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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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*Ex parte* JILL S. BECKER, ROGER R. COUTU, and  
DOUWE J. MONSMA

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Appeal 2018-002137  
Application 12/647,821<sup>1</sup>  
Technology Center 1700

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Before KAREN M. HASTINGS, JAMES C. HOUSEL, and  
JEFFREY R. SNAY, *Administrative Patent Judges*.

HASTINGS, *Administrative Patent Judge*.

DECISION ON APPEAL<sup>2</sup>

Appellants seeks our review under 35 U.S.C. § 134(a) of the  
Examiner’s decision rejecting claims 1, 2, 4–7, 9, 10, 18–22, 37–40, and 52.<sup>3</sup>

We have jurisdiction over the appeal under 35 U.S.C. § 6(b).

We AFFIRM.

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<sup>1</sup> Appellants identify the real party in interest as Ultratech, Inc. (Appeal Br. 2).

<sup>2</sup> We refer to the Specification, filed Dec. 28, 2009 (“Spec.”), the Final Office Action mailed Nov. 10, 2016 (“Final Act.”), the Appeal Brief filed Feb. 8, 2017 (“Appeal Br.”), the Examiner’s Answer mailed Oct. 20, 2017 (“Ans.”), and the Reply Brief filed Dec. 19, 2017 (“Reply Br.”).

<sup>3</sup> Claims 1, 2, 4–7, 9, 10, 18–22, 37–40, and 52 are pending following entry of the amendment dated February 8, 2017 canceling claims 11 and 12 (Adv. Act. 2, dated March 14, 2017).

Independent claim 1 below, as provided in the Appeal Brief filed March 13, 2017 (in response to the Notice of Non-Compliant Appeal Brief dated March 10, 2017), is illustrative of the subject matter on appeal (emphases added):

1. A gas deposition chamber for depositing solid material layers onto substrates supported therein comprising:
  - a substantially cylindrical wall and a top wall, the two walls together enclosing an interior volume having a flared portion defined by the top wall and a cylindrical portion defined by the substantially cylindrical wall,
    - the substantially cylindrical wall being symmetric around a vertical axis,
    - the top wall also being symmetric around the vertical axis and characterized by an interior surface that defines a truncated one-sheet hyperboloid of revolution defining a top aperture and a middle circular aperture at opposing ends thereof, the slope of the truncated one-sheet hyperboloid of revolution being approximately parallel to the vertical axis at the top aperture,
    - the top aperture having a smaller diameter than a diameter of the middle circular aperture, and
    - the top wall and the substantially cylindrical wall being joined at the middle circular aperture;
  - a substrate support chuck, comprising a circular substrate support surface, and supported inside the cylindrical portion of the interior volume with the circular substrate support surface axially centered by and substantially orthogonal to the vertical axis, wherein the substrate support chuck further comprises an aerodynamically formed outer shell attached to the circular substrate support surface;*
  - two or more hollow tubes fixedly attached to the outer shell and extending from the outer shell to outside the external chamber wall, the tubes fixedly supporting the substrate support chuck inside the cylindrical portion of the interior volume;*
  - a precursor input port, comprising a tube, passing through the top wall proximate to the top aperture for delivering a first gas flow into the flared portion of the internal*

*volume, the precursor input port defining an axis oriented at approximately a 45-degree angle with respect to the vertical axis; and,*

a plasma source in fluid communication with the top aperture, the plasma source configured to deliver a plasma through the top aperture and into the flared portion of the interior volume parallel to the vertical axis.

