

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

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte JOSE TONG
and
ERIC H. LENZ

Appeal 2006-3124
Application 10/251,179
Technology Center 1700

Decided: December 29, 2006

Before THOMAS A. WALTZ, JEFFREY T. SMITH, and LINDA M. GAUDETTE, *Administrative Patent Judges*.

GAUDETTE, *Administrative Patent Judge*.

DECISION ON APPEAL

This appeal involves claims 1-9 and 13-20, the only claims pending in this application. We have jurisdiction over the appeal pursuant to 35 U.S.C. § 134.

INTRODUCTION

The invention is directed to an apparatus and method for reducing polymer deposition on a substrate and substrate support. A prior art apparatus is illustrated in Figure 1 below:

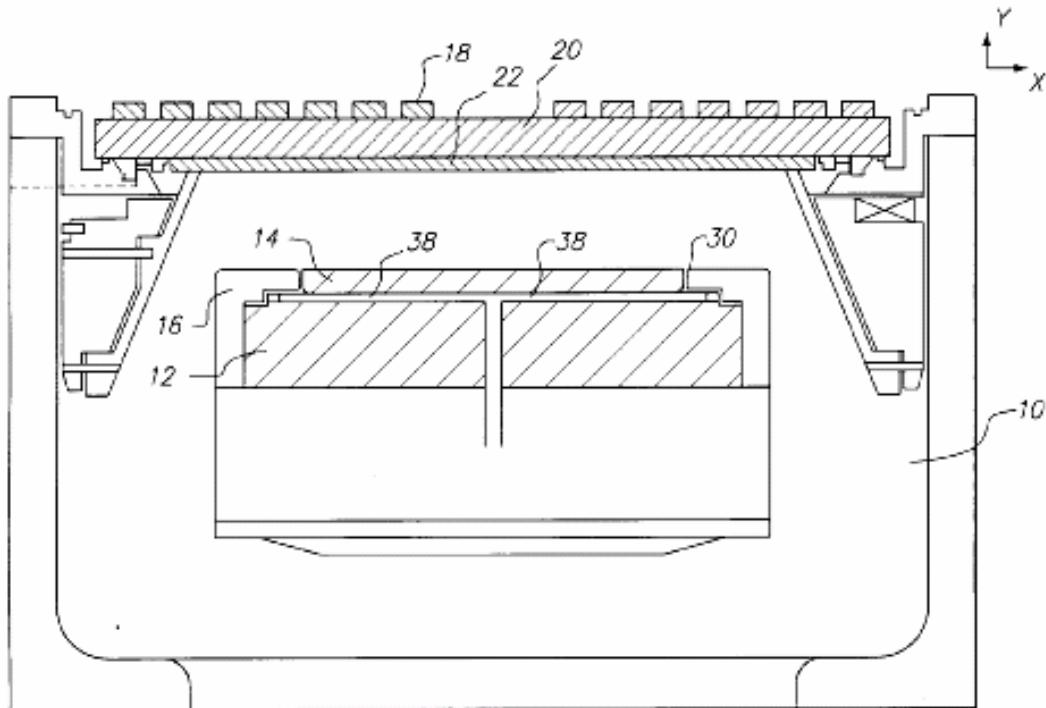


FIG. 1 PRIOR ART

Figure 1 shows the vertical gap *30* between a surrounding ring *16* and the overhanging substrate edge in the prior art device. Para. [0012]. The gap *30* is said to prevent the overhanging edge of the substrate from being lifted and thereby avoid a reduction in clamping force applied by the substrate holder *14*. Para. [0011]. The Specification states that a drawback of the clearance gap *30* is that it provides additional opportunity for polymer buildup which may flake off and contaminate the substrate *S* or the electrostatic chuck *14'*.

Para. [0011]. Thus, the invention is directed to the adjustment of the gap between a substrate holder and a substrate to reduce polymer deposition on exposed surfaces of the substrate holder and bottom surfaces of the substrate.

Br. 15-16.

