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(71) Applicant (for all designated States except US): **BATTELLE MEMORIAL INSTITUTE** [US/US]; Pacific Northwest Division, Intellectual Property Services, P.O. Box 999, Richland, WA 99352 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **SMITH, Richard, D.** [US/US]; 402 Scot Street, Richland, WA 99354 (US). **TANG, Keqi** [US/US]; 350 Snyder Street, Richland, WA 99354 (US). **SHVARTSBURG, Alexandre, A.** [RU/US]; 2000 Stevens Drive, Apt. 202, Richland, WA 99354 (US).

(74) Agents: **BRANTON, Vincent, A.** et al.; Battelle Memorial Institute, P.O. Box 999 (MSIN K1-53), Richland, WA 99352 (US).

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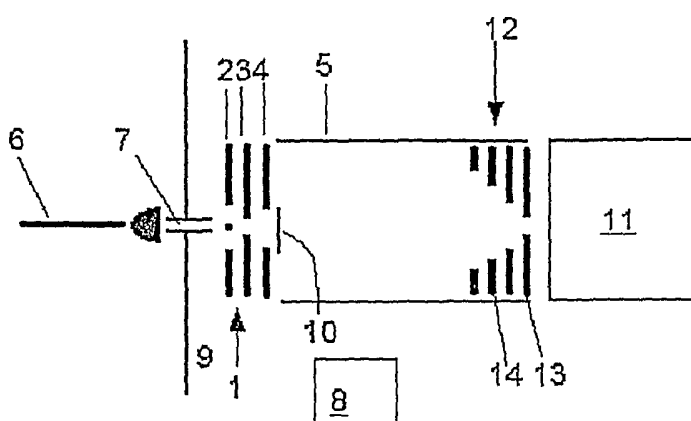
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(54) Title: IMPROVED HIGH PERFORMANCE ION MOBILITY SPECTROMETRY USING HOURGLASS ELECTRODYNAMIC FUNNEL AND INTERNAL ION FUNNEL



(57) Abstract: A method and apparatus enabling increased sensitivity in ion mobility spectrometry/mass spectrometry instruments which substantially reduces or eliminates the loss of ions in ion mobility spectrometer drift tubes utilizing a device for transmitting ions from an ion source which allows the transmission of ions without significant delay to an hourglass electrodynamic ion funnel at the entrance to the drift tube and/or an internal ion funnel at the exit of the drift tube. An hourglass electrodynamic funnel is formed of at least an entry element, a center element, and an exit element, wherein the aperture of the center element is smaller than the aperture of the entry element and the aperture of the exit elements. Ions generated in a relatively

high pressure region by an ion source at the exterior of the hourglass electrodynamic funnel are transmitted to a relatively low pressure region at the entrance of the hourglass funnel through a conductance limiting orifice. Alternating and direct electrical potentials are applied to the elements of the hourglass electrodynamic funnel thereby drawing ions into and through the hourglass electrodynamic funnel thereby introducing relatively large quantities of ions into the drift tube while maintaining the gas pressure and composition at the interior of the drift tube as distinct from those at the entrance of the electrodynamic funnel and allowing a positive gas pressure to be maintained within the drift tube, if desired. An internal ion funnel is provided within the drift tube and is positioned at the exit of said drift tube. The advantage of the internal ion funnel is that ions that are dispersed away from the exit aperture within the drift tube, such as those that are typically lost in conventional drift tubes to any subsequent analysis or measurement, are instead directed through the exit of the drift tube, vastly increasing the amount of ions exiting the drift tube.



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A. CLASSIFICATION OF SUBJECT MATTER

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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)

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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, INSPEC, COMPENDEX

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CHEROKEE S. HOAGLUND-HYZER, YOUNG JIN LEE, ANNE E. COUNTERMAN, DAVID E. CLEMMER: "Coupling Ion Mobility Separations, Collisional Activation Techniques, and Multiple Stages of MS for Analysis of Complex Peptide Mixtures" ANALYTICAL CHEMISTRY, vol. 74, no. 5, 1 March 2002 (2002-03-01), pages 992-1006, XP002371949 page 993, column 1, line 31 - line 32 page 993, column 1, line 4 - line 6 page 993, column 1, line 13 - line 15 page 995, column 1, line 13 page 995, column 1, line 31 - line 38 page 995, column 2, line 6 - line 15 figure 1 ----- -/--	1-104



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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

Lachaud, S

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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.
A	US 2003/141447 A1 (VERENTCHIKOV ANATOLI ET AL) 31 July 2003 (2003-07-31) figure 2A figure 3B -----	1-104
A	US 2002/185606 A1 (SMITH RICHARD D ET AL) 12 December 2002 (2002-12-12) abstract figure 1 -----	1-104
A	US 6 107 628 A (SMITH ET AL) 22 August 2000 (2000-08-22) column 3, line 66 - line 67 column 4, line 1 - line 3 column 4, line 58 - line 65 figure 1 figure 5 -----	1-104
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Information on patent family members

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