The Examiner maintains the following rejections:<sup>4</sup>

(a) Claims 1, 2, 4–7, 9, 18–21, 37–40, and 52 under 35 U.S.C. § 103(a) as being unpatentable over Lu et al. (US 2006/0177600 A1, published Aug. 10, 2006) (“Lu”) in view of Tsukamoto (US 2007/0235137 A1, published Oct. 11, 2007) (“Tsukamoto”), Foster et al. (US 5,273,588 issued Dec. 28, 1993) (“Foster”), Makino et al. (US 2008/0145193 A1, published June 19, 2008) (“Makino”), Ikeda et al. (US 6,143,077 issued Nov. 7, 2000) (“Ikeda”), Ku et al. (US 7,066,194 B2, issued June 27, 2006) (“Ku”), and Schaepkens (US 6,969,953 B2, issued Nov. 29, 2005) (“Schaepkens”); and

(b) Claims 10 and 22 under 35 U.S.C. § 103(a) as being unpatentable over Lu in view of Tsukamoto, Foster, Makino, Ikeda, Ku, and Schaepkens and further in view of Hiroki (US 2006/0182534 A1, published Aug. 17, 2006) (“Hiroki”).

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<sup>4</sup> The rejections of claims 1, 2, 4–7, 9, 10, 18–22, 37–40, and 52 under 35 U.S.C. § 112, first paragraph, and under 35 U.S.C. § 112, second paragraph, have been withdrawn by the Examiner (Ans. 2).

## ANALYSIS

### *Section 103 Rejection over Lu, Tsukamoto, Foster, Makino, Ikeda, Ku, and Schaepkens*

Claims 1, 2, 4–7, 9, 18–21, 37–40, and 52 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Lu in view of Tsukamoto, Foster, Makino, Ikeda, Ku, and Schaepkens.

Appellants' principal argument on appeal is there would not have been a reason to modify Lu's system to relocate nozzles proximate to a top aperture in view of Tsukamoto (Appeal Br. 21–24; Reply Br. 1–6). Specifically, Appellants assert the Examiner's rationale to modify Lu in view of Tsukamoto is based upon the Examiner's own common sense or an equivalency not recognized by the prior art, especially because Tsukamoto concerns removing unwanted materials, Lu is directed to depositing materials, and Lu's nozzles do not distribute a carrier gas for a plasma, as in Tsukamoto (Appeal Br. 22–24; Reply Br. 2–6). In view of this, Appellants contend there would have been a lack of a reasonable expectation of success for modifying Lu in view of Tsukamoto (Reply Br. 4).

Appellants' arguments are unpersuasive. The Examiner finds Lu discloses, among other things, a gas deposition chamber including an external chamber wall having a top portion and a cylindrical middle portion, a top aperture, a circular substrate support chuck, and a precursor input port (Final Act. 4–5). The Examiner finds Lu does not disclose that the precursor input port passes through the top wall proximate to the top aperture, as recited in claim 1, but finds Tsukamoto discloses a gas port proximate a top aperture and concludes it would have been obvious to relocate Lu's input port in view of Tsukamoto's disclosure (*id.* at 5).



via a top nozzle 145 and/or gas ring 137 having source gas nozzles 139 (*id.* ¶¶ 28, 35). The Examiner finds the top nozzle 145 functions as a top aperture (Final Act. 4). As shown in Figure 1 above, the gas ring 137 and gas nozzles 139 are located in the body member 122 of the chamber 113, not the dome 114.

Tsukamoto discloses a post-etch treatment system for reduced damage treatment of a substrate following an etching process (Tsukamoto ¶ 3). Figure 5 of Tsukamoto is reproduced below.

