

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.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. 14

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte TIHIRO OHKAWA
and
STANLEY I. TSUNODA

Appeal No. 1998-2311
Application No. 08/401,869

ON BRIEF

Before HAIRSTON, KRASS, and RUGGIERO, Administrative Patent Judges.

RUGGIERO, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on the appeal from the final rejection of claims 1, 3-14, and 16-37, all of the claims pending in the present application. Claims 2 and 15 have been canceled.

A proposed amendment after final rejection submitted as an appendix to the Appeal Brief was denied entry by the Examiner.

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The disclosed invention relates to plasma processing and the prevention of negative ions and negatively-charged particulates from being trapped in the plasma. A particular electrode and electrode-biasing configuration is provided in which a formed plasma is maintained at a positive potential with respect to a set of control electrodes placed at opposite ends and aligned with a longitudinal axis of a plasma chamber. A set of reference electrodes, positively biased with respect to the plasma, are placed along opposing sides and aligned with a lateral axis of the plasma chamber. A magnetic field of a specified magnitude having magnetic field lines that parallel the longitudinal axis of the plasma chamber is provided enabling the negative ions and negatively charged particles to laterally cross the magnetic field lines to the more positively charged reference electrodes.

Claim 1 is illustrative of the invention and reads as follows:

1. A method of controlling a plasma to prevent negative ions and negatively-charged particulates from becoming trapped within the plasma comprising the steps of:

forming a plasma from a specified gas within a
plasma formation chamber, the chamber having control

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electrodes at each end of the chamber that are aligned with a longitudinal axis of the chamber, and reference electrodes along opposing sides of the chamber that are aligned with a lateral axis of the chamber, at least one of the reference electrodes having

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a surface on which a workpiece may be supported and with which it is in electrical contact, the lateral axis being substantially orthogonal relative to the longitudinal axis;

biasing the control electrodes with a first bias voltage that includes a negative dc component to control the plasma potential so that the plasma potential is positive with respect to the control electrodes;

restricting electron flow in the plasma to a longitudinal flow that substantially parallels the longitudinal axis, while at the same time allowing a lateral negative ion flow or a lateral negative particulate flow in the plasma, wherein said step of restricting the flow of electrons in the plasma comprises applying a magnetic field of a specified magnitude to the plasma formation chamber that has magnetic field lines that substantially parallel the longitudinal axis, the specified magnitude of the magnetic field restricting the movement of electrons to a direction that substantially parallels the magnetic field lines, while at the same time allowing negative ions and negatively-charged particulates to laterally cross the magnetic field lines; and

biasing the reference electrodes with a second bias voltage that is more positive than the plasma, whereby the plasma potential becomes negative relative to the reference electrodes;

whereby negative ions and negatively-charged particulates in the plasma are laterally drawn out of the plasma across the magnetic field lines to the more positively charged reference electrodes and are not allowed to become trapped within the plasma.

The Examiner relies on the following prior art:

O'Donnell

4,657,619

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		1987
Walker	4,664,938	May 12, 1987
Harada	4,962,727	Oct. 16, 1990
Mizutani et al. (Mizutani)	5,284,554	Feb. 08, 1994
Heinrich et al. (Heinrich)	5,527,394	Jun. 18, 1996
		(filed May 13, 1994)

Claims 1, 3-14, and 16-37 stand finally rejected under 35 U.S.C. § 103. As evidence of obviousness, the Examiner offers Heinrich in view of Walker and O'Donnell with respect to claims

1, 3-5, 8-14, 16, 17, 19-27, and 32-37, and adds Harada and Mizutani to the basic combination with respect to claims 6, 7, 18, and 28-31.

Rather than reiterate the arguments of Appellants and the Examiner, reference is made to the Briefs¹ (Paper Nos. 9 and 12) and Answer (Paper No. 11) for the respective details.

OPINION

We have carefully considered the subject matter on appeal, the rejection advanced by the Examiner, the arguments in support of the rejection and the evidence of obviousness

¹The Appeal Brief was filed November 24, 1997. In response to the Examiner's Answer dated February 11, 1998, a Reply Brief was filed April 7, 1998 which was acknowledged and entered by the Examiner without further comment as indicated in the communication dated June 15, 1999.

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relied upon by the Examiner as support for the rejection. We have, likewise, reviewed and taken into consideration, in reaching our decision, Appellants' arguments set forth in the Briefs along with the Examiner's rationale in support of the rejection and arguments in rebuttal set forth in the Examiner's Answer.

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It is our view, after consideration of the record before us, that the evidence relied upon and the level of skill in the particular art would not have suggested to one of ordinary skill in the art the obviousness of the invention as set forth in claims 1, 3-14, and 16-37. Accordingly, we reverse.

In rejecting claims under 35 U.S.C. § 103, it is incumbent upon the Examiner to establish a factual basis to support the legal conclusion of obviousness. See In re Fine, 837 F.2d 1071, 1074, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988). In so doing, the Examiner is expected to make the factual determinations set forth in Graham v. John Deere Co., 383 U.S. 1, 17, 148 USPQ 459, 467 (1966), and to provide a reason why one having ordinary skill in the pertinent art would have been led to modify the prior art or to combine prior art references to arrive at the claimed invention. Such reason must stem from some teaching, suggestion, or implication in the prior art as a

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whole

or knowledge generally available to one having ordinary skill
in

the art. Uniroyal, Inc. v. Rudkin-Wiley Corp., 837 F.2d 1044,
1051, 5 USPQ2d 1434, 1438 (Fed. Cir.), cert. denied, 488 U.S.

