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BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, 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, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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Published:

- with international search report (Art. 21(3))
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- (88) **Date of publication of the international search report:**
13 November 2014

(54) **Title:** PELTIER-COOLED CRYOGENIC LASER ABLATION CELL

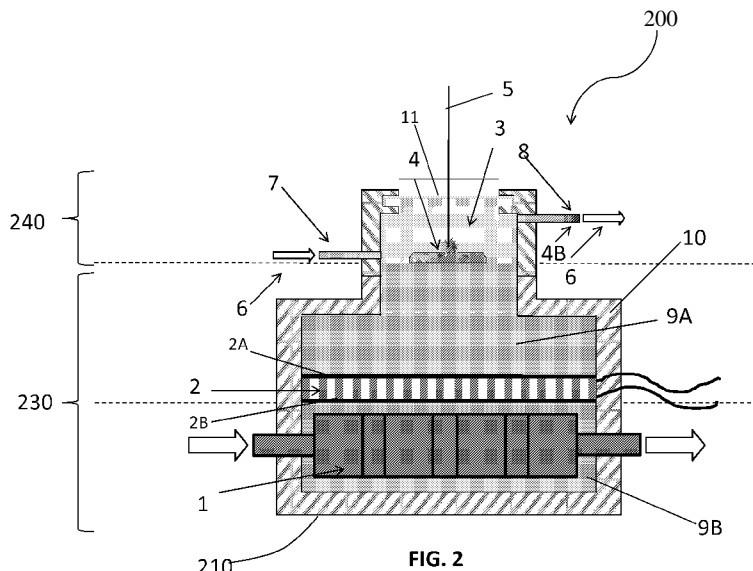


FIG. 2

(57) **Abstract:** Peltier-cooled cryogenic laser ablation cells for sample preparation.

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INTERNATIONAL SEARCH REPORT

014/020135 00.03.2014
International application No.

PCT/US2014/0281 55

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - B01D 59/00 (2014.01)

USPC - 250/282

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(8) - B01D 59/00; H01J 49/00; G01N 21/01 (2014.01)

USPC - 250/282, 428, 429; 73/863.1 1; 219/121 .67

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

CPC - H01J 49/0036, 49/424; G01N 27/622 (2014.02)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Orbit, Google Patents, ProQuest

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JPH1 151904 A (OTSUKA) 26 February 1999 (26.02.1999) see machine translation	1-3
Y		4-10
Y	US 5,075,555 A (WOLDSETH et al) 24 December 1991 (24.12.1991) entire document	4-5
Y	US 5,821,175 A (ENGELSBURG) 13 October 1998 (13.10.1998) entire document	6-8
Y	US 5,616,139 A (OKAMOTO) 01 April 1997 (01.04.1997) entire document	9
Y	US 2006/0014272 A1 (TAJIMA et al) 19 January 2006 (19.01.2006) entire document	10
A	US 2012/0104244 A1 (VERBECK et al) 03 May 2012 (03.05.2012) entire document	1-10
A	US 2002/01 70891 A1 (BOYLE et al) 21 November 2002 (21.11.2002) entire document	1-10
A	US 2012/0135537 A1 (HORTON et al) 31 May 2012 (31.05.2012) entire document	1-10



Further documents are listed in the continuation of Box C.

* 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

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"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

18 August 2014

Date of mailing of the international search report

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Name and mailing address of the ISA/US

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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 extra 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 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.:
1-10

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.

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claims 1-10, drawn to a laser ablation cell comprising at least one Peltier-cooled stage and a sample surface in communication with the Peltier-cooled stage.

Group II, claims 11-15, drawn to a sample analysis system comprising a Peltier-cooled laser ablation preparation cell and a sample analyzer.

The inventions listed as Groups I-II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: the special technical feature of the Group I invention: "a sample surface in communication with the at least one Peltier-cooled stage to promote cryogenic cooling of a sample during laser ablation of the sample" as claimed therein is not present in the invention of Group II. The special technical feature of the Group II invention: "a sample analyzer fluidly connected downstream of the Peltier-cooled laser ablation sample preparation cell" as claimed therein is not present in the invention of Group I.

Groups I and II lack unity of invention because even though the inventions of these groups require the technical feature of a laser ablation cell comprising at least one Peltier-cooled stage, this technical feature is not a special technical feature as it does not make a contribution over the prior art.

Specifically, JPH-1 1051904A (OTSUKA) 26 February 1999 (26.02.1999) teaches a laser ablation cell comprising at least one Peltier-cooled stage (See Abstract of the machine translated English Version of JPH-1 1051904A).

Since none of the special technical features of the Group I or II inventions are found in more than one of the inventions, unity of invention is lacking.