

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
13 July 2000 (13.07.2000)

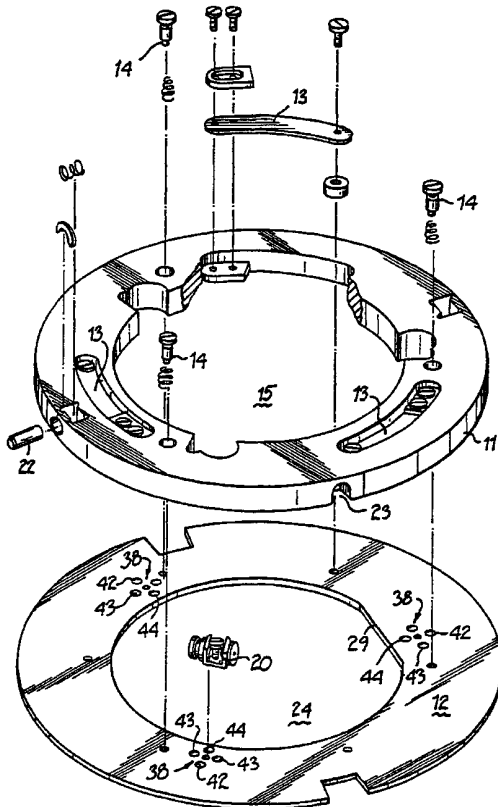
PCT

(10) International Publication Number
WO 00/41217 A3

- (51) International Patent Classification⁷: H01L 21/00 (71) Applicant (for JP only): TOKYO ELECTRON ARIZONA, INC. [US/US]; 2120 W. Guadalupe Road, Gilbert, AZ 85233-8205 (US).
- (21) International Application Number: PCT/US99/30673
- (22) International Filing Date: 22 December 1999 (22.12.1999) (72) Inventor: REISS, Ira; 1 Auburn Drive, New City, NY 10956 (US).
- (25) Filing Language: English (74) Agents: FREI, Donald, F. et al.; Wood, Herron & Evans, L.L.P., 2700 Carew Tower, Cincinnati, OH 45202 (US).
- (26) Publication Language: English (81) Designated States (national): DE, JP, KR.
- (30) Priority Data: 09/227,911 8 January 1999 (08.01.1999) US (84) Designated States (regional): European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).
- (71) Applicant: TOKYO ELECTRON LIMITED [JP/JP]; TBS Broadcast Center, 3-6, Akasaka 5-chome, Minato-ku, Tokyo 107 (JP). (84) Designated States (regional): European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).
- Published:
— With international search report.

[Continued on next page]

(54) Title: METHOD AND APPARATUS FOR PREVENTING WARP OF CLAMP RING USED FOR WAFER COATING APPARATUS



(57) Abstract: Warping of a clamping ring, by which a series of semiconductor wafers (17) is held to a wafer holder (10) for vapor deposition of coatings onto the wafers (17), is retarded by providing a clamping ring (12) formed of the material having a coefficient of thermal expansion that is approximately the same as or close to that of the coating material being deposited onto the wafers (17). Preferably, the clamping ring (12) is one having a generally circular opening (24) that is slightly smaller than the wafers (17) to be clamped and that has a flat edge (29) on the inner edge (18) of the ring (12) corresponding to the orientation flat found on the outer edge of an industry standard wafer (17), so that the ring (12) engages the wafer during clamping around the entire outer rim of the wafer (17).



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(88) Date of publication of the international search report:
22 February 2001

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 99/30673

A. CLASSIFICATION OF SUBJECT MATTER IPC 7 H01L21/00		
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) IPC 7 H01L C23C C30B B25B		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practical, search terms used) EPO-Internal, WPI Data, PAJ		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 997 677 A (WANG CHRISTINE A ET AL) 5 March 1991 (1991-03-05) abstract; figure 2 column 1, line 62 - line 68 column 2, line 35 -column 4, line 39 ---	1,3
A	EP 0 498 752 A (IBM) 12 August 1992 (1992-08-12) abstract; claims column 3, line 12 -column 4, line 53 ---	1,3
A	EP 0 725 426 A (APPLIED MATERIALS INC) 7 August 1996 (1996-08-07) column 1, line 3 - line 32 abstract; figures column 16, line 36 -column 17, line 6 --- -/--	4-7
<input checked="" type="checkbox"/> Further documents are listed in the continuation of box C. <input checked="" type="checkbox"/> Patent family members are listed in 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 document but 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 17 October 2000		Date of mailing of the international search report 22. NOV. 2000
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016		Authorized officer Hamdani, F

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 99/30673

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	PATENT ABSTRACTS OF JAPAN vol. 009, no. 185 (E-332), 31 July 1985 (1985-07-31) & JP 60 054444 A (OKI DENKI KOGYO KK), 28 March 1985 (1985-03-28) abstract -----	4
A	US 5 730 803 A (STEGER ROBERT ET AL) 24 March 1998 (1998-03-24) column 9, line 38 - line 54; figures column 9, line 6 - line 54; figures -----	8-13

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 99/30673

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- The additional search fees were accompanied by the applicant's protest.
- No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-3

A wafer holder clamping ring.

2. Claims: 4-7

A method of holding a wafer and deposition of gold and tantalum.

3. Claims: 8-13

A method of retarding clamping ring warping, sputtering system and method.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 99/30673

Patent document cited in search report	A	Publication date	Patent family member(s)	Publication date
US 4997677	A	05-03-1991	NONE	
EP 0498752	A	12-08-1992	US 5166856 A JP 2040505 C JP 4277648 A JP 7079122 B	24-11-1992 28-03-1996 02-10-1992 23-08-1995
EP 0725426	A	07-08-1996	US 5691876 A JP 8330405 A US 5908334 A	25-11-1997 13-12-1996 01-06-1999
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