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Paper 42
Entered: September 29, 2015

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

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

v.

ZOND, LLC,
Patent Owner.

Case IPR2014-00726[1]
Patent 6,896,773 B2

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

CHANG, *Administrative Patent Judge*.

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

[1] Case IPR2014-01481 has been joined with the instant *inter partes* review.

I. INTRODUCTION

The Gillette Company ("Gillette") filed a Petition requesting an *inter partes* review of claims 21–33 and 40 of U.S. Patent No. 6,896,773 B2 (Ex. 1101, "the '773 patent"). Paper 3 ("Pet."). Patent Owner Zond, LLC ("Zond") filed a Preliminary Response. Paper 7 ("Prelim. Resp."). Upon consideration of the Petition and Preliminary Response, we instituted the instant trial on October 10, 2014, pursuant to 35 U.S.C. § 314. Paper 8 ("Dec.").

Subsequent to institution, we granted the 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 IPR2014-01481 with the instant trial (Paper 15), and also granted a Joint Motion to Terminate with respect to TSMC (Paper 31).[2] Zond filed a Response (Paper 27 ("PO Resp.")), and Gillette filed a Reply (Paper 33 ("Reply")). Oral hearing[3] was held on June 16, 2015, and a transcript of the hearing was entered into the record. Paper 41 ("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 21–33 and 40 of the '773 patent are unpatentable under 35 U.S.C. § 103(a).

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[2] In this Decision, we refer to The Gillette Company (the original Petitioner) and Fujitsu as "Gillette," for efficiency.

[3] The oral arguments for the instant review and Case IPR2014-00580 were consolidated.

A. Related District Court Proceedings

Gillette indicates the '773 patent was asserted in *Zond, LLC v. The Gillette Co.*, No.1:13-CV-11567-DJC (D. Mass.), and identifies other proceedings in which Zond asserted the claims of the '773 patent. Pet. 1.

B. The '773 Patent

The '773 patent relates to a method and an apparatus for high-deposition sputtering. Ex. 1101, Abs. At the time of the invention, sputtering was a well-known technique for depositing films on semiconductor substrates. *Id*. at 1:5–6. According to the '773 patent, conventional magnetron sputtering systems deposit films with relatively low uniformity. *Id*. at 1:53–54. Although film uniformity can be increased by mechanically moving the substrate and/or magnetron, the '773 patent indicates such systems are relatively complex and expensive to implement. *Id*. at 1:54–57. The'773 patent states that conventional magnetron sputtering systems also have relatively poor target utilization (how uniformly the target material erodes during sputtering) and a relatively low deposition rate (the amount of material deposited on the substrate per unit of time). *Id*. at 1:57–66. To address these issues, the '773 patent discloses a plasma sputtering apparatus that creates a strongly-ionized plasma from a weakly-ionized plasma using a pulsed power supply. *Id*. at Abs. According to the '773 patent, "[t]he strongly-ionized plasma includes a first plurality of ions that impact the sputtering target to generate sufficient thermal energy in the sputtering target to cause a sputtering yield of the sputtering target to be non-linearly related to a temperature of the sputtering target." *Id*.

C. Illustrative Claims

Of the challenged claims, claims 21 and 40 are independent. Claims 22–33 depend directly from claim 21. Claims 21 and 40, reproduced below, are illustrative:

> 21. A method for high deposition rate sputtering, the method comprising:
>
> ionizing a feed gas to generate a weakly-ionized plasma proximate to a cathode assembly that comprises a sputtering target; and
>
> applying a voltage pulse to the cathode assembly to generate a strongly-ionized plasma from the weakly-ionized plasma, an amplitude and a rise time of the voltage pulse being chosen so that ions in the strongly-ionized plasma generate sufficient thermal energy in the sputtering target to cause a sputtering yield to be non-linearly related to a temperature of the sputtering target, thereby increasing a deposition rate of the sputtering.
>
> 40. A sputtering source comprising:
>
> means for ionizing a feed gas to generate a weakly-ionized plasma; and
>
> means for increasing the density of the weakly-ionized plasma to generate a strongly-ionized plasma having a density of ions that generate sufficient thermal energy in the sputtering target to cause a sputtering yield to be non-linearly related to a temperature of the sputtering target.

Ex. 1101, 22:21–33, 24:17–25.

D. Prior Art Relied Upon

Gillette relies upon the following prior art references:

Wang	US 6,413,382 B1	July 2, 2002	(Ex. 1103)
Lantsman	US 6,190,512 B1	Feb. 20, 2001	(Ex. 1108)
Kawamata	US 5,958,155	Sept. 28, 1999	(Ex. 1109)

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. 1102) ("Mozgrin").

Interaction of Low-Temperature Plasma With Condensed Matter, Gas, and Electromagnetic Field in (III) ENCYCLOPEDIA OF LOW-TEMPERATURE PLASMA (V.E. Fortov ed., 2000) (Ex. 1104) ("Fortov").[4]

A.A. Kudryavtsev and V.N. Skrebov, *Ionization Relaxation in a Plasma Produced by a Pulsed Inert-Gas Discharge*, 28 SOV. PHYS. TECH. PHYS. 30–35 (Jan. 1983) (Ex. 1106) ("Kudryavtsev").

W. Ehrenberg and D.J. Gibbons, ELECTRON BOMBARDMENT INDUCED CONDUCTIVITY AND ITS APPLICATIONS, 8–122 (1981) (Ex. 1125) ("Ehrenberg").

E. Grounds of Unpatentability

We instituted the instant trial based on the following grounds of unpatentability (Dec. 39):

Claim(s)	Basis	References
21, 22, 26–33, and 40	§ 103	Mozgrin and Fortov
24 and 25	§ 103	Mozgrin, Fortov, and Lantsman
23	§ 103	Mozgrin, Fortov, and Kudryavtsev

[4] Fortov is a Russian-language reference (Ex. 1110). The citations to Fortov are to the certified English-language translation submitted by Gillette (Ex. 1104).

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