825

(1988); Ashland Oil, Inc. v. Delta Resins & Refractories,
Inc.,

776 F.2d 281, 293, 227 USPQ 657, 664 (Fed. Cir. 1985), cert.

denied, 475 U.S. 1017 (1986); ACS Hosp. Sys., Inc. v.

Montefiore Hosp., 732 F.2d 1572, 1577, 221 USPQ 929, 933 (Fed.

Cir. 1984). These showings by the Examiner are an essential

part

of complying with the burden of presenting a prima facie case

of

obviousness. Note In re Oetiker, 977 F.2d 1443, 1445, 24

USPQ2d

1443, 1444 (Fed. Cir. 1992).

With respect to independent claims 1, 12, 19, and 22, the
Examiner, as the basis for the obviousness rejection, proposes
to modify the plasma processing disclosure of Heinrich.

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According to the Examiner (Answer, page 8), Heinrich discloses the claimed invention except for the use of a DC voltage to bias the plasma chamber electrodes and the superimposition of a DC voltage over an RF voltage to power the electrodes. To address these deficiencies, the Examiner turns initially to Walker which describes the biasing of electrodes 58 and 60 in plasma chamber 12 in order to attract ions of a certain polarity to the electrode of opposite polarity. O'Donnell is added to the combination as providing a teaching of superimposing a DC voltage over an RF voltage in the formation of a plasma in a plasma apparatus. As stated by the Examiner at pages 7 and 8 of the Answer:

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have formed a plasma between control electrodes located at opposite sides of a chamber's longitudinal axis and provided a magnetic field to control the electrons and ions in a plasma as taught by Heinrich et al., to have utilized a DC voltage to attract impurities out of a plasma and to have superimposed a DC voltage over an RF voltage to an electrode as taught by O'Donnell because it is desired to form a plasma in a plasma apparatus.

In response, Appellants assert several arguments in support of their position that the Examiner has not established proper motivation for the proposed combination of

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references so as to set forth a prima facie case of obviousness. After careful review of the applied prior art in light of the arguments of record, we are in agreement with Appellants' position as stated in the Briefs. 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. In re Fritch, 972 F.2d 1260, 1266 n.14, 23 USPQ2d 1780, 1783-84 n.14 (Fed. Cir. 1992).

It is our view that, while a showing of proper motivation does not require that a combination of prior art teachings be made for the same reason as Appellants to achieve the claimed invention, we can find no motivation for the skilled artisan to apply the DC voltage electrode biasing feature of Walker to the plasma chamber structure of Heinrich. There is nothing in the disclosure of Heinrich to indicate that impurity removal, the problem addressed by Walker, was ever a concern. It is our opinion that the only basis for applying the teachings of Walker to the plasma chamber structure of Heinrich comes from an improper attempt to reconstruct Appellants' invention in hindsight.

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With regard to the O'Donnell reference, it is apparent that this reference was applied by the Examiner solely to address the claimed feature of powering an electrode by superimposing a DC voltage upon an RF voltage. Our review of O'Donnell, however, reveals nothing which would overcome the deficiencies of Heinrich alone or in combination with Walker.

We are further of the opinion that even assuming, arguendo, that proper motivation were established for the Examiner's proposed combination, the resulting system would fall far short of meeting the specific requirements of the claims on appeal. The appealed claims set forth a specific configuration and biasing arrangement for the control and reference electrodes. The Examiner has provided no indication as to how and where the skilled artisan might have found it obvious to modify the teachings of Heinrich with Walker and O'Donnell to arrive at the specifics of the language of the various appealed claims. In order for us to sustain the Examiner's rejection under 35 U.S.C. § 103, we would need to resort to speculation or unfounded assumptions or rationales to supply deficiencies in the factual basis of the rejection before us. In re Warner, 379 F.2d 1011, 1017, 154 USPQ 173,

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178 (CCPA 1967), cert. denied, 389 U.S. 1057 (1968), reh'g denied, 390 U.S. 1000 (1968). Accordingly, since the Examiner has not established a prima facie case of obviousness, the rejection of independent claims 1, 12, 19, and 22, and claims 3-5, 8-11, 13, 14, 16, 17, 20, 21, 23-27, and 32-37 dependent thereon, over the combination of Heinrich, Walker, and O'Donnell is not sustained.

Turning to a consideration of the Examiner's 35 U.S.C. § 103 rejection of dependent claims 6, 7, 18, and 28-31 in which the Harada and Mizutani references are added to the combination of Heinrich, Walker, and O'Donnell, we do not sustain this rejection as well. It is apparent from the Examiner's analysis (Answer, pages 7 and 8) that Harada and Mizutani are relied on solely to address the claimed segmented structure of the control electrodes. We find nothing, however, in the disclosures of Harada or Mizutani which would overcome the innate deficiencies of Heinrich, Walker, and O'Donnell discussed supra.

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In conclusion, since the Examiner has not established a prima facie case of obviousness, the 35 U.S.C. § 103 rejection of independent claims 1, 12, 19, and 22 and claims 3-11, 13, 14, 16-18, 20, 21, and 23-37 dependent thereon, cannot be sustained. Therefore, the decision of the Examiner rejecting claims 1, 3-14, and 16-37 is reversed.

REVERSED

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KENNETH W. HAIRSTON)	
Administrative Patent Judge)	
)	
)	
)	BOARD OF PATENT
ERROL A. KRASS))
Administrative Patent Judge)	APPEALS AND
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)	INTERFERENCES
)	
JOSEPH F. RUGGIERO))
Administrative Patent Judge)	

JFR:hh

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FITCH, EVEN, TABIN & FLANNERY
Suite 900
135 South LaSalle Street
Chicago, IL 60603