Claims 1 and 8 are illustrative:

1. A plasma processing apparatus comprising:

a processing chamber;

a power source which energizes process gas in an interior of the processing chamber into a plasma state for processing a substrate;

a substrate support which supports a substrate within the interior of the processing chamber, the substrate support having an upper surface;

an upper ring surrounding the substrate support, the upper ring having a portion extending under a substrate when the substrate is located on the substrate support; and

a coupling ring surrounding the substrate support, the coupling ring having a first ring rotatable with respect to a second ring to adjust height of the coupling ring and adjust a gap between the upper ring and the substrate.

8. An adjustment mechanism for adjusting a gap between a substrate and a surrounding ring in a plasma processing apparatus, the adjustment mechanism comprising:

a first ring having at least three projections extending from the first ring in a direction parallel to an axis of the first ring; and

a second ring having at least three sets of a plurality of steps arranged to receive each of the at least three projections, wherein a total thickness of the first and second ring rings is adjustable by rotation of the first ring with respect to the second ring.

The Examiner relies on the following prior art references to show unpatentability:

Fukuyama ¹	JP 2-11781	Jan. 16, 1990
Tanaka ²	JP 2000-150623	May 30, 2000
Maeda	US 6,624,084 B2	Sept. 23, 2003
Koike	US 6,726,799 B2	Apr. 27, 2004
Tong	US 2004/0083975 A1	May 6, 2004
(Appellants' Admitted Prior Art (AAPA))		

The rejections as presented by the Examiner are as follows:

1. Claims 8, 9, and 18-20 are rejected under 35 U.S.C § 103(a) over Tanaka;
2. Claims 1-7 and 13-17 are rejected under 35 U.S.C. § 103(a) over AAPA in view of Koike and Tanaka;
3. Claims 1-7 and 15-17 are rejected under 35 U.S.C. § 103(a) over AAPA in view of Fukuyama and Tanaka;
4. Claim 13 is rejected under 35 U.S.C. § 103(a) over AAPA in view of Fukuyama and Tanaka, and further in view of Maeda; and
5. Claim 14 is rejected under 35 U.S.C. § 103(a) over Tanaka in view of Maeda.

We reverse all grounds of rejection for essentially the reasons stated in Appellants' Brief and Reply Brief.

¹ The Examiner relies on the English Abstract. For convenience, we refer to the complete translation in describing Figure 1 below.

² The Examiner relies on the English Abstract. For convenience, we refer to the complete translation in describing Figure 1 below.

OPINION

Claims 8, 9, and 18-20 are rejected under 35 U.S.C § 103(a) over Tanaka.

The Examiner relies on Tanaka for a disclosure of an adjustable mechanism for adjusting a gap comprising a rotatable ring (26) with at least three projections extending in a direction of its axis and a stage (24) with conforming projections and steps disposed over it. Answer 3. The Examiner concedes that stage (24) does not appear to have an explicit hole, but maintains that it is “clear from the drawing that the lower conforming part of the stage with the projections and steps is of the shape of a ring,” with the part that holds a substrate being “a plate fixed to the top of the ring.” Answer 3. The Examiner maintains that it would have been obvious to one of ordinary skill in the art at the time of invention to use a part without a continuous top, i.e., more like a ring with an explicit hole, as the stage (24). Answer 4.

The initial burden is on the Examiner to produce evidence sufficient to support a showing of obviousness, and only then does the burden shift to the applicant. *In re Piasecki*, 745 F.2d 1468, 1472, 223 USPQ 785, 788, (Fed. Cir. 1984). Appellants argue, and we agree, that the Examiner has failed to provide the requisite evidentiary support to establish a *prima facie* case of obviousness. See *In re Kahn*, 441 F.3d 977, 985-86, 78 USPQ2d 1329, 1335 (Fed. Cir. 2006). Like Appellants, we fail to see any basis for the Examiner’s finding that stage (24) could be disassembled so as to provide two separate

elements, i.e., a top plate and a separate ring-like structure. *See* Br. 11. Similarly, the Examiner has not explained the underlying basis for his conclusion that "the disclosed adjustment apparatus could be easily configured to lift a ring and is therefore an obvious variation and art recognized equivalent." (Answer 8). *See* Br. 11.

