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— with international search report (Art. 21(3))

[Continued on next page]

(54) Title: METHOD AND APPARATUS FOR CONTROLLING AN ELECTROSTATIC LENS ABOUT A CENTRAL RAY TRAJECTORY OF AN ION BEAM

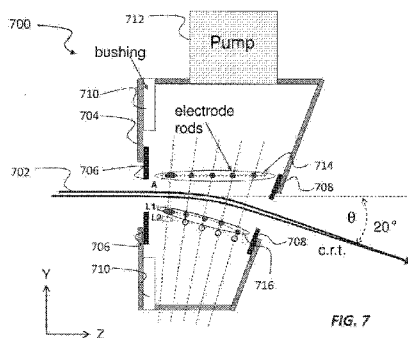


FIG. 7

(57) Abstract: A method of controlling deflection of a charged particle beam in an electrostatic lens (700) includes establishing a symmetrical electrostatic lens configuration comprising a plurality of electrodes (714, 716) disposed at unadjusted positions (L1) that are symmetric with respect to the central ray trajectory (702) with applied unadjusted voltages that create fields symmetric with respect to the central ray trajectory. A symmetric electric field is calculated corresponding to the set of unadjusted voltages. A plurality of lower electrodes (716) is arranged at adjusted positions (L2) that are asymmetric with respect to the central ray trajectory. A set of adjusted voltages is obtained for the plurality of lower electrodes, wherein the set of adjusted voltages corresponds to a set of respective potentials of the symmetric electric field at respective adjusted asymmetric positions. The adjusted voltages are applied to the asymmetric lens configuration when the charged particle beam passes therethrough.

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— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

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INTERNATIONAL SEARCH REPORT

International application No PCT/US2011/064413

A. CLASSIFICATION OF SUBJECT MATTER
 INV. H01J37/12 H01J37/15 H01J37/317
 ADD.

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)
 H01J

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)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 963 748 A (SZILAGYI MIKLOS N [US]) 16 October 1990 (1990-10-16) column 1, lines 7-22 column 4, line 57 - column 5, line 34; figures 3-6	9,15,16
X	----- US 2003/066961 A1 (KIENZLE OLIVER [DE] ET AL) 10 April 2003 (2003-04-10) paragraph [0108]; figure 13	9,15,16
L	US 6 414 319 B1 (SPEHR RAINER [DE]) 2 July 2002 (2002-07-02) column 5, line 37 - column 6, line 47; figure 1	
L	& DE 196 34 456 A1 (SPEHR RAINER DR [DE]) 5 March 1998 (1998-03-05) ----- -/--	

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 but published on or after the international filing date
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- "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

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Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

International application No
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2004/105160 A1 (KIENZLE OLIVER [DE] ET AL) 3 June 2004 (2004-06-03) paragraphs [0050] - [0062], [0070] - [0073]; figures 3, 6, 7, 10 paragraphs [0082], [0083], [0110] - [0112]; figures 12, 19 -----	9,15,16
X	US 2004/113092 A1 (KNIPPELMEYER RAINER [DE]) 17 June 2004 (2004-06-17) paragraphs [0004], [0005], [0079], [0082] - [0085], [0089] - [0130], [0150]; figures 3,4,6a-6c,7,9,11a,11b,12-14 -----	1-4,9, 15,16

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2011/064413

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:

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 fees, this Authority did not invite payment of 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.:

1-4, 9, 15, 16

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.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1-4, 9, 15, 16

dedicated to a method comprising calculating a symmetrical electric field corresponding to the set of unadjusted voltages and obtaining a set of adjusted voltages wherein the set of adjusted voltages corresponds to a set of respective potentials of the symmetric electric field

2. claims: 5-8, 10-14, 17

dedicated to a method and respective apparatus with the step / feature of arranging the plurality of lower electrodes at shifted positions

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/US2011/064413

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