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- (71) Applicant (for all designated States except US): APPLIED MATERIALS, INC. [US/US]; 3050 Bowers Avenue, Santa Clara, CA 95054 (US).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): WU, Dien-yeh [CN/US]; 1326 Longfellow Way, San Jose, CA 95129 (US). BAJAJ, Puneet [IN/IN]; Apt. #G 05, Harihara Enclave, 1st Main, 15th Cross, Sector 6, HSR Layout, Karnataka, Bangalore 560 048 (IN). YUAN, Xiaoxiong [CN/US]; 2162 Capitol Park Ct., San Jose, CA 95132 (US). KIM, Steven, H. [US/US]; 4853 Mendota Street, Union City, CA 94587 (US). CHU, Schubert, S. [US/US]; 38 Sequoia Way, San Francisco, CA 94127 (US). MA, Paul, F. [NZ/US]; 2181 Rancho McCormick Blvd., Santa Clara,

CA 95050 (US). AUBUCHON, Joseph, F. [US/US]; 280 El Bosque Drive, San Jose, CA 95134 (US).

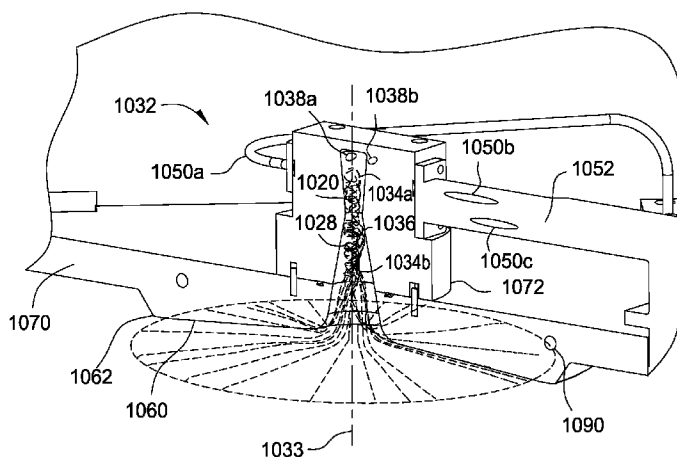
(74) Agents: PATTERSON, B. Todd et al.; Patterson & Sheridan, L.L.p., 3040 Post Oak Blvd., Suite 1500, Houston, Texas 77056-6582 (US).

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[Continued on next page]

(54) Title: VORTEX CHAMBER LIDS FOR ATOMIC LAYER DEPOSITION



(57) Abstract: Embodiments of the invention relate to apparatuses and methods for depositing materials on substrates (210) during atomic layer deposition processes. In one embodiment, a chamber (200) for processing substrates (210) is provided which includes a chamber (200) lid assembly (232) containing a centrally positioned gas dispersing channel (234), wherein a converging portion of the gas dispersing channel (234) tapers towards a central axis of the gas dispersing channel (234) and a diverging portion of the gas dispersing channel (234) tapers away from the central axis. The chamber (200) lid assembly (232) further contains a tapered bottom surface (260) extending from the diverging portion of the gas dispersing channel (234) to a peripheral portion of the chamber (200) lid assembly (232), wherein the tapered bottom surface (260) is shaped and sized to substantially cover the substrate and two conduits are coupled to gas inlets (236a,b) within the converging portion of the gas dispersing channel (234) and positioned to provide a circular gas flow through the gas dispersing channel (234).

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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER

IPC: C23C 16/00(2006.01)
C23C 16/44(2006.01)

USPC: 118/715

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. : 118/715

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 practicable, search terms used)
EAST

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 6,306,216 B (KIM et al) 23 October 2001 (23.10.2001) column 6, lines 1-25	16, 17 ----- 1-15, 18-24
Y	WO/1999/019260 (WASKAAS) 24 April 1999 (24.04.1999), Page 6	1-11, 13-15, 19-24
Y	US 6818250 B2 (George; Steven M. et al.) 16 November 1999 (16.11.1999) column 5, line 59 - column 6, line 10	12, 18

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

27 August 2008 (27.08.2008)

Date of mailing of the international search report

12 SEP 2008

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

Rudy Zervigon

Telephone No. 703.308.0661

Jean Proctor
Paralegal Specialist

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US07/82369

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 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 No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
Please See Continuation 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 additional fees, this Authority did not invite payment of any additional fees.
 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.: 1-24
- Remark on Protest**
- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
 - The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
 - No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US07/82369

BOX III. 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) 1-24, 26-49, and 51-77, drawn to a chamber for processing substrates.

Group II, claim(s) 25, 50, and 78, drawn to a method for depositing material.

This application contains claims directed to more than one species of the generic invention. These species are deemed to lack unity of invention because they are not so linked as to form a single general inventive concept under PCT Rule 13.1.

In order for more than one species to be examined, the appropriate additional examination fees must be paid. The species are as follows:

- Species I – Figures 1-4
- Species II – Figure 5
- Species III – Figure 6
- Species IV – Figure 7
- Species V – Figures 8
- Species VI – Figures 9A,9B
- Species VII – Figures 10A-10F
- Species VIII – Figures 11A-11C
- Species IX – Figures 12A-12E, 13A-13E, 14A-14C
- Species X – Figures 15A-15C
- Species XI – Figures 16A-16C
- Species XII – Figures 17A-17D
- Species XIII – Figures 18A-18H

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:

Applicant's repeatedly, independently claimed, feature of "a gas dispersing channel..." is known as exhibited by Kim; Yong (US 6306216 B1 – 701; Figure 4A; column 8; line 22). As a result, there is lack of unity *a posteriori*, since "a gas dispersing channel..." is not a technical feature that defines a contribution over the prior art.

The species listed above do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, the species lack the same or corresponding special technical features for the following reasons:

INTERNATIONAL SEARCH REPORT

International application No.

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Applicant's species claims require, in part, the feature of "a gas dispersing channel..." is known as exhibited by Kim; Yong (US 6306216 B1 - 701; Figure 4A; column 8; line 22). As a result, there is lack of unity *a posteriori*, since "a gas dispersing channel..." is not a technical feature that defines a contribution over the prior art.

Claims 1-78 meet the criteria set out in PCT Article 33(4), and thus the invention meets industrial applicability because the subject matter claimed can be made or used in industry.