The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

Paper No. 16

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte CHING-HSING SHIH,
HIS-SHEN CHUANG and CHENG-FANG CHUNG

Appeal No. 2003-0626
Application No. 09/410,896

ON BRIEF

Before PAK, JEFFREY T. SMITH and POTEATE, Administrative Patent Judges.

POTEATE, Administrative Patent Judge.

DECISION ON APPEAL

This is an appeal under 35 U.S.C. § 134 from the examiner's refusal to allow claims 1-3, 5, 8-10, 12-16 and 18-20, which are all of the claims pending in the application.

Claims 1 and 16 are representative of the subject matter on appeal and are reproduced below:

1. A cooling stage for a semiconductor substrate comprising:

a pedestal having a substantially planar top surface,

a first plurality of circular grooves concentrically formed in said top surface, and

a second plurality of linear grooves formed in radial directions emanating from a center of said top surface in fluid communication with each and everyone of said first plurality of circular grooves allowing a cooling fluid to flow therethrough when said semiconductor substrate is positioned on said top surface of the pedestal, said first plurality of circular grooves and said second plurality of linear grooves each having a width between about 1 mm and about 7 mm, and a depth between about 1 mm and about 7 mm.

16. A wafer pedestal effective for cooling a high temperature processed wafer comprising:

a wafer pedestal having a substantially planar top surface,

at least three circular grooves concentrically formed in said top surface, and

at least two linear grooves formed in radial directions emanating from a center of said top surface in fluid communication with each and everyone of said at least three circular grooves for flowing a cooling fluid therethrough cooling said high temperature processed wafer positioned thereon.

The references relied upon by the examiner are:

Flanigan et al. (Flanigan)	6,081,414	Jun. 27, 2000
Moslehi	6,138,745	Oct. 31, 2000

Grounds of Rejection

1. Claim 12 stands rejected under 35 U.S.C. § 112, second paragraph.

We affirm.

2. Claims 16, 18 and 20 stand rejected under 35 U.S.C. § 102(e), as anticipated by Flanigan.

We affirm.

3. Claims 1-3, 5, 8-10, 12-16 and 18-20 stand rejected under 35 U.S.C. § 103, as unpatentable over by Moslehi.

We reverse.

Background

During a multi-layer deposition process, a semiconductor substrate is frequently processed in several sputter chambers. Specification, page 3, lines 15-16. The processing temperatures for the various sputtering processing may vary significantly. Id., page 4, lines 3-4. Thus, it may be necessary to conduct a rapid cool-down process to reduce the temperature of the semiconductor substrate during two sputtering processes. Id. at lines 6-7. In order to reduce the substrate temperature, a cool-down chamber may be utilized wherein the bottom surface of the wafer is cooled via a cooling fluid in the wafer pedestal and the top surface of the wafer is cooled by a cooling gas circulated

through a cavity in the cooling chamber housing. See id. pages 3-4. In general, heat conductance to the cooling fluid in the wafer pedestal is less efficient than that provided by cooling fluid in the chamber. Id., page 4, lines 10-12. Due to the difference in cooling rates on the top and bottom surfaces of the wafer, thermal stresses may cause a vertical movement of the wafer from the pedestal resulting in inaccurate placement of the wafer or the dropping of the wafer resulting in a total loss of the wafer. See id., at lines 12-20.

According to the inventors, the present invention provides a cooling stage for a semiconductor substrate which may be used as a wafer pedestal to provide improved cooling to the wafer and reduce the wafer movements on the pedestal. See id., pages 5 and 6.

Discussion

Rejection of Claim 12 under 35 U.S.C. § 112, second paragraph

Appellants fail to present arguments traversing this ground of rejection. See examiner's answer, Paper No. 14, mailed September 6, 2002, page 4, last paragraph and appeal brief (references to appellants' "appeal brief" refer to the "*REVISED* APPEAL BRIEF", Paper No. 13, filed May 20, 2002), page 2, second paragraph. Accordingly, we summarily affirm this ground of

rejection.

