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### **PCT**

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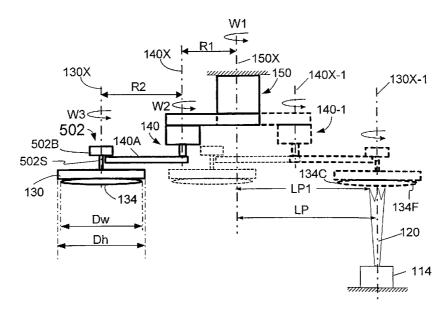
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[Continued on next page]

(54) Title: PLASMA PROCESSING COMPRISING THREE ROTATIONAL MOTIONS OF AN ARTICLE BEING PROCESSED



(57) Abstract: An article (134) which is being processed with plasma is moved during plasma processing so that the motion of the article comprises at least a first rotational motion, a second rotational motion, and a third rotational motion which occur simultaneously. The apparatus that moves the article comprises a first arm (150A) rotatable around a first axis, a second arm (140A) rotatably attached to the first arm and rotating the article around a second axis, and a rotational mechanism for inducing a rotational motion of the article in addition to, and simultaneously with, the rotation of the first and second arms.



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### INTERNATIONAL SEARCH REPORT

nal Application No PC17US 01/47391

A. CLASSIFICATION OF SUBJECT MATTER IPC 7 H01J37/32 H01J37/20 H01L21/00

C23C16/458

C23C16/513

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According to International Patent Classification (IPC) or to both national classification and IPC

### B. FIELDS SEARCHED

IPC 7

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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, PAJ, WPI Data, COMPENDEX, INSPEC

Category °	Citation of document, with indication, where appropriate, of t	the relevant passages	Relevant to claim No.			
Х	PATENT ABSTRACTS OF JAPAN vol. 013, no. 383 (E-811), 24 August 1989 (1989-08-24) & JP 01 133318 A (TOSHIBA MACK	H CO LTD),	1-5,7-9, 11-15,17			
Υ	25 May 1989 (1989-05-25) abstract; figures 1,2	.,	6,10,16, 18,19			
X	US 3 598 083 A (DORT ROBERT F 10 August 1971 (1971-08-10) abstract; figures 1-4 column 1, line 8-26 column 2, line 55 -column 5,		1-5,7-9, 11-15,17			
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X Furt	ther documents are listed in the continuation of box C.	χ Patent family members are listed	in annex.			
"A" docum consid "E" earlier filing of the citatio "O" docum which citatio "O" docum other "P" docum	ories 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 unent but published on or after the international which may throw doubts on priority claim(s) or ited to establish the publication date of another other special reason (as specified)  "Y" 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 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 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					
	e actual completion of the international search	Date of mailing of the international se	arch report			
	2 July 2002	10/07/2002				
			Authorized officer  Lang, T			

### INTERNATIONAL SEARCH REPORT

Interreportal Application No PCT/US 01/47391

	uation) DOCUMENTS CONSIDERED TO BE RELEVANT	15.
Category <sup>e</sup>	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
X	WO 99 16927 A (HANS MICHAEL; BALZERS HOCHVAKUUM AG (CH); ZAECH MARTIN (LI)) 8 April 1999 (1999-04-08) page 4, line 15 -page 5, line 26; figures 3,4 page 14, line 13-18 page 15, line 20 -page 16, line 16; figure 2	1-5, 7-10, 12-15,17
Y	US 3 853 091 A (CHRISTENSEN R ET AL) 10 December 1974 (1974-12-10) abstract; figures 1-3 column 2, line 1 -column 5, line 39	1–19
Y	WO 99 46805 A (TRUSI TECHNOLOGIES LLC) 16 September 1999 (1999-09-16) cited in the application abstract; figures 1-3 page 3, line 20 -page 9, line 10 & US 6 139 678 A (TRUSI TECHNOLOGIES LLC) 31 October 2000 (2000-10-31) abstract; figures 1-4 column 3, line 31 -column 9, line 34	1-19
Y	US 4 593 168 A (AMADA HARUO) 3 June 1986 (1986-06-03) column 6, line 5-15; figures 1,6	6,16,18
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### INTERNATIONAL SEARCH REPORT

Interruptial Application No PCT/US 01/47391

				I .	. 0 . , 50	01/4/391
Patent document cited in search report		Publication date		Patent family member(s)	·	Publication date
JP 01133318	Α	25-05-1989	NONE			
US 3598083	Α	10-08-1971	NONE			
WO 9916927	A	08-04-1999	WO EP JP	9916927 1025277 2001518559	A1	08-04-1999 09-08-2000 16-10-2001
US 3853091	A	10-12-1974	CA CH DE ES FR GB IT JP JP NL SE SE	1035255 606479 2448023 432508 2253270 1474927 1022786 945590 50087576 53025718 7415450 397435	A5 A1 A1 A B C A B B	25-07-1978 31-10-1978 05-06-1975 01-03-1977 27-06-1975 25-05-1977 20-04-1978 30-03-1979 14-07-1975 28-07-1978 05-06-1975 31-10-1977 04-06-1975
WO 9946805	A	16-09-1999	US JP WO	6168697 11284057 9946805	Α	02-01-2001 15-10-1999 16-09-1999
US 4593168	A	03-06-1986	JP JP DE FR GB HK IT SG US	1937434 6069027 59152618 3402630 2541510 2136258 288 1173301 87887 4667076	B A1 A1 A , B A B G	09-06-1995 31-08-1994 31-08-1984 23-08-1984 24-08-1984 12-09-1984 15-01-1988 24-06-1987 20-05-1988