Trials@uspto.gov
571-272-7822

Paper 59
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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

THE GILLETTE COMPANY, FUJITSU SEMICONDUCTOR LIMITED, and FUJITSU SEMICONDUCTOR AMERICA, INC.,
Petitioner,

v.

ZOND, LLC,
Patent Owner.

Case IPR2014-00578[1]
Patent 6,896,775 B2

Before KEVIN F. TURNER, DEBRA K. STEPHENS, JONI Y. CHANG, SUSAN L.C. MITCHELL, and JENNIFER MEYER CHAGNON, *Administrative Patent Judges*.

TURNER, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
Inter Partes Review
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

The Gillette Company ("Gillette") filed a Petition requesting *inter partes* review of claims 1–29 of U.S. Patent No. 6,896,775 B2 ("the '775

[1] IPR2014-01494 has been joined with IPR2014-00578.

Patent"). Paper 9 ("Pet.")[2]. Patent Owner Zond, LLC ("Zond") filed a Preliminary Response. Paper 11 ("Prelim. Resp."). We instituted the instant trial on October 15, 2014, pursuant to 35 U.S.C. § 314. Paper 13 ("Dec.").

Subsequent to institution, we granted a revised Motion for Joinder filed by Taiwan Semiconductor Manufacturing Company, Ltd., TSMC North America Corp., (collectively, "TSMC"), Fujitsu Semiconductor Limited, and Fujitsu Semiconductor America, Inc. (collectively, "Fujitsu"), joining Case IPR2014-01494 with the instant trial (Paper 17), and also granted a Joint Motion to Terminate with respect to TSMC (Paper 46). Zond filed a Response (Paper 39 ("PO Resp.")), and Gillette[3] filed a Reply (Paper 48 ("Reply")). Oral hearing[4] was held on May 26, 2015, and a transcript of the hearing was entered into the record. Paper 58 ("Tr.").

We have jurisdiction under 35 U.S.C. § 6(c). This Final Written Decision is entered pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons set forth below, we determine that Gillette has shown, by a preponderance of the evidence, that claims 1–29 of the '775 Patent are unpatentable under 35 U.S.C. § 103(a).

A. Related District Court Proceedings

The parties indicate that the '775 Patent was asserted in *Zond, LLC v. Advanced Micro Devices, Inc.*, No.1:13-cv-11567-DJC (D. Mass.), and

[2] We refer generally to the Revised Petition filed in response to defects noted in the Notice of Filing Date Accorded the Petition (Paper 4).
[3] We refer to Gillette and Fujitsu collectively as "Gillette" herein.
[4] The hearings for this review and IPR2014-00604 were consolidated.

identify other proceedings in which Zond asserted the '775 Patent. Pet. 1; Paper 7.

B. The '775 Patent

The '775 Patent relates to methods and apparatus for generating magnetically enhanced plasma. Ex. 1001, Abs. At the time of the invention, sputtering was a well-known technique for depositing films on semiconductor substrates. *Id*. at 1:14–25. The '775 Patent indicates that prior art magnetron sputtering systems deposit films having low uniformity and poor target utilization (the target material erodes in a non-uniform manner). *Id*. at 3:34–44. To address these problems, the '775 Patent discloses that increasing the power applied between the target and anode can increase the uniformity and density in the plasma. *Id*. at 3:45–56. However, increasing the power also "can increase the probability of generating an electrical breakdown condition leading to an undesirable electrical discharge (an electrical arc) in the chamber 104." *Id*.

According to the '775 Patent, forming a weakly-ionized plasma substantially eliminates the probability of establishing a breakdown condition in the chamber when high-power pulses are applied between the cathode and anode. *Id*. at 7:4–15. Once the weakly-ionized plasma is formed, high-power pulses are applied between the cathode and anode to generate a strongly-ionized plasma from the weakly-ionized plasma. *Id*. at 7:16–24. The '775 Patent also discloses that the provision of the feed gas to the plasma allows for homogeneous diffusion of the feed gas in the

weakly-ionized plasma and allows for the creation of a highly uniform strongly-ionized plasma. *Id*. at 5:59–67.

C. Illustrative Claims

Of the challenged claims, claims 1 and 15 are the only independent claims. Claims 2–14 and 16–29 depend, directly or indirectly, from claims 1 or 15. Claims 1 and 15, reproduced below, are illustrative:

> 1. A magnetically enhanced plasma processing apparatus comprising:
>
> an anode;
>
> a cathode that is positioned adjacent to the anode and forming a gap there between;
>
> an ionization source that generates a weakly-ionized plasma proximate to the cathode;
>
> a magnet that is positioned to generate a magnetic field proximate to the weakly-ionized plasma, the magnetic field substantially trapping electrons in the weakly-ionized plasma proximate to the cathode;
>
> a power supply that produces an electric field across the gap, the electric field generating excited atoms in the weakly-ionized plasma and generating secondary electrons from the cathode, the secondary electrons ionizing the excited atoms, thereby creating a strongly-ionized plasma comprising a plurality of ions; and
>
> a voltage supply that applies a bias voltage to a substrate that is positioned proximate to the cathode, the bias voltage causing ions in the plurality of ions to impact a surface of the substrate in a manner that causes etching of the surface of the substrate.

> 15. A method of magnetically enhanced plasma processing, the method comprising:
>
> ionizing a feed gas to generate a weakly-ionized plasma proximate to a cathode;
>
> generating a magnetic field proximate to the weakly-ionized plasma, the magnetic field substantially trapping electrons in the weakly-ionized plasma proximate to the cathode;
>
> applying an electric field across the weakly-ionized plasma that excites atoms in the weakly-ionized plasma and that generates secondary electrons from the cathode, the secondary electrons ionizing the excited atoms, thereby creating a strongly-ionized plasma comprising a plurality of ions; and
>
> applying a bias voltage to a substrate that is positioned proximate to the cathode, the bias voltage causing ions in the plurality of ions to impact a surface of the substrate in a manner that causes etching of the surface of the substrate.

Ex. 1001, 21:45–67, 22:46–64.

D. Prior Art Relied Upon

Based on the instituted grounds, Gillette relies upon the following prior art references:

Lantsman	US 6,190,512	Feb. 20, 2001	(Ex. 1025)
Wang	US 6,413,382	July 2, 2002	(Ex. 1008)
Kouznetsov	US 2005/0092596	May 5, 2005	(Ex. 1004)

D.V. Mozgrin, et al., *High-Current Low-Pressure Quasi-Stationary Discharge in a Magnetic Field: Experimental Research*, 21 PLASMA PHYSICS REPORTS 400–409 (1995) (Ex. 1002) (hereinafter "Mozgrin").

A. A. Kudryavtsev and V.N. Skrebov, *Ionization Relaxation in a Plasma Produced by a Pulsed Inert-Gas Discharge*, 28(1) SOV. PHYS. TECH. PHYS. 30–35 (Jan. 1983) (Ex. 1003) (hereinafter "Kudryavtsev").

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