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Table with 5 columns: APPLICATION NO., FILING DATE, FIRST NAMED INVENTOR, ATTORNEY DOCKET NO., CONFIRMATION NO. Includes application details for Cheng-Hsiung Liu and examiner information for CHEN, KEATH T.

Please find below and/or attached an Office communication concerning this application or proceeding.

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte CHENG-HSIUNG LIU,
CHUN-HAO HSU, YU-YUN PENG,
CHIH-YUAN YAO, CHIA-I SHEN,
and KENG-CHU LIN

Appeal 2019-003789
Application 14/198,651
Technology Center 1700

Before MICHAEL P. COLAIANNI, GEORGE C. BEST, and
DEBRA L. DENNETT, *Administrative Patent Judges*.

COLAIANNI, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellant¹ appeals under 35 U.S.C. § 134(a) the final rejection of claims 1, 2, 4–6, 9, 11–15, 17–19, and 21–26. Claims 3, 7, 8, 10, 16, and 20 have been canceled. We have jurisdiction over the appeal pursuant to 35 U.S.C. § 6(b).

We REVERSE.

¹ We use the word “Appellant” to refer to “applicant” as defined in 37 C.F.R. § 1.42. Appellant identifies the real party in interest as Taiwan Semiconductor Manufacturing Company Ltd. (Appeal Br. 2).

STATEMENT OF THE CASE

Appellant's invention is directed to chemical vapor deposition (CVD), which involves placing a wafer in a deposition chamber defined within a CVD assembly (Spec. ¶ 1). The Specification describes that a precursor is introduced into the CVD assembly's deposition chamber to expose a surface of the wafer to the precursor, thereby forming a thin film on the surface of the wafer (*id.*).

Claim 1 is illustrative (emphasis added):

1. A pumping liner usable in a chemical vapor deposition (CVD) assembly, comprising:
 - an annular body; and
 - an array of liner apertures defined within and penetrating radially through the annular body, wherein:
 - a first liner aperture of the array of liner apertures occupies a first area of an outermost surface of the annular body,
 - a second liner aperture of the array of liner apertures occupies a second area of the outermost surface of the annular body,
 - the first liner aperture and the second liner aperture have a same shape,
 - the second area is equal to the first area,
 - the first liner aperture and the second liner aperture are on diametrically opposite sides of the annular body,*
 - a center of the first liner aperture is spaced a first distance from a top surface of the annular body,*
 - a center of the second liner aperture is spaced a second distance, different than the first distance, from the top surface of the annular body, and*
 - distances between the top surface of the annular body and a center of each aperture gradually increase for every liner*

aperture of the array of liner apertures between the first liner aperture and the second liner aperture such that, for each pair of adjacent liner apertures between the first liner aperture and the second liner aperture:

a distance between the top surface of the annular body and a center of an aperture of the pair closest to the first liner aperture is less than a distance between the top surface of the annular body and a center of an aperture of the pair furthest from the first liner aperture.

Appeal Br. 15 (Claim App.) (emphasis added).

Appellant appeals the following rejection:

1. Claims 1, 2, 4–6, 9, 11–15, 17–19, and 21–26 are rejected under 35 U.S.C. § 103(a) as unpatentable over Yang et al. (US 2002/0045362 A1, published Apr. 18, 2002, “Yang”) in view of Komiya et al. (US 2003/0094135 A1, published May 22, 2003, “Komiya”) (Final Act. 3–13).

FINDINGS OF FACT & ANALYSIS

After review of the respective positions provided by Appellant and the Examiner, we REVERSE the Examiner’s rejection of claims 1, 2, 4–6, 9, 11–15, 17–19, and 21–26 for the reasons presented by Appellant. We add the following.

Appellant’s arguments for reversal of the Examiner’s rejection of each of the instant claims focus on limitations recited in independent claim 1 (*see* Appeal Br. 4–13). We select claim 1 as representative of claims 2, 4–6, 9, 11–15, 17–19, and 21–26. =

The Examiner's findings and conclusions regarding Yang and Komiya are located on pages 3–13 of the Final Office Action and pages 9–12 of the Answer.

