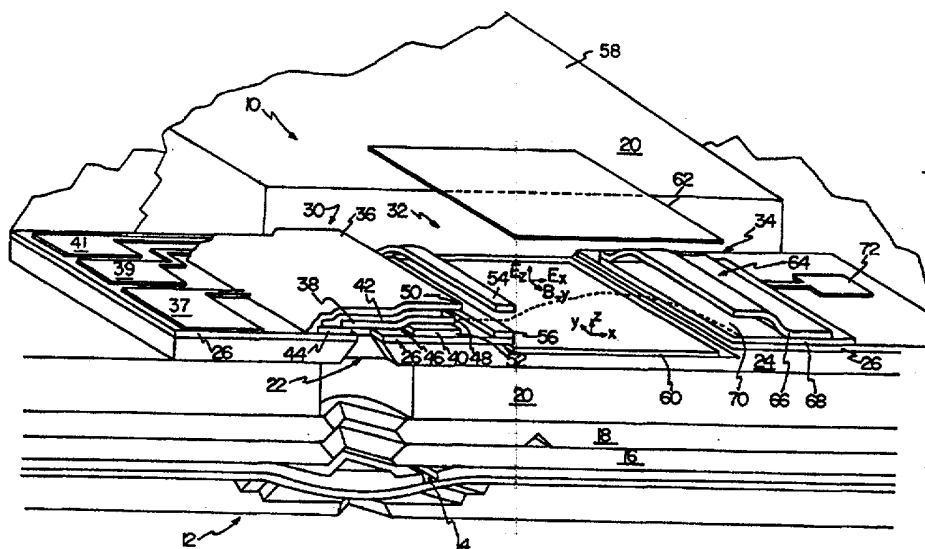




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : H01J 49/16, 27/26	A3	(11) International Publication Number: WO 95/12894 (43) International Publication Date: 11 May 1995 (11.05.95)
(21) International Application Number: PCT/US94/10385 (22) International Filing Date: 14 September 1994 (14.09.94) (30) Priority Data: 08/146,220 1 November 1993 (01.11.93) US (71) Applicant: ROSEMOUNT ANALYTICAL INC. [US/US]; 12001 Technology Drive, Eden Prairie, MN 55344 (US). (72) Inventor: SITTLER, Fred, C.; 6526 Aster Trail, Excelsior, MN 55331 (US). (74) Agents: CHAMPLIN, Judson, K. et al.; Westman, Champlin & Kelly, Suite 720 - TCF Tower, 121 South Eighth Street, Minneapolis, MN 55402-2827 (US).		(81) Designated States: CA, CN, JP, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i> (88) Date of publication of the international search report: 22 June 1995 (22.06.95)

(54) Title: MICROMACHINED MASS SPECTROMETER**(57) Abstract**

A micromachined mass spectrometer (10) includes an ionizer (30), a separation region (32) and a detector (34). The ionizer (30) is formed from an upper electrode (36), a center electrode (38) and a lower electrode (40). Ionization (30) of a sample gas takes place around an edge (48) of the center electrode (38). Accelerating electrodes (54, 56) extract ionized particles from the ionizer (30). Ionized particles are accelerated through the separation region (32). A magnetic field is applied in a direction perpendicular to travel of the ionized particles through the separation region (32) causing the trajectory of the ionized particles to bend. The mass spectrometer (10) is formed using micromachined techniques and is carried on a single substrate (24).

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A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H01J49/16 H01J27/26

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 6 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 practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US,A,5 245 192 (B. L. HOUSEMAN) 14 September 1993 see abstract see column 4; figures 1-5 see column 6, line 3 - line 11; claims 1,9,14	1-5,8, 13,20
X	--- REVIEW OF SCIENTIFIC INSTRUMENTS., vol.57, no.5, 1986, NEW YORK US pages 989 - 990 C.C. CURTIS ET AL. 'SPACECRAFT MASS SPECTROMETER ION SOURCE EMPLOYING FIELD EMISSION CATHODES' see page 1; figures 1,2 --- -/--	1,6,8

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

18 May 1995

Date of mailing of the international search report

24.05.95

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Hulne, S

INTERNATIONAL SEARCH REPORT

Internati. Application No
PCT/US 94/10385

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,A,5 043 576 (J. H. BROADHURST) 27 August 1991 cited in the application see abstract ---	1
A	EP,A,0 346 271 (SRI INTERNATIONAL) 13 December 1989 cited in the application see column 7, line 28 - line 43; figures 1,6 see claim 1 ---	1
A	FR,A,2 657 999 (MITSUBISHI) 9 August 1991 see abstract; figures 1-5 ---	1
X	JOURNAL OF PHYSICS E. SCIENTIFIC INSTRUMENTS, vol.7, no.9, September 1974, BRISTOL GB pages 759 - 768 N G ADAMS ET AL. 'A MULTICOLLECTOR , CYCLIDAL FOCUSING, MAGNETIC MASS SPECTROMETER' see page 760, right column, line 19 - page 761, left column, line 1; figure 1 -----	21,22

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 94/10385

Box I Observations where certain claims were found unsearchable (Continuation of item 1 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 II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. Claims 1-20
2. Claims 21-22

For further information please see form PCT/ISA/206 mailed 17.02.95.

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 fee, this Authority did not invite payment of any additional fee.
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.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☒ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

Internat Application No
PCT/US 94/10385

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A-5245192	14-09-93	NONE	
US-A-5043576	27-08-91	US-A- 4850371	25-07-89
		CA-A- 1328930	26-04-94
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