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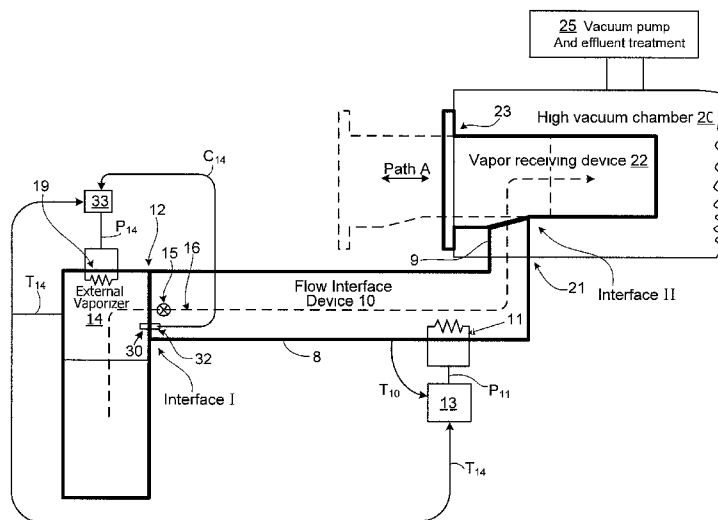
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[Continued on next page]

(54) **Title:** VAPOR DELIVERY SYSTEM USEFUL WITH ION SOURCES AND VAPORIZER FOR USE IN SUCH SYSTEM



(57) **Abstract:** Vapor delivery systems and methods that control the heating and flow of vapors from solid feed material, especially material that comprises cluster molecules for semiconductor manufacture. The systems and methods safely and effectively conduct the vapor to a point of utilization, especially to an ion source for ion implantation. Ion beam implantation is shown employing ions from the cluster materials. The vapor delivery system includes reactive gas cleaning of the ion source, control systems and protocols, wide dynamic range flow-control systems and vaporizer selections that are efficient and safe. Borane, decarborane, carboranes, carbon clusters and other large molecules are vaporized for ion implantation. Such systems are shown cooperating with novel vaporizers, ion sources, and reactive cleaning systems.

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A CLASSIFICATION OF SUBJECT MATTER IPC(8) - C23C 16/00, G05D 7/00 (2008.4) USPC - 261/130, 250/423R 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 (8) - C23C 16/00, G05D 7/00 (2008 4) USPC - 261/130, 250/423R Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched USPC - 261/142, 34/380, 137/8, 250/425, 427, 492 3 Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) PUBWEST (PGPB,USPT,USOC,EPAB,JPAB), Google Terms -ion implantation vapor source heat heater thermal semequip butterfly flow purge solid thermally conductive valve block ion vapor ion vaporizer condense		
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 7,022,999 B2 (HORSKY et al) 04 April 2006 (04 04 2006), col 22, ln 53-61, col 23, ln 9-17, col 23, ln 29-38, FIG 3A	1-4, 48-49 -- 50
Y	US 2002/0144655 A 1 (CHIANG et al) 10 October 2002 (10 10 2002), para [0097]	50
D Further documents are listed in the continuation of Box C <input type="checkbox"/>		
* 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 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 09 Jun 2008 (09 06 2008)		Date of mailing of the international search report 
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 Lee W Young PCT Helpdesk 571 272-4300 PCT OSP 571 272 7774

INTERNATIONAL SEARCH REPORT

International application No
PCT/US 07/85320

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	<input checked="" type="checkbox"/> Claims Nos because they relate to subject matter not required to be searched by this Authority, namely
2	<input type="checkbox"/> 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	<input checked="" type="checkbox"/> Claims Nos 5-47 and 51-57 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	
1	<input type="checkbox"/> As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims
2	<input type="checkbox"/> As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees
3	<input type="checkbox"/> 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	<input type="checkbox"/> 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	<input type="checkbox"/> The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee <input checked="" type="checkbox"/> D 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 <input type="checkbox"/> No protest accompanied the payment of additional search fees