Yang's Figure 5, reproduced below, illustrates a cross-sectional side view of a portion of a semiconductor wafer processing chamber:

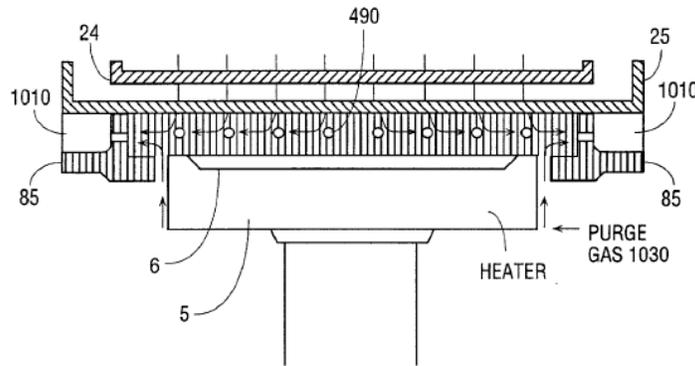


FIG. 5

Yang's Figure 5 illustrates a semiconductor wafer processing chamber including pumping plate 85; vertical annular first stepped portion 464 that forms a circumferential edge of a longitudinal wall to face plate 25; and gas holes 490 (Yang ¶¶ 65–66).

The Examiner finds that Yang's annular portion 464 teaches each limitation of the pumping liner comprising an annular body having an array of liner apertures recited in claim 1, with the exception that Yang does not teach that:

(a center of the second liner aperture is spaced a second distance), different than the first distance, (from the top surface of the annular body),

distances between the top surface of the annular body and a center of each aperture gradually increase for every liner aperture or the array of liner apertures between the first liner

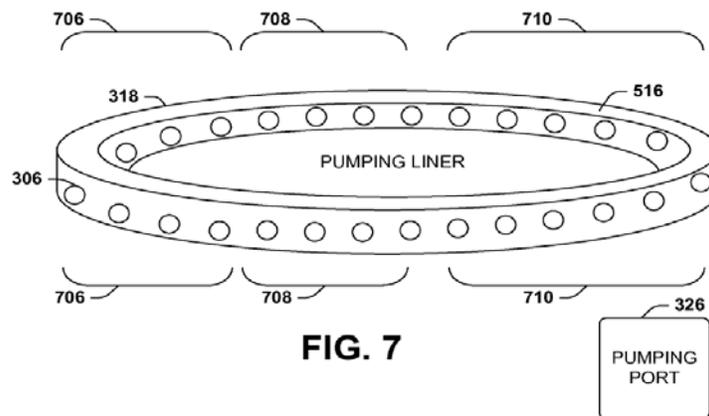
aperture and the second liner aperture such that, for each pair of adjacent liner apertures between the first liner aperture and the second liner aperture:

a distance between the top surface of the annular body and a center of an aperture of the pair closest to the first liner aperture is less than a distance between the top surface of the annular body and a center of an aperture of the pair furthest from the first liner aperture.

(Final Act. 7–8 (indentations added); *see also id.* at 3–4).

Appellant does not dispute the Examiner’s assertion that the claim limitations which are missing from Yang are depicted in the Specification’s Figure 7 (Ans. 11; *see generally* Reply Br.).

Figure 7 of the Specification, reproduced below, illustrates the claimed pumping liner:

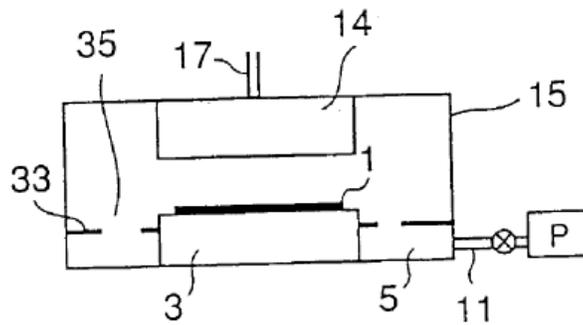


The Specification’s Figure 7 illustrates liner apertures 306, which vary in distance from the top surface 516 of pumping liner 318 (Spec. ¶ 28). According to the Specification, substantially uniform gas flow in communication with pumping port 326 occurs among the different groups of apertures 706, 708, 710 to promote formation of a substantially uniform layer of thin film on the surface of wafer 304 (not shown) (*id.*).