To establish *prima facie* obviousness, the Examiner must also provide reasons why one of ordinary skill in the art would have possessed the knowledge and motivation to make the claimed invention. *See In re Kahn*, 441 F.3d at 988, 78 USPQ2d at 1336 . In our view, the Examiner's assertion that "it would be obvious to one of ordinary skill in the art at the time of invention to realize that a part without the continuous top . . . would be usable . . ." establishes, at best, a "general incentive" to use a ring in place of a solid top. While a "general incentive" may make an approach "obvious to try" it does not make the invention obvious. *In re Deuel*, 51 F.3d 1552, 1559, 34 USPQ2d 1210, 1216 (Fed. Cir. 1995). *See In re O'Farrell*, 853 F.2d 894, 903, 7 USPQ2d 1673, 1680 (Fed. Cir. 1988) ("Obvious to try" is not the standard of obviousness under 35 U.S.C. § 103.).

The rejection of claims 8, 9 and 18-20 as unpatentable over Tanaka is reversed.

Claim 14 is rejected under 35 U.S.C. § 103(a) over Tanaka in view of Maeda. Claim 14 depends from claim 8. The Examiner's reliance on Maeda is limited to its disclosure of a focus ring made of quartz. Accordingly, the rejection of claim 14 is reversed for the same reasons discussed in connection with claim 8.

Claims 1-7 and 13-17 are rejected under 35 U.S.C. § 103(a) over AAPA in view of Koike and Tanaka. Claims 1-7 and 15-17 are rejected under

35 U.S.C. § 103(a) over AAPA in view of Fukuyama and Tanaka. Claim 13 is rejected under 35 U.S.C. § 103(a) over AAPA in view of Fukuyama and Tanaka, and further in view of Maeda.

The Examiner relies on AAPA for a disclosure of the invention as claimed in independent claim 1 with the exception of an adjustment for ring height. Figure 2 of the present application, shown below, illustrates a prior art device.

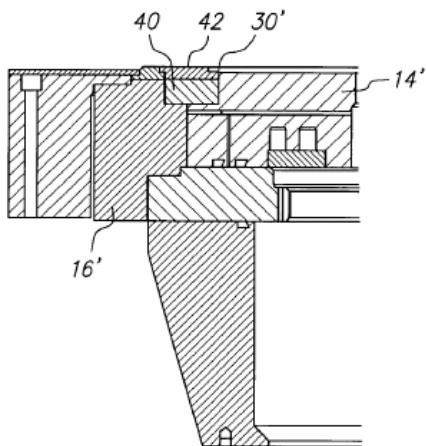


FIG. 2 PRIOR ART

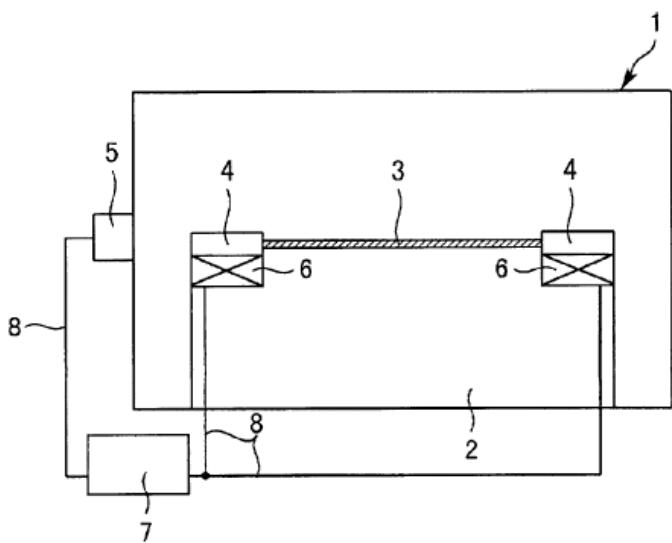
The Examiner describes Figure 2 as illustrating a substrate support (i.e., electrostatic chuck 14') and an upper ring (hot edge ring 42) having a portion which extends under a substrate. Answer 5.

The Examiner relies on Koike and Fukuyama for disclosures of a plasma process chamber where the height of a focus ring is controlled to have uniformity of processing under diverse processing conditions. Answer 5

(citing Koike, col. 1, ll. 11-25 and col. 2, ll. 32-36) and 6 (citing Fukuyama, Abstract).