Rejection of claims 16, 18 and 20 under 35 U.S.C. § 102(e)

Anticipation requires the disclosure, in a single prior art reference, of each element of the claim under consideration. See W. L. Gore & Assocs. v. Garlock, Inc., 721 F.2d 1540, 1554, 220 USPQ 303, 313 (Fed. Cir. 1983). According to the examiner, Flanigan discloses a structure which reads on appellants' claims 16, 18 and 20. The examiner found that in Fig. 2, Flanigan shows a pedestal assembly having a top surface including five concentrically formed circular grooves and at least five radially formed linear grooves each of which is in communication with the circular grooves. Examiner's answer, page 5. A gas conduit extends from the bottom of the pedestal assembly through an opening in the top surface "to allow a heat transfer gas to be pumped under the wafer during processing." Flanigan, column 4, lines 66 - column 5, line 10.

According to appellants, the grooves shown in the top surface 103 of Flanigan's electrostatic chuck 105 are "not used for cooling at all, instead, the grooves are used for achieving heat transfer on the wafer backside thus achieving a more uniform wafer temperature. . . . The surface grooves provided by Flanigan et al are therefore not used to 'enable cooling using a

coolant' as suggested by the Examiner." Appeal brief, page 6. Appellants further point out that cooling of the electrostatic chuck 105 is actually achieved using a plurality of grooves 236 in the cooling plate 234. Id.

Like the examiner, we are unpersuaded by appellants' arguments which are directed towards the intended use of the claimed apparatus. See examiner's answer, page 7. As properly pointed out by the examiner, anticipation only requires that Flanigan's grooves be capable of enhancing cooling or any other type of heat transfer. See examiner's answer, page 7. Since Flanigan's grooves are designed to allow a "heat transfer" gas to be pumped under the wafer, we are in agreement with the examiner that Flanigan anticipates the claim limitation of allowing a cooling fluid to flow therethrough to cool a high temperature wafer positioned on the chuck. See id.

Accordingly, the rejection of claims 16, 18 and 20 under 35 U.S.C. § 102(e) is affirmed.

Rejection of claims 1-3, 5, 8-10, 16 and 18-20 under 35 U.S.C. § 103 as unpatentable over Moslehi

The examiner found that Moslehi discloses the invention as claimed with exception that Moslehi "does not specify that the dimensions of grooves 88 and 90 as having any particular value or range of values nor does it show more than two circular

concentric grooves 88 which are intersected by each and everyone of linear radial grooves 90." Examiner's answer, page 6. The examiner maintains that Moslehi nonetheless renders obvious appellants' claimed invention since appellants have failed to establish any unexpected results corresponding to the particular dimensions of the grooves or to the number of grooves. Id.

Appellants argue that Moslehi does not render obvious the claimed invention because the term "first plurality" used in claims 1 and 8 necessarily requires at least three circular grooves each and everyone of which is in fluid communication with a second plurality of linear grooves. See appeal brief, pages 8-9. In this regard, appellants note that term "first plurality" refers to at least three grooves when interpreted in accordance with the specification and claims. See appeal brief, page 8, and examiner's answer, page 8. Since only two circular grooves on Moslehi's pedestal are in fluid communication with the linear grooves, Moslehi cannot render obvious the claimed invention. Appeal brief, page 8.

The examiner argues that claim language must be interpreted as broadly as possibly and the term "plurality" is equivalent to "more than one" and therefore, the limitation of the plurality of grooves including at least three grooves which appears in the

specification is not properly read into the claims.

Although the examiner is correct that limitations from the specification should not be read into the claims, we are in agreement with the appellants that in the present case, the specification clearly defines the term “first plurality” as requiring at least three grooves. See, e.g., specification, page 7, lines 11-12 and page 11, lines 1-2 and 7-8. See In re Thrift, 298 F.3d 1357, 1364, 63 USPQ2d 2002, 2006 (Fed. Cir. 2002)(the terms in a patent claim are given their ordinary meaning as used in the field of the invention unless the text of the patent indicates they have a special meaning).

Claims 1 and 8 each include the limitation of “a first plurality”, of circular grooves with the second plurality of linear grooves being in fluid communication with each and everyone of the first plurality of grooves. The remaining independent claim, claim 16, specifically requires at least three circular grooves, each of which is in fluid communication with linear grooves. We are in agreement with appellants that the examiner has failed to establish why it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Moslehi such that each of the linear grooves is in communication with at least three, i.e., a plurality, of the concentric grooves.

Accordingly, the rejection is reversed.

Time Period for Response

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a).

AFFIRMED-IN-PART

CHUNG K. PAK Administrative Patent Judge	)	
JEFFREY T. SMITH Administrative Patent Judge	)	BOARD OF PATENT APPEALS AND INTERFERENCES
LINDA R. POTEATE Administrative Patent Judge	)	

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