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Paper 10
Entered: June 9, 2017

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MICRON TECHNOLOGY, INC., INTEL CORPORATION, and GLOBALFOUNDRIES U.S., INC.,
Petitioners,

v.

DANIEL L. FLAMM,
Patent Owner.

Case IPR2017-00391
Patent 6,017,221

Before CHRISTOPHER L. CRUMBLEY, JO-ANNE M. KOKOSKI, and KIMBERLY McGRAW, *Administrative Patent Judges.*

KOKOSKI, *Administrative Patent Judge.*

DECISION
Institution of *Inter Partes* Review
37 C.F.R. § 42.108

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I. INTRODUCTION

Micron Technology, Inc., Intel Corporation, and GLOBALFOUNDRIES U.S., Inc. (collectively, "Petitioner") filed a Petition ("Pet.") to institute an *inter partes* review of claims 1–7 of U.S. Patent No. 6,017,221 ("the '221 patent," Ex. 1001). Paper 1. Daniel L. Flamm ("Patent Owner") filed a Preliminary Response ("Prelim. Resp."). Paper 9. We have jurisdiction under 35 U.S.C. § 314.

Upon consideration of the Petition and Preliminary Response, we determine that Petitioner has established a reasonable likelihood of prevailing with respect to the unpatentability of claims 1–7 of the '221 patent. Accordingly, we institute an *inter partes* review of those claims.

A. Related Proceedings

Petitioner indicates that the '221 patent is "at issue in five related patent infringement actions, in which [Patent Owner] sued Petitioners and other defendants, in the Northern District of California, Case Nos. 5:16-cv-01578-BLF; 5:16-cv-01579-BLF; 5:16-cv-01580-BLF; 5:16-cv-02252-BLF." Pet. 3; *see* Paper 7, 2. The '221 patent previously was the subject of IPR2015-01767 (terminated on December 15, 2016 at the joint request of the parties before a Final Written Decision was entered). *Lam Research Corp. v. Daniel L. Flamm*, Case IPR2015-01767, slip. op. at 3–6 (PTAB Dec. 15, 2016) (Paper 36).

B. The '221 Patent

The '221 patent, titled "Process Depending on Plasma Discharges Sustained by Inductive Coupling," is directed to a process for fabricating a product using plasma discharge. Ex. 1001, 6:14–16. The process "relies upon the control of the instantaneous plasma AC potential to selectively

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control a variety of plasma characteristics," such as "the amount of neutral species, the amount of charged species, overall plasma potential, the spatial extent and distribution of plasma density, the distribution of electrical current, and others." *Id.* at 6:16–22. The process "can be used in applications including chemical dry etching (e.g., stripping, etc.), ion-enhanced etching, plasma immersion ion implantation, chemical vapor deposition and material growth, and others." *Id.* at 6:22–26.

The process comprises subjecting a substrate to a composition of entities, where "[a]t least one of the entities emanates from a species generated by a gaseous discharge excited by a high frequency field in which the vector sum of [the] phase and anti-phase capacitive coupled voltages (e.g., AC plasma voltage) from the inductive coupling structure are substantially balance[d]." *Id.* at 6:31–37. According to the '221 patent, "[t]his process provides for a technique that is substantially free from stray or parasitic capacitive coupling from the plasma source to chamber bodies (e.g., substrate, walls, etc.) at or near ground potential." *Id.* at 6:37–41.

The '221 patent also describes a plasma discharge apparatus that includes a plasma source and a plasma applicator. *Id.* at 7:26–28. "A wave adjustment circuit (e.g., RLC circuit, coil, transmission line, etc.) is operably coupled to the plasma applicator" and "can selectively adjust phase and anti-phase potentials of the plasma from an rf power supply." *Id.* at 7:30–34.

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Figure 2A of the ’221 patent is reproduced below.

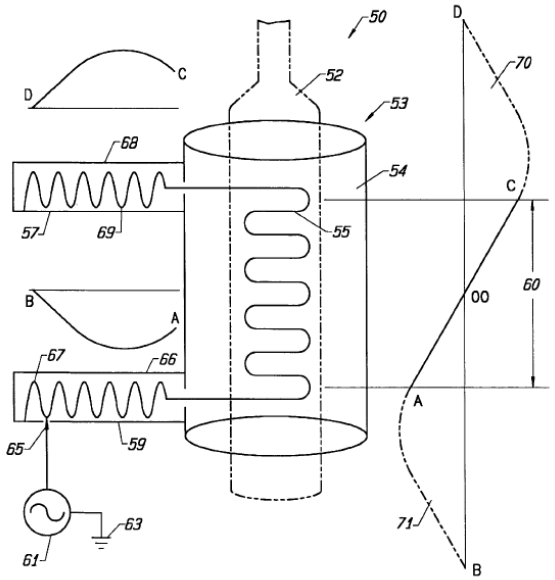

FIG. 2A

Figure 2A is a simplified configuration using wave adjustment circuits. *Id.* at 7:46–47. Embodiment 50 includes discharge tube 52, inductive applicator 55, exterior shield 54, upper wave adjustment circuit 57, lower wave adjustment circuit 59, plasma source region 60, and rf power supply 61. *Id.* at 10:3–8. “In this embodiment, the wave adjustment circuits are adjusted to provide substantially zero AC voltage at one point on the inductive coil (refer to point 00 in FIG. 2A),” providing “substantially equal phase 70 and anti-phase 71 voltage distributions in directions about this point (refer to 00-A and 00-C in FIG. 2A)” and “substantially equal capacitance coupling to the plasma from physical inductor elements (00-C) and (00-A), carrying the phase and anti-phase potentials.” *Id.* at 10:14–22. According to the ’221 patent, “[s]ince the capacitive current increases monotonically with the magnitude of the difference of peak phase and anti-phase voltages, which occur at points A and C in FIG. 2A, this coupling can be lessened by

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reducing this voltage difference," which is achieved by way of wave adjustment circuits 57 and 59. *Id.* at 10:31–37.

C. Challenged Claims

Petitioner challenges claims 1–7 of the '221 patent. Claim 1, the only independent claim, is representative, and is reproduced below.

> 1. A process for fabricating a product using a plasma source, said process comprising the steps of subjecting a substrate to entities, at least one of said entities emanating from a gaseous discharge excited by a high frequency field from an inductive coupling structure in which a phase portion and an anti-phase portion of capacitive currents coupled from the inductive coupling structure are selectively balanced;
>
> wherein said inductive coupling structure is adjusted using a wave adjustment circuit, said wave adjustment circuit adjusting the phase portion and the anti-phase portion of the capacitively coupled currents.

Ex. 1001, 22:58–23:2.

D. The Prior Art

Petitioner relies on the following prior art references:

Reference	Description	Date	Exhibit No.
Collins	US 5,065,118	Nov. 12, 1991	1008
Dible	US 5,573,595	Nov. 12, 1996	1007
Qian	US 5,683,539	Nov. 4, 1997	1009
Hanawa	US 5,688,357	Nov. 18, 1997	1010
Lieberman	*Design of High-Density Plasma Sources for Materials Processing*, Plasma Sources for Thin Film Deposition and Etching (Physics of Thin Films Vol. 18, pp. 1–119)	Aug. 18, 1994	1006

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