(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

**(19) World Intellectual Property Organization**
International Bureau

**(43) International Publication Date**
**1 February 2007 (01.02.2007)**

**PCT**

**(10) International Publication Number**
**WO 2007/014289 A3**

**(51) International Patent Classification:**
*H01L 21/8242* (2006.01)

**(21) International Application Number:** PCT/US2006/029166

**(22) International Filing Date:** 26 July 2006 (26.07.2006)

**(25) Filing Language:** English

**(26) Publication Language:** English

**(30) Priority Data:**
60/702,901 26 July 2005 (26.07.2005) US

**(71) Applicant** *(for all designated States except US)*: **APPLIED MATERIALS, INC.** [US/US]; 3050 Bowers Avenue, Santa Clara, California 95054 (US).

**(72) Inventor; and**
**(75) Inventor/Applicant** *(for US only)*: **MIMKEN, Victor** [US/US]; 1624 Hervey Street, Boise, Idaho 93705 (US).

**(74) Agents: PATTERSON, B. Todd** et al.; PATTERSON & SHERIDAN LLP, 3040 Post Oak Blvd., Suite 1500, Houston, Texas 77056 (US).

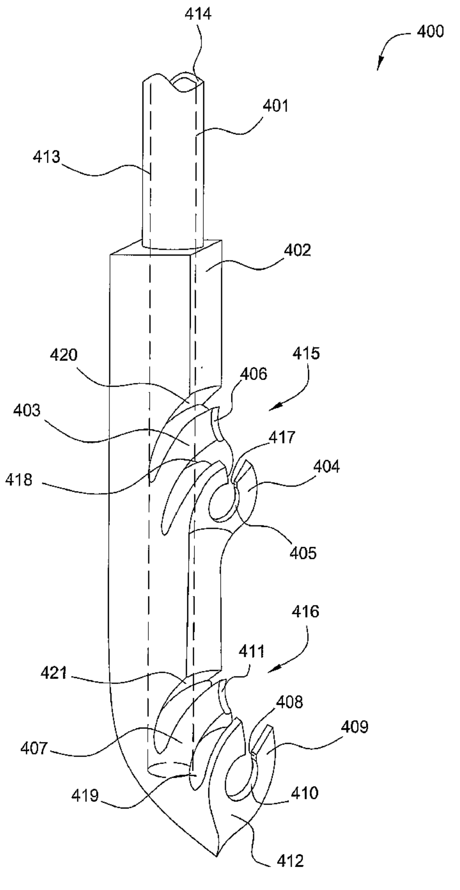
**(81) Designated States** *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

**(84) Designated States** *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

**Published:**
— *with international search report*

*[Continued on next page]*

# (54) Title: METHOD OF MINIMAL WAFER SUPPORT ON BEVEL EDGE OF WAFER



**(57) Abstract:** The present invention generally provides a method and apparatus for supporting and transferring a substrate in and out a wet cleaning chamber with minimal contact. One embodiment of the present invention provides an apparatus for support and transferring a substrate. The apparatus comprises a frame connected with an actuator configured to move the frame, two posts extending from the frame, two end effecter bodies, each of the two end effecter bodies formed on a respective one of the two posts, wherein the frame and the end effecter bodies are positioned on opposite ends of the two posts, and two contact assemblies extending from each of the two end effecter bodies, wherein the two contact assemblies are configured to receive and support the substrate near a bevel edge.

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

**(88) Date of publication of the international search report:**
7 September 2007

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

## INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 06/29166

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8): H01L 21/8242 (2007.01)
USPC: 438/243
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
USPC: 438/243

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC: 348/689

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

PubWEST(USPT,PGPB,EPAB,JPAB); DialogPRO; WIPO, EPO, CITESEER, Google patents, Google Scholar. Search Terms Used: semiconductor substrate end effector end effecter (inclined or bevel or incline or tilt) support transfer radial lateral tungsten carbide polymer chemical resistive coating actuator

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | US 6,726,848 B2 (Hansen et al.) 27 April 2004 (27.04.2004) entire document especially col 15, ln 64 - col 16, ln 64 and Figs. 7A to 7E | 1 - 20 |

☐ Further documents are listed in the continuation of Box C. ☐

| | | | |
|---|---|---|---|
| * | Special categories of cited documents: | "T" | later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention |
| "A" | document defining the general state of the art which is not considered to be of particular relevance | | |
| "E" | earlier application or patent but published on or after the international filing date | "X" | document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone |
| "L" | document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) | "Y" | document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art |
| "O" | document referring to an oral disclosure, use, exhibition or other means | | |
| "P" | document published prior to the international filing date but later than the priority date claimed | "&" | document member of the same patent family |

| | |
|---|---|
| Date of the actual completion of the international search<br>18 April 2007 (18.04.2007) | Date of mailing of the international search report<br>13 JUL 2007 |
| Name and mailing address of the ISA/US<br>Mail Stop PCT, Attn: ISA/US, Commissioner for Patents<br>P.O. Box 1450, Alexandria, Virginia 22313-1450<br>Facsimile No. 571-273-3201 | Authorized officer:<br>Lee W. Young<br>PCT Helpdesk: 571-272-4300<br>PCT OSP: 571-272-7774 |