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Paper No. 27
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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SPTS TECHNOLOGIES LTD.,
Petitioner,

v.

PLASMA-THERM LLC,
Patent Owner.

Case IPR2017-01674
Patent 8,802,545 B2

Before WILLIAM V. SAINDON, ELIZABETH M. ROESEL, and AMANDA F. WIEKER, *Administrative Patent Judges*.

WIEKER, *Administrative Patent Judge*.

FINAL WRITTEN DECISION

Finding All Challenged Claims Not Unpatentable
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73
and
Dismissing Patent Owner's Contingent Motion to Amend
35 U.S.C. § 316(d) and 37 C.F.R. § 42.121

I. INTRODUCTION

A. Background

SPTS Technologies Limited ("Petitioner") filed a Petition requesting an *inter partes* review of claims 1, 2, 4, and 5 ("challenged claims") of U.S. Patent No. 8,802,545 B2 (Ex. 1001, "the '545 patent"). Paper 1 ("Pet."). Plasma-Therm LLC ("Patent Owner") filed a Preliminary Response. Paper 6 ("Prelim. Resp."). We instituted an *inter partes* review of challenged claims 1, 2, 4, and 5 on the sole asserted ground of unpatentability, pursuant to 35 U.S.C. § 314. Paper 7 ("Dec. on Inst.").

After institution, Patent Owner filed a Response (Paper 15, "PO Resp.") to the Petition, Petitioner filed a Reply (Paper 18, "Pet. Reply"), and Patent Owner filed a Sur-Reply (Paper 22, "PO Sur-Reply"), with our authorization.

With its Patent Owner Response, Patent Owner also filed a Contingent Motion to Amend (Paper 16, "MTA"), Petitioner filed an Opposition to the Motion (Paper 19, "Opp. MTA"), and Patent Owner filed a Reply (Paper 20, "Reply MTA").

An oral hearing was held on October 10, 2018, and a transcript of the hearing is included in the record. Paper 26 ("Tr.").

We issue this Final Written Decision pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons set forth below, we determine that Petitioner has not shown by a preponderance of the evidence that challenged claims 1, 2, 4, and 5 of the '545 patent are unpatentable. Accordingly, we dismiss as moot Patent Owner's Contingent Motion to Amend.

B. Related Proceedings

The parties identify no related litigation matters pursuant to 37 C.F.R. § 42.8(b)(2). Pet. 3–4; Paper 3, 1.

The parties identify the following PTAB proceedings related to "sibling patents" of the '545 patent: IPR2017-01314 and IPR2107-01457. Pet. 3–4; Paper 3, 1.

C. The '545 Patent

The '545 patent is titled "Method and Apparatus for Plasma Dicing a Semi-Conductor Wafer" and was issued August 12, 2014 from U.S. Application No. 13/412,119, filed March 5, 2012. Ex. 1001, (21), (22), (45), (54). The '545 patent discloses a method for plasma dicing a semiconductor wafer. *Id.* at (54). Dicing is a process by which individual semiconductor devices (die or chips) are separated from each other after they have been fabricated on a substrate, such as a silicon wafer. *Id.* at 1:23–26, 2:12–14. Dicing can be carried out by mechanical means, such as breaking along scribe lines or sawing, or by plasma etching. *Id.* at 2:14–20, 2:45–47. According to the '545 patent, plasma dicing has a number of benefits over mechanical dicing, but current plasma etching equipment is not suitable for processing substrates that are "fixtured for dicing." *Id.* at 2:55–63, 3:1–16. The '545 patent aims to provide a plasma etching method that is "compatible with the established wafer dicing technique of handling a substrate mounted on tape and supported in a frame." *Id.* at 3:44–46.

Figure 3 of the ’545 patent is reproduced below:

Figure 3

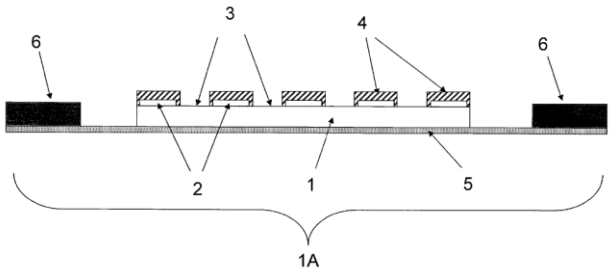

Figure 3 of the ’545 patent is a cross-sectional view of work piece 1A, including substrate 1 adhered to tape 5, which is mounted in rigid frame 6. Ex. 1001, 9:27–29. Substrate 1 has device structures 2 separated by street areas 3. *Id.* at 8:62–9:7; *see also id.* at Fig. 1. Device structures 2 are covered with protective material 4, such as photoresist, while street areas 3 remain unprotected. *Id.* During processing, unprotected street areas 3 of substrate 1 are etched away using a reactive plasma etch process to separate devices 2 into individual die. *Id.* at 9:63–66.

More specifically, the ’545 patent discloses an exemplary method for separating devices 2 into individual die. *Id.* at 7:6–38. The method includes first and second plasma etch processes, each of which can be a time division multiplexed (“TDM”) etch process. *Id.* at 7:16–32. According to the ’545 patent, a “Bosch or TDM” process “alternates a high rate silicon etch step with a passivation step to control the etch sidewall, [and] is commonly used to etch deep features into silicon.” *Id.* at 1:56–59. In the first plasma etch process, a “work piece is exposed to a first plasma etch process using a first etchant gas.” *Id.* at 7:16–17; *see also id.* at 4:11–20. This first plasma etch process “terminate[s] after the die are singulated . . . using a standard endpoint technique.” *Id.* at 7:21–25. The second plasma etch process uses a

second etchant gas and is "a lower etch rate process designed to reduce undercut." *Id.* at 7:25–28; *see also id.* at 13:41–67 (explaining that undercutting occurs at the substrate-insulator interface and affects performance of the singulated die).

D. Illustrative Claim

The '545 patent includes five claims, four of which are challenged. Claims 1, 4, and 5 are independent claims. Claim 1 is reproduced below, reformatted and with bracketed letters [A] – [L] added to correspond to Petitioner's identification of the claim elements:

> 1. [A] A method for plasma dicing a substrate, the method comprising:
>
> [B] providing the substrate having a top surface and a bottom surface, the top surface having a plurality of device structures and street areas;
>
> [C] applying photoresist to the plurality of device structures and the street areas on the top surface of the substrate;
>
> [D] patterning the applied photoresist to allow the street areas to be unprotected;
>
> [E] placing the bottom surface of the substrate on a carrier support to form a work piece;
>
> [F] loading the work piece into a plasma processing chamber;
>
> [G] exposing the unprotected street areas on the top surface of the substrate of the work piece in the plasma processing chamber to a first plasma time division multiplex process using a first etchant gas;
>
> [H] terminating the first plasma time division multiplex process at a time at which an interface between the bottom surface of the substrate and the carrier support is reached,
>
> [I] said time being determined using an endpoint technique; and

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