a through hole in the metal base," and "does not show a concave portion in a plate having an upper end that is lower than the heating element, wherein the concave portion communicates with a through hole in the base." App. Br. 23. Appellants also argue that Okajima '308 "provides no teaching as to the desirability of avoiding projection areas of through holes <u>in the base</u> where a portion of the ceramic body in the projection region would not contact the metal base." *Id*.

We understand the Examiner to be saying that because the hole 6 or 34 having a depth in Okajima '308's ceramic plate 32 could be projected upwardly onto the remainder of the plate thereabove to form a projection region, the heat transfer properties of the structure of Okajima '308 are thermally equivalent to Appellants' ceramic plate/metal base with through hole. As such, according to the Examiner, "Kanno et al. '617 as evidenced by Kanno et al. '233, and in view of Okajima et al. '537 in view of Okajima '308 would have a heating value per unit area in a projection region being 50% or less of a heating value per unit area in an outer region." Ans. 29. We understand Appellants to be arguing that because Okajima '308's plate 32 only consists of a single material, i.e., ceramic, instead of ceramic on top of a metal base as in the present invention, Okajima '308's heater 31 is not "thermally" equivalent to the present invention from a heat transfer standpoint. Appellants have the better argument here because we do not agree that Okajima '308's heater is "thermally" equivalent to Appellants' ceramic plate/metal base with through hole. The presence of metal base 9 in contact with ceramic body 7 affects the heat transfer properties of ceramic body 7. In contrast, Okajima '308's heater 31 consists only of a single ceramic plate 32 with no metal base therebeneath. As such, because we find that the structure of Okajima '308 is not "thermally" equivalent to Appellants' ceramic plate/metal base with through hole, as the Examiner proposes, we conclude that the Examiner's reliance on Okajima '308 to teach "a heating value per unit area in a projection region of each of the at least one through hole is 50% or less of a heating value per unit area in an outer region," as recited in claim 1, is based on conjecture and is not supported by a preponderance of the evidence.

Accordingly, we do not sustain the Examiner's rejection of independent claim 1, and claims 4-8, 14, and 16, under 35 U.S.C. § 103(a) as unpatentable over Kanno '617, Okajima '537, and Okajima '308, as evidenced by Kanno '233.

Rejections V and VI – Obviousness based on Kanno '617, Okajima '537, Okajima '308, and Logan, as evidenced by Kanno '233, and Kanno '617, Okajima '537, Okajima '308, and Matsuda, as evidenced by Kanno '233, respectively

Because the Examiner's rejection of claim 16 as unpatentable over Kanno '617, Okajima '537, Okajima '308, and Logan, as evidenced by Kanno '233, and the Examiner's rejection of claims 2 and 10 as unpatentable over Kanno '617, Okajima '537, Okajima '308, and Matsuda, as evidenced by Kanno '233, both rely upon the erroneous finding that Okajima '308 discloses "a heating value per unit area in a projection region of each of said at least one through hole is 50% or less of a heating value per unit area in an outer region," we do not sustain these rejections for the same reasons as discussed *supra* with respect to the rejection of independent claim 1.

DECISION

We reverse all of the Examiner's rejections of claims 1-11 and 14-17.

<u>REVERSED</u>

Klh