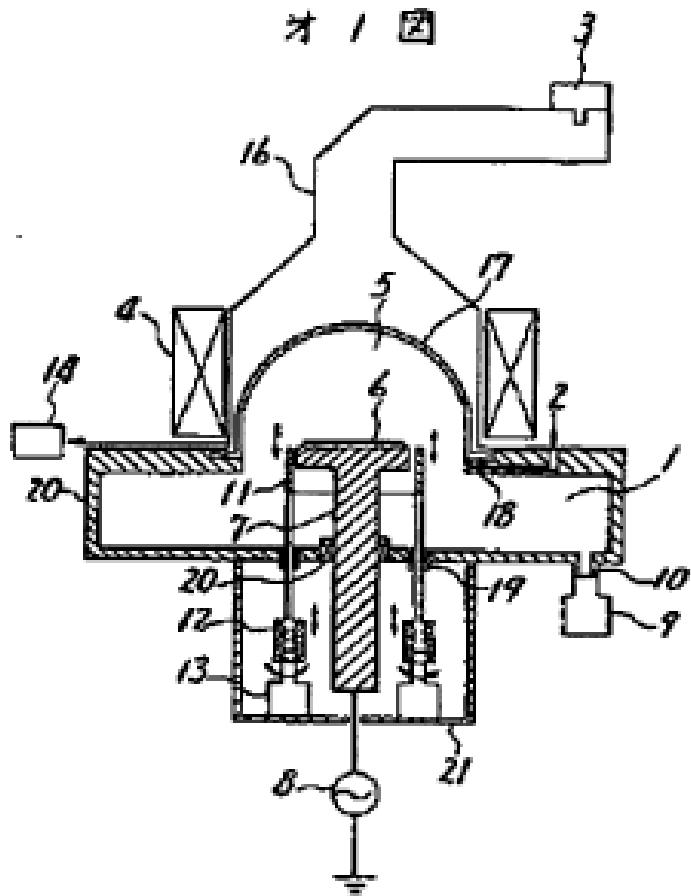
Figure 1 of Koike is illustrated below.

Fig. 1



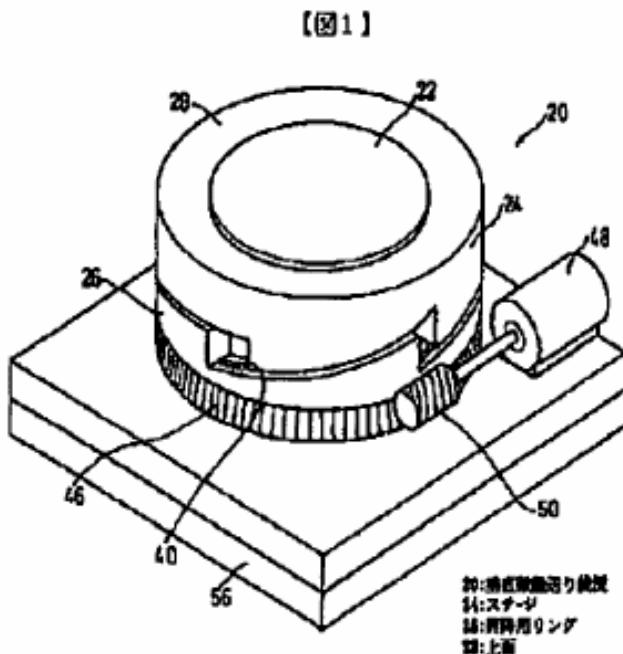
Koike Figure 1 illustrates a plasma etching apparatus. A focus ring 4 is disposed around the circumference of the substrate 3 for controlling plasma deposition. Koike, col. 2, ll. 32-35. Drive mechanism 6 is used to adjust the height of the focus ring 4. *Id.* l. 43.

Figure 1 of Fukuyama is shown below.



Fukuyama Figure 1 illustrates a vacuum chamber 1 in which the surface of a sample 6 is etched with radicals and ions of the plasma 5. Etching uniformity is controlled by adjusting the height of ring 11 via a displacement converting member 12 by using a pulse motor 13. Fukuyama, p. 5.

The Examiner relies on Tanaka for a disclosure of height adjustment by using relative rotational position of two rings. Answer 5 & 7. Figure 1 of Tanaka is shown below.



Tanaka Figure 1 illustrates a vertical fine motion feeder 20 having a stage 24 for mounting a semiconductor wafer 22 and an elevating ring 26 that is arranged below the stage 24 for vertically moving the stage. Tanaka [0014].

