

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau

(43) International Publication Date
08 August 2024 (08.08.2024)



(10) International Publication Number
WO 2024/161145 A1

- (51) International Patent Classification:
H01J 49/40 (2006.01)
- (21) International Application Number:
PCT/GB2024/050282
- (22) International Filing Date:
01 February 2024 (01.02.2024)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
2301462.4 01 February 2023 (01.02.2023) GB
- (71) Applicant: **MICROMASS UK LIMITED** [GB/GB];
Stamford Avenue, Altrincham Road, Wilmslow Cheshire
SK9 4AX (GB).
- (72) Inventors: **WILDGOOSE, Jason Lee**; 110 Barcroft
Road, Heaton Mersey, STOCKPORT Cheshire SK4 3 PJ

(GB), **JOHNSON, William**; 94 Lindfield Estate South,
Wilmslow Cheshire SK9 5JD (GB). **KOZLOV, Boris**; 18
Barrowfield Road, Wythenshaw Greater Manchester M22
1RT (GB).

(74) Agent: **CHIVA, Andrew Peter**; Delms, St Bride's House,
10 Salisbury Square, London Greater London EC4Y 8JD
(GB).

(81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,
AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ,
CA, CH, CL, CN, CO, CR, CU, CV, CZ, DE, DJ, DK, DM,
DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT,
HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG,
KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY,
MA, MD, MG, MK, MN, MU, MW, MX, MY, MZ, NA,
NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO,
RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH,

(54) Title: MULTI-REFLECTING TOF MASS SPECTROMETRY

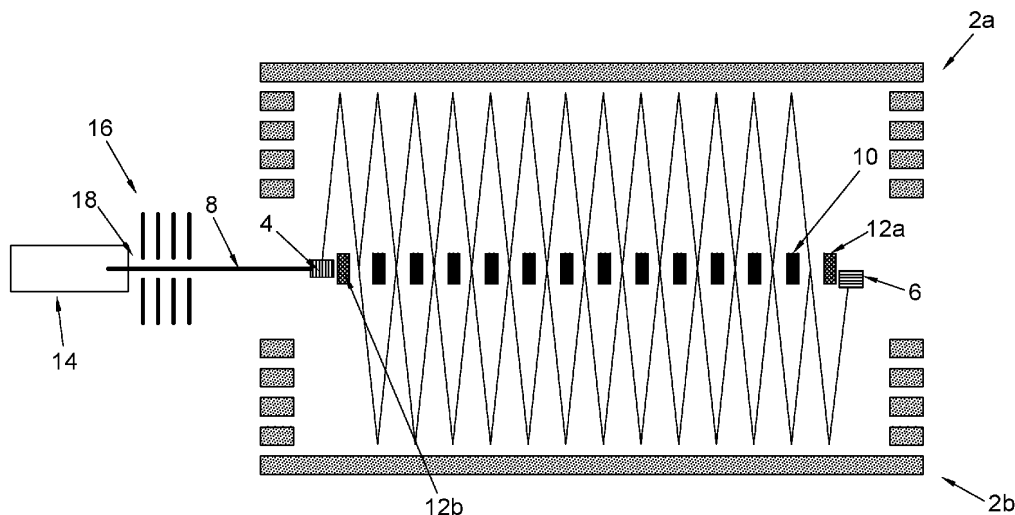


FIG. 4

(57) Abstract: A mass spectrometer comprising: an ion accumulation device (14) for accumulating and pulsing out ions (8); a time of flight mass analyser comprising: ion mirrors (2a, 2b) for reflecting ions; an ion accelerator (4) arranged and configured to receive ions from the ion accumulation device and pulse them into one of the ion mirrors such that ions are reflected back and forth between the mirrors in a first dimension as the ions drift in a drift dimension; reflectors (12a, 12b) for reflecting the ions in the drift dimension; an ion detector (6) for detecting ions; and control circuitry configured to activate the reflectors so as to cause the ions to make multiple passes along the drift dimension and then deactivate one of the reflectors so as to allow ions to pass to the ion detector and be detected, wherein the timings at which the reflectors are activated and deactivated is such that only ions within a first range of mass to charge ratios are capable of having undergone the same number of passes in the drift dimension at the time that they are detected by the ion detector; and wherein control circuitry of the mass spectrometer synchronises the time that ions are pulsed out of the ion accumulation device with the time that ions are pulsed by the ion accelerator such that only ions having mass to charge ratios within said first range

[Continued on next page]

TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS,
ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every
kind of regional protection available):* ARIPO (BW, CV,
GH, GM, KE, LR, LS, MW, MZ, NA, RW, SC, SD, SL, ST,
SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ,
RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ,
DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT,
LU, LV, MC, ME, MK, MT, NL, NO, PL, PT, RO, RS, SE,
SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN,
GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

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

are pulsed by the ion accelerator into said one of the ion mirrors.