

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
4 April 2002 (04.04.2002)

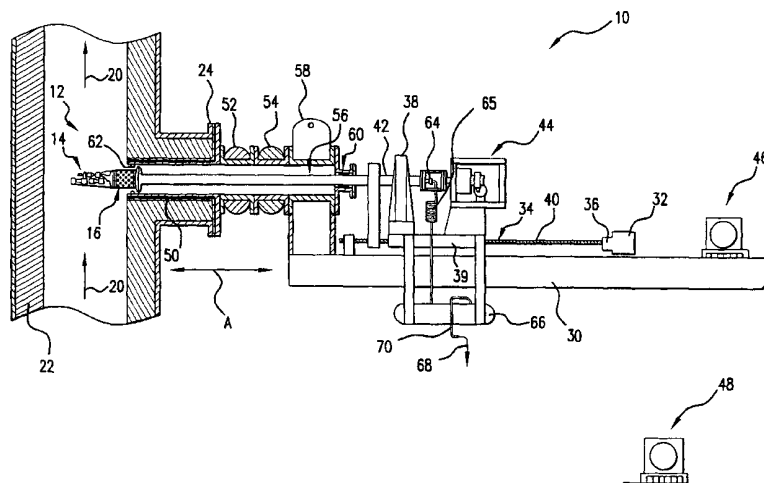
PCT

(10) International Publication Number
WO 02/26341 A3

- (51) International Patent Classification⁷: G01N 1/18, 1/20, 1/22
 - (21) International Application Number: PCT/US01/30028
 - (22) International Filing Date: 25 September 2001 (25.09.2001)
 - (25) Filing Language: English
 - (26) Publication Language: English
 - (30) Priority Data: 09/670,794 25 September 2000 (25.09.2000) US
 - (71) Applicant: SOUTHERN RESEARCH INSTITUTE [US/US]; P.O. Box 55305, Birmingham, AL 35255-5305 (US).
 - (72) Inventors: DAHLIN, Robert, S.; 3705 Keswick Circle, Birmingham, AL 35242 (US). FARTHING, William, E.; 6944 Mountain View Drive NE, Pinson, AL 35126 (US). LANDHAM, Edward, C., Jr.; 2627 Buckboard Road, Birmingham, AL 35244 (US).
 - (74) Agents: DECARLO, Kean, J. et al.; Needle & Rosenberg, P.C., Suite 1200, The Candler Building, 127 Peachtree Street, N.E., Atlanta, GA 30303-1811 (US).
 - (81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW.
 - (84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
- Published: — with international search report

[Continued on next page]

(54) Title: PARTICULATE AND PROCESS GAS STREAM SAMPLER



(57) Abstract: A sampling system (10) samples particulate material in a high-temperature, high-pressure gas stream (20) flowing in process pipe (22). A sampling device (12) comprising an alumina lined activated bauxite alkali vapor collector (16) and a threadless sacrificial connector containing cyclone separator (14) is inserted into stream (20) via a pipe flange (24) connected to block-and-bleed valves (52, 54). (In alternative embodiments instead of a cyclone separator (14) a cascade impactor (240) with integrally spaced and aligned jet plates (282) having collection substrates (284) may be used). Support structure (30) supports a stepper motor (32) driving screw actuator (34) carrying draw yoke (38) is driven along linear bearing rail (40) by engagement with screw actuator (34). Draw yoke (38) engages sampling device carrying probe (42) so as to move in axial direction (A). Probe rotator (44) mounted to carriage (39) can be controlled or monitored by local controller/monitor (46) or remote one (48) which can also monitor and control axial movement production.



WO 02/26341 A3



— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(88) Date of publication of the international search report:

13 June 2002

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US01/30028

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :G01N 1/18, 1/20, 1/22
US CL :73/863.21, 863.22, 863.85, 28.05; 55/464, 465; 96/147, 154
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)

U.S. : 73/863.21, 863.22, 863.85, 28.04, 28.05, 28.06; 55/464, 465; 96/108, 134, 136, 139, 147, 152, 154

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 practicable, search terms used)
Please See