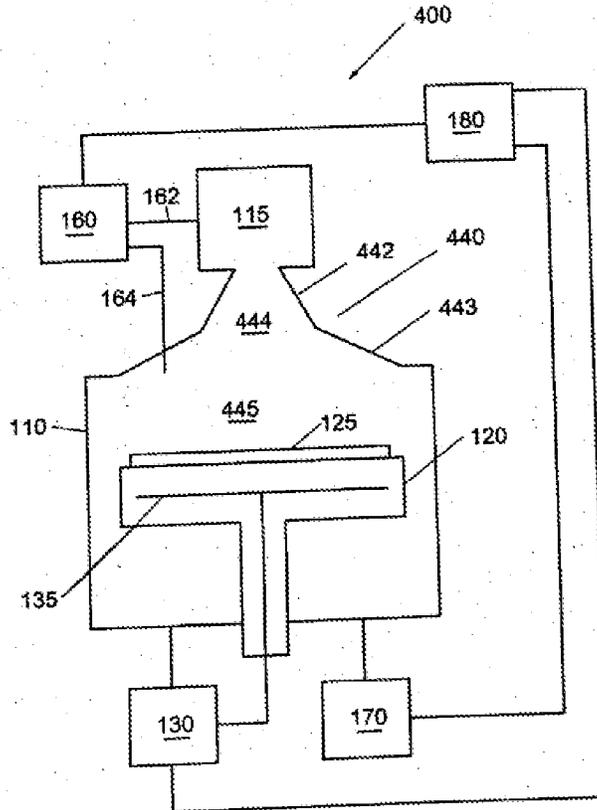


FIG. 5

Tsukamoto's Figure 5 is a schematic diagram of a treatment system

The treatment system 400 includes a process chamber 110 and a

radical generation system 115 that generates atomic and/or molecular radicals from a process gas supplied from a gas supply system 160 via conduits 162 and 164 (*id.* ¶¶ 26, 28, 30, 56).

The Examiner finds that although the gases and processes of Lu and Tsukamoto differ, Tsukamoto demonstrates it was known to locate an input port (Tsukamoto's conduit 164) in the top wall of a chamber to deliver a gas into the chamber from that location (Ans. 2). Thus, the Examiner's rationale does not rely upon art recognized equivalency or common sense, as hypothesized by Appellants. Instead, the Examiner's obviousness rationale relies on the well-established principle that, for an improvement to be patentable, it must be more than the predictable use of prior art elements according to their established functions (*KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007)). Here, even though Tsukamoto's system uses a different gas for a different purpose, Tsukamoto's gas supply system 160 nevertheless uses a conduit 164 to deliver gas through the top wall of a chamber 110 proximate to an aperture communicating with the radical generation system 115. Thus, modifying Lu's system to use a conduit passing through Lu's dome 114 would have been predictable in view of Tsukamoto's disclosure.

Moreover, Schaepkens also demonstrates it was known to have precursor input port pass through a chamber top wall proximate to a top aperture of the chamber, as recited in claim 1. Figure 3 of Schaepkens is reproduced below.



angle recited in claim 1 but also demonstrates it was known in the art to position an inlet so it passes through a top wall of a chamber proximate to a top aperture, as recited in claim 1.

Appellants contend Schaepkens discloses no significance for the orientation of its inlet, does not provide an art-recognized suitability for its inlet, and the Examiner's rationale is insufficient to support a conclusion of obviousness (Appeal Br. 25–26; Reply Br. 8). These arguments are unpersuasive. The Examiner explains that Schaepkens demonstrates it was known to use a 45 degree input port as an effective means for injecting gas into a chamber and using Schaepkens's inlet in Lu's system would accomplish the same purpose (Ans. 3–4). In other words, substituting the inlet 326 of Schaepkens for the gas ring 137 and nozzles 139 of Lu would have been a predictable use of another gas delivery device for a deposition system and would have been the mere application of a known technique (*KSR*, 550 U.S. at 416–417).

In addition, Appellants argue the Examiner has not discussed why Foster discloses or suggests a substrate support chuck comprising “an aerodynamically formed outer shell attached to the circular substrate support surface,” as recited in claim 1, particularly the limitations of “attached” or “shell” (Appeal Br. 24; Reply Br. 7).

As an initial matter, we note claim 1 does not include any limitations for what an aerodynamic outer shell encompasses and Appellants do not cite any definitions to outline the meaning of a “shell” or to what degree it is aerodynamic. For instance, an aerodynamic shell may simply be a surface that forces gases to flow around it, which would appear to be Lu's substrate support member 18. Nonetheless, as the Examiner correctly finds (Final

