



**EUROPEAN PATENT APPLICATION**

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**Methods of using ion trap mass spectrometers.**

Improved methods of using an ion trap mass spectrometer, whereby AC voltages supplemental to the AC trapping voltage are used for scanning the trap (10), for conducting chemical ionization experiments, and for conducting MS<sup>n</sup> experiments, are shown. In one embodiment a broadband supplemental AC voltage is applied to rid the trap of ions above or below a preselected cutoff mass. This is particularly useful in conducting chemical ionization experiments for eliminating high mass sample ions that are formed when the reagent gas is ionized by electron impact ionization. Likewise, this technique may be used to eliminate low mass reagent ions when conducting an electron impact ionization experiment in the presence of a reagent gas. In another embodiment a non-resonant, low-frequency supplemental voltage is applied to the trap (10) causing trapped ions to undergo collision induced dissociation. Multiple generations of ion fragments may be simultaneously formed in this manner, thereby enabling MS<sup>n</sup> experiments. The low-frequency supplemental field has the additional property of causing high mass ions to be ejected from the trap (10) as a function of the magnitude of the supplemental voltage. This property may be used to scan the trap (10), for example, by scanning the magnitude of the supplemental voltage. Likewise, when conducting chemical ionization experiments, this property may be used for eliminating unwanted high mass sample ions, formed during ionization of the reagent gas, from the trap (10).

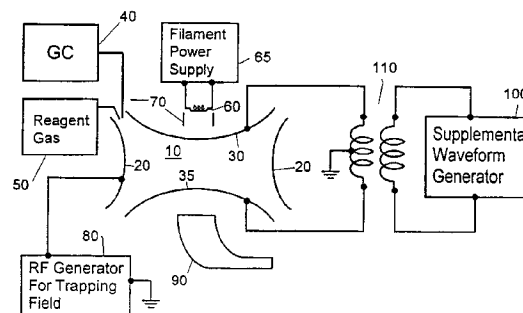


FIG. 2



European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 93 10 8670

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 5)
X	EP-A-0 362 432 (BRUKER-FRANZEN ANALYTIK GMBH)	1,2,3,5 11,12- 13,31	H 01 J 49/00 H 01 J 49/42
A	* column 4, line 21 - column 5, line 12; claims 1,6-10; column 5, line 45 - column 6, line 13 *	37,33	
A	EP-A-0 336 990 (BRUKER-FRANZEN ANALYTIK GMBH) * abstract; claims 1,2,10-13; figure 3 *	37	
P,X	WO-A-9 305 533 (TELEDYNE) * abstract *	1	
P,A	* page 12, line 5 - page 13, line 9; figure 1 *	33	
D,A	EP-A-0 215 615 (FINNIGAN) * page 11, line 6 - line 29; figure 18 *	1,31	
D,A	EP-A-0 202 943 (FINNIGAN) * page 8, line 26 - page 9, line 5; figure 4 *	1,37	TECHNICAL FIELDS SEARCHED (Int. Cl.5) H 01 J
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 27-09-1993	Examiner HULNE S L
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

EPO FORM 1503 01.82 (P/0401)



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**CLAIMS INCURRING FEES**

The present European patent application comprised at the time of filing more than ten claims.

- All claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for all claims.
- Only part of the claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claims:
- No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

**LACK OF UNITY OF INVENTION**

The Search Division considers that the present European patent application does not comply with the requirement of unity of invention and relates to several inventions or groups of inventions, namely:

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- All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:
- None of the further search fees has been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims.

namely claims: 1-31, 33-39



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EP 93 10 8670 -B-

**LACK OF UNITY OF INVENTION**

The Search Division considers that the present European patent application does not comply with the requirement of unity of invention and relates to several inventions or groups of inventions, namely:

1. Claims 1-31,33-39: Method of operating a quadrupole ion trap mass spectrometer by means of applying a supplemental AC-field in addition to the R.F. trapping field
2. Claim 32 : Method of adjusting the dynamic range of an ion trap mass spectrometer by identifying the sample ion present in the greatest concentration