The Examiner finds that Komiya's porous baffle plate, along with a gas process chamber, teaches or suggests the limitations missing from Yang (Final Act. 9–10).

Komiya's Figure 14, reproduced below, illustrates the structure of a gas process chamber on which a baffle plate is mounted:

FIG. 14



Komiya's Figure 14 illustrates schematic views of a semiconductor wafer processing chamber wherein the conductance of gas flow through exhaust slit 35, for penetrating the area surrounding wafer 1, is adjusted by varying slit 35 width and baffle plate 33 thickness in the circumferential direction (Komiya ¶ 173; *see also* Fig. 13). The Examiner finds Komiya discloses that “gradual change of each attribute” in the porous baffles and gas process chambers leads to “uniform exhaust without depending on process conditions” (Final Act. 10 (citing Komiya Abstract; Figs. 6, 7, 11–20; ¶ 173)).

The Examiner determines that it would have been obvious for one of ordinary skill in the art at the time of the invention

to have increased/adjusted the distance between [Yang's] gas hole 490 that is closer to the pump side to reduce the conductance at the pump side relative to the gas hole 490 at [the] diametrically opposite side of the pumping liner [and],

furthermore, *to have other holes 490 in between gradually changing height, as taught by [Komiya]*, for the purpose of uniform exhaust without depending on process conditions

(Final Act. 10 (citing Komiya ¶ 173; Abstract; Figs. 13, 14)) (emphasis added); *See also* Yang Fig. 5.

Appellant argues that the Examiner has failed to demonstrate that a person of ordinary skill in the art would have been motivated to modify Yang's gas holes 490, which are in a curved surface of pumping plate 85, in view of Komiya's exhaust slit 35, which is disposed on a circular top surface of baffle plate 33 (Appeal Br. 12). In particular, Appellant argues

that the conspicuous lack of any embodiment in *Komiya* teaching or suggesting that a plurality of holes may be shifted, while describing numerous other embodiments that vary holes in other manners, suggests that the inventors in *Komiya* (who are presumably at least people of ordinary skill in the art) did not contemplate an embodiment in which a plurality of holes are shifted [vertically] as claimed

(*id.* at 8–9; *see also* Reply Br. 3). Appellant asserts that “*Komiya* is silent with respect to varying the positions of gas holes relative to the top surface of a pumping plate based upon the proximity of the gas holes to a pumping port” (Reply Br. 3).

Appellant's arguments are persuasive.

It is well understood that “[r]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007) (quoting *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)). The fact that a reference may be modified to reflect features of the claimed invention would not have made the modification, and hence the claimed

invention, obvious unless the prior art, knowledge of a person having ordinary skill in the art, or the nature of the problem to be solved suggested the desirability of such modification. *In re Mills*, 916 F.2d 680, 682 (Fed. Cir. 1990).

In this case, the Examiner has not provided findings or reasoning supported by adequate facts to explain why a person of ordinary skill in the art would have pursued *varying positions of gas holes relative to the top surface* of a pumping plate based upon the proximity of the gas holes to a pumping port. For example, Komiya discloses several embodiments that adjust conductance to obtain uniform exhaust by *differing the amount of area occupied by gas holes* in a pumping plate (*see, e.g.*, Komiya Figs. 6, 7). Komiya's Figure 13 and 14, furthermore, depict a single gas exhaust slit 35 varied in the circumferential direction (*see also id.* ¶ 173). The Examiner has not explained why the ordinarily skilled artisan would have replaced Komiya's circumferentially-adjusted exhaust slit in modifying Yang's plurality of liner apertures to shift vertically. Thus, the Examiner has not established a prima facie case of obviousness based upon articulated reasoning with rational underpinnings.

On this record, we reverse the Examiner's § 103(a) rejection.

CONCLUSION

In summary:

Claims Rejected	35 U.S.C. §	Basis	Affirmed	Reversed
1, 2, 4-6, 9, 11-15, 17-19, 21-26	103(a)	Yang, Komiya		1, 2, 4-6, 9, 11-15, 17-19, 21-26

REVERSED