The Examiner maintains that it would have been obvious for one of ordinary skill in the art at the time of invention to have modified the AAPA device to have the capability of height adjustment in order to gain the advantage of uniform processing under different processing conditions as taught by Koike or Fukuyama. The Examiner further states that it would have been obvious to use the method of adjustment taught by Tanaka to gain the advantage of uniformity and reduction of contamination by having a simpler lift mechanism, which could also be used manually. Answer 5-7.

Appellants note that Tanaka's device is not used in connection with plasma deposition, but to allow inspection of a semiconductor wafer. As

such, Appellants assert that Tanaka's feed gear 20 is structurally and functionally different from the claimed "adjustment mechanism for adjusting a gap between a substrate and a surrounding ring in a plasma processing apparatus." Br. 10. According to Appellants, Tanaka's feed gear 20 is constructed specifically to support a substrate (wafer 22) on its top face 28 and to *elevate and lower the substrate* supported on the top face 28 via elevating/lowering ring 26 under stage 24. Appellants note that both Fukuyama and Koike relate to adjustment of a single ring disposed along the circumferential part of, but not underlying, the substrate. Thus, Appellants disagree with the Examiner's finding that one of ordinary skill in the art would have been motivated to use Tanaka's mechanism as the drive mechanism for elevating and lowering a ring as in Fukuyama's or Koike's devices. *See* Br. 17-19 and 22-24.

An obviousness analysis is based on several factual inquiries: (1) the scope and content of the prior art; (2) the differences between the prior art and the claims at issue; (3) the level of ordinary skill in the art at the time the invention was made; and (4) objective evidence of nonobviousness, if any.

Graham v. John Deere Co., 383 U.S. 1, 17-18, 148 USPQ 459, 467 (1966). Where the Examiner combines various components described in separate prior art references, he must identify a reason for the combination: a teaching, a motivation, an incentive, or a suggestion. *In re Laskowski*, 871 F.2d 115, 117, 10 USPQ2d 1397, 1398-99 (Fed. Cir. 1989). This requires the Examiner to consider the thinking of one of ordinary skill in the art at the time of the invention, "guided only by the prior art references and the then-accepted wisdom in the field." *In re Dembicza*k, 175 F.3d 994, 999, 50 USPQ2d 1614, 1617 (Fed. Cir. 1999).

Although the Examiner offers reasons for combining the applied prior art, we do not find his explanation sufficient to meet the requirement for a showing of a “teaching or motivation to combine” the prior art references. *See Dembiczak*, 175 F.3d at 999, 50 USPQ2d at 1617. In particular, the Examiner fails to explain why one of ordinary skill in the art would have been motivated to modify a lifting mechanism such as that of Koike and Fukuyama based on Tanaka’s device, which has a different structure and function. Moreover, as noted above, the Examiner has not identified the prior art teaching, suggestion, or motivation to disassemble Tanaka’s stage 24 so as to provide the claimed “coupling ring having a first ring rotatable with respect to a second ring.” *See In re Fritch*, 972 F.2d 1260, 1266, 23 USPQ2d 1780, 1783-74 (Fed. Cir. 1992) (“The mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification.”). When the Examiner does not explain the motivation, or the suggestion or teaching that would have led the skilled artisan at the time of the invention to the claimed combination as a whole, there is an inference that the Examiner relied on hindsight to conclude that the invention was obvious. *In re Lee*, 277 F.3d 1338, 1343, 61 USPQ2d 1430, 1433 (Fed. Cir. 2002). *See In re Fine*, 837 F.2d 1071, 1075, 5 USPQ2d 1596, 1600 (Fed.Cir.1988) (“One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention.”).

In view of the foregoing, we reverse the rejection of claims 1-7 and 13-17 as unpatentable over AAPA in view of Koike and Tanaka and the rejection of claims 1-7 and 15-17 as unpatentable over AAPA in view of Fukuyama and

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Tanaka. We also reverse the rejection of claim 13 as unpatentable over AAPA in view of Fukuyama and Tanaka, and further in view of Maeda, the Examiner's reliance on Maeda being limited to its disclosure of a focus ring made of quartz.

The Examiner's decision is reversed.

REVERSED

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