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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
10 November 2005 (10.11.2005)

PCT

(10) International Publication Number
WO 2005/105356 A3

(51) International Patent Classification:
B23H 7/26 (2006.01) *C25F 3/30* (2006.01)
B23H 3/00 (2006.01) *C25F 7/00* (2006.01)
B23H 7/12 (2006.01) *H05K 3/07* (2006.01)

(21) International Application Number:
PCT/US2005/014040

(22) International Filing Date: 22 April 2005 (22.04.2005)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
10/830,894 23 April 2004 (23.04.2004) US

(71) Applicant *(for all designated States except US)*: **ASM NUTOOL, INC.** [US/US]; 3501 W. Warren Ave., Fremont, California 94538 (US).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: **BASOL, Bulent, M.** [US/US]; 3001 Maple Ave., Manhattan Beach, California 90266 (US). **TALIEH, Homayoun** [US/US]; 2211 Bentley Ridge Drive, San Jose, California 95138 (US).

(74) Agent: **ALTMAN, Daniel, E.**; Knobbe, Martens, Olson & Bear, LLP, 2040 Main Street, 14th Floor, Irvine, California 92614 (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, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, 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, 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*
— *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:
4 January 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.

(54) Title: ELECTROCHEMICAL MECHANICAL PLANARIZATION PROCESS AND APPARATUS

(57) Abstract: A system for electrochemical mechanical polishing of a conductive surface of a wafer is provided. The system includes a wafer holder to hold the wafer and a belt pad disposed proximate to the wafer to polish the conductive surface. Application of a potential difference between the belt pad and the conductive surface result in material removal from the conductive surface. Electrical contact to the surface is provided through either contacts embedded in the belt pad or contacts placed adjacent the belt pad.

WO 2005/105356 A3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US05/14040

A. CLASSIFICATION OF SUBJECT MATTER

IPC: **B23H 7/26**(2006.01),**3/00**(2006.01),**7/12**(2006.01)
C25F 3/30(2006.01),7/00(2006.01);H05K 3/07(2006.01)

USPC: 204/198,199,206,209,212,224R,224M,242;205/640,651,654,662,663

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)
U.S. : 204/198,199,206,209,212,224R,224M,242;205/640,651,654,662,663

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
EAST

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2002/0119286 A1(Chen et al.) 29 August 2002(29.28.2002), Figs. 2, 10A-D, 15A-B, paragraphs [0056-0064], [0108-0116], [0150-0151]	1-14
Y	US 5,807,165 (Uzoh et al) 15 September 1998 (15.9.1998), Figs. 7, 11b, 11b1, 11b2, 15, col. 5 line 42- col. 6 line 33)	1-14
Y	US 6,482,307 B2 (Ashjaee et al) 19 November 2002 (19.11.2002) Fig. 4, 14, 18-21, col. 9 line 64 - col. 10 line 43, col. 3 lines 35-57.	1-14

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

☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent published on or after the international filing date

"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)

"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

"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

"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

"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

"&" document member of the same patent family

Date of the actual completion of the international search
12 September 2006 (12.09.2006)

Date of mailing of the international search report
02 NOV 2006

Name and mailing address of the ISA/US
Mail Stop PCT, Attn: ISA/US
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
Facsimile No. (571) 273-3201

Authorized officer
Roy King
Jacqueline A. Whitfield
Special Project Asst.
Telephone No. (571) 272-1700

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US05/14040

BOX II. OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claim(s) 1-14, drawn to a method.

Group II, claim(s) 15-22, drawn to an apparatus.

The inventions listed as Groups I and II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: Chen teaches a method and an apparatus for electrochemically polishing a wafer (abstratct). The electrochemical polishing apparatus comprising a wafer holder(Fig. 2 #130), a polishing pad having a plurality of parallel embedded contacts(Fig. 10A #1004) capable of electrically connecting to an edge surface of the wafer(Fig. 10A-D), an electrode that touches the back surface of the polishing pad(Fig. 15 #1510), and means for providing relative motion between the wafer and the pad both linearly and rotationally (Fig. 2, #138, 212). Chen further teaches a plurality of openings in the polishing pad(Fig. 10C, #1010) and the polishing pad can be a belt pad(col. 7 lines 56-57). Chen further teaches the application of electrical potential to the electrode and the embedded contact(Figs. 10C, 15A-D). Regarding the claimed apparatus, the electropolishing apparatus of Chen reads on the claimed apparatus. Regarding the claimed electropolishing method, Chen teaches using a belt pad and the two sides of the belt pad are in proximity to the electrode(Figs. 15A-B). Chen also teaches contacting edge surface region of the wafer atone side of the belt pad to provide a wafer electrical connection, holding the wafer against the belt pad, applying potential between the electrode and the wafer and establishing relative motion between the belt pad and the wafer(Fig. 15B and corresponding sections of the specification). Therefore, Chen's electropolishing method reads on the claimed electropolishing method. The instant Groups I and II lack the same or corresponding special technical features, which invokes lack of unity.