

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MOSES LAKE INDUSTRIES, INC.
Petitioner

v.

ENTHONE, INC.
Patent Owner

Case IPR2014-00243
Patent 7,303,992 B2

Before KEVIN F. TURNER, SHERIDAN K. SNEDDEN, and
JEREMY M. PLENZLER, *Administrative Patent Judges*.

TURNER, *Administrative Patent Judge*

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

I. INTRODUCTION

Moses Lake Industries, Inc. (hereinafter, “MLI”) filed a petition (Paper 1, “Pet.”) requesting *inter partes* review of claims 1-28 of U.S. Patent No. 7,303,992 B2 (“the ’992 Patent”). Patent Owner, Enthone, Inc. (“Enthone”), filed a Preliminary Response (Paper 5, “Prelim. Resp.”). We have jurisdiction under 35 U.S.C. § 314.

The standard for instituting an *inter partes* review is set forth in 35 U.S.C. § 314(a), which provides:

THRESHOLD.—The Director may not authorize an *inter partes* review to be instituted unless the Director determines that the information presented in the petition filed under section 311 and any response filed under section 313 shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.

We conclude that the information presented in the Petition does not demonstrate that there is a reasonable likelihood that MLI will prevail in challenging claims 1-28 as unpatentable under 35 U.S.C. §§ 102 or 103. For the reasons that follow, the Petition is *denied*.

A. *Related Matters*

MLI indicates that the '992 Patent was asserted in *Enthone, Inc. v. Moses Lake Industries, Inc.*, Case No. 1:13-cv-1054, in the U.S. District Court for the Northern District of New York. Pet. 1. U.S. Patent No. 7,815,786 B2, which issued from a divisional application based on the patent application that issued as the '992 Patent, was also asserted in that civil action. U.S. Patent No. 7,815,786 is also the subject of a petition requesting *inter partes* review in Case IPR2014-00246, which is being decided concurrently.

B. *The '992 Patent (Ex. 1001)*

The '992 Patent relates to a method for electrolytically plating copper onto a substrate having submicron-sized interconnect features using a source of copper ions and suppressor compound having polyether groups. Ex. 1001, Abstract. The '992 Patent discusses known systems that rely on so-called "superfilling" or "bottom-up growth" to deposit copper into high aspect ratio features, where the superfilling involves filling a feature from the bottom up, rather than at an equal rate on all its surfaces, to avoid seams and pinching off that can result in voiding. *Id.* at 2:6-11. The '992 Patent discloses a suppressor compound formed from a combination of propylene oxide (PO) repeat units and ethylene oxide (EO) repeat units present in a PO:EO ratio between about 1:9 and about 9:1 and bonded to a nitrogen-containing species, wherein the molecular weight of the suppressor compound is between about 1000 and about 30,000. *Id.* at 3:25-30.

C. *Challenged Claims*

Independent claims 1, 2, and 17, as well as dependent claims 3-16 and 18-28, are challenged by MLI in its Petition. Claims 1 and 17 are illustrative and are reproduced below, with emphasis added:

1. A method for electroplating a copper deposit onto a semiconductor integrated circuit device substrate with electrical interconnect features including submicron-sized features having bottoms, sidewalls, and top openings, the method comprising:

immersing the semiconductor integrated circuit device substrate including submicron-sized features having bottoms, sidewalls, and top openings wherein said submicron-sized features include high aspect ratio features having dimensions such that the high aspect ratio features have aspect ratios of at least about 3:1 into an electrolytic plating composition comprising a source of Cu ions in an amount sufficient to electrolytically deposit Cu onto the substrate and into the electrical interconnect features and *a polyether suppressor compound comprising a combination of propylene oxide (PO) repeat units and ethylene oxide (EO) repeat units present in a PO:EO ratio between about 1:9 and about 9:1 and bonded to a nitrogen-containing species, wherein the molecular weight of the suppressor compound is between about 1000 and about 30,000; and*

supplying electrical current to the electrolytic composition to deposit Cu onto the substrate and *superfill the submicron-sized features by rapid bottom-up deposition at a rate of growth in the vertical direction which is greater than a rate of growth in the horizontal direction.*

17. A method for electroplating a copper deposit onto a semiconductor integrated circuit device substrate with electrical interconnect features including submicron-sized features having bottoms, sidewalls, and top openings, the method comprising:

immersing the semiconductor integrated circuit device substrate into the electrolytic plating composition comprising a source of Cu ions in an amount sufficient to electrolytically deposit Cu onto the substrate and into the electrical interconnect features, an accelerator, and a suppressor; and

supplying electrical current to the electrolytic composition to deposit Cu onto the substrate and *superfill the submicron-sized features by rapid bottom-up deposition at a vertical Cu deposition growth rate in features from the bottoms of the features to the top openings of the features which is greater than 15 times faster than a field deposition growth rate on substrate surfaces outside the features.*

D. Prior Art Relied Upon

MLI relies upon the following prior art references:

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|----------|--------------------|---------------|------------|
| Hagiwara | US 6,800,188 B2 | Oct. 5, 2004 | (Ex. 1006) |
| Wang | US 7,128,822 B2 | Oct. 31, 2006 | (Ex. 1007) |
| Mikkola | US 6,649,038 B2 | Nov. 18, 2003 | (Ex. 1008) |
| Martyak | US 2004/0045832 A1 | Mar. 11, 2004 | (Ex. 1009) |
| Ishikawa | US 6,518,182 B1 | Feb. 11, 2003 | (Ex. 1010) |
| Dubin | US 6,491,806 B1 | Dec. 10, 2002 | (Ex. 1011) |
| Mikkola | US 2004/0217009 A1 | Nov. 4, 2004 | (Ex. 1013) |
| Brown | US 2004/0138075 A1 | Jul. 15, 2004 | (Ex. 1016) |
| Stridde | US 6,420,311 B1 | Jul. 16, 2002 | (Ex. 1017) |
| Nakada | US 2008/0264798 A1 | Oct. 30, 2008 | (Ex. 1018) |
| Eckles | US 4,384,930 | May 24, 1983 | (Ex. 1019) |
| Willis | US 4,347,108 | Aug. 31, 1982 | (Ex. 1020) |

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