Act. 5), Foster discloses a susceptor 40 with an exterior side surface 110 that is smoothly contoured to minimize turbulence in the flow of reacting gases within a chamber (Foster 13:20–22). In other words, the exterior side surface 110 of the susceptor 40 functions as the shell of claim 1 and we discern no limitations in claim 1 to distinguish the shell from the surface 110. In view of Foster’s disclosure that the surface 110 minimizes turbulence for gases in a chamber, it would have been obvious to modify Lu’s substrate support member 18, as the Examiner concludes (Final Act. 5). Further, the underside of Foster’s susceptor (i.e., exterior side surface 110) is attached to the substrate support surface because they are part of the same structure, as explained by the Examiner (Ans. 3). Foster discloses that the susceptor 40 includes a wafer support surface 44 (Foster 12:17–23) and therefore supports the Examiner’s finding that they are attached to one another. As a result, Appellants’ arguments do not demonstrate a difference between the attached shell of claim 1 and Foster’s susceptor 40.

Appellants also argue it would not have been obvious to modify Lu in view of Makino because the latter does not disclose a benefit for its arrangement, the Examiner appears to be applying his own common sense, and any pedestal of the applied references would have provided the asserted advantage, which one of ordinary skill in the art would have selected instead of Makino’s support because pedestal supports were popular and provided greater improvements (Appeal Br. 24–25, 27; Reply Br. 7–8).

These arguments are unpersuasive. We agree with the Examiner’s findings (Final Act. 5) that Makino discloses it was known to use hollow support beams 520 to support a wafer holder body 504 and a support base member 523 (Makino ¶¶ 76–77, Figures 5 and 6). Thus, Makino

demonstrates another structure (i.e., one using two or more hollow tubes) for supporting a substrate that differs from Lu's support. It would have been obvious to substitute Makino's support structure for that of Lu due to the known and predictable use of Makino's structure for supporting a substrate (*KSR*, 550 U.S. at 416–417). To the extent Makino's support is less advantageous or popular than a pedestal support, which Appellants have not established by merely citing the disclosure of pedestals in other references, something that is known or obvious does not become patentable simply because it has been described as somewhat inferior to some other product for the same use (*In re Gurley*, 27 F.3d 551, 553 (Fed. Cir. 1994)).

Appellants do not dispute the Examiner's findings and conclusions regarding Ikeda and Ku (Appeal Br. 21–27).

In addition, Appellants argue that the number of references applied in the Examiner's rejection should be considered a factor weighing against a conclusion of obviousness when considered in combination with the other facts and arguments (Appeal Br. 27). However, as noted by Appellants (*id.*), the reliance on a large number of references alone, without more, does not weigh against a conclusion of obviousness (*In re Gorman*, 933 F.2d 982, 986 (Fed. Cir. 1991)). Although Appellants argue that their challenge to the application of four of the references and assertion of hindsight amounts to more than merely arguing that the rejection relies on too many references, Appellants' arguments are not persuasive of reversible error in the rejection as discussed above. Thus, we are not persuaded that the number of references relied on in this rejection weighs against the conclusion of obviousness.

As a result, a preponderance of the evidence in the record supports the

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Examiner's § 103(a) rejection of claim 1. Appellants do not argue claims 2, 4–7, 9, 18–21, 37–40, and 52 separately from claim 1 (Appeal Br. 21–27).

For the reasons discussed above and those set forth in the Examiner's Answer, we sustain the Examiner's § 103(a) rejection of claims 1, 2, 4–7, 9, 18–21, 37–40, and 52.

*Section 103 Rejection over Lu, Tsukamoto, Foster, Makino, Ikeda, Ku, Schaepkens, and Hiroki*

Claims 10 and 22 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Lu in view of Tsukamoto, Foster, Makino, Ikeda, Ku, and Schaepkens and further in view of Hiroki.

Appellants do not argue claims 10 and 22 separately from claim 1 (*id.* at 27–28). As discussed above, Appellants' arguments do not identify a reversible error in the rejection of claim 1. Therefore, we sustain the § 103(a) rejection of claims 10 and 22.

#### DECISION

The Examiner's rejection of claims 1, 2, 4–7, 9, 10, 18–22, 37–40, and 52 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)(iv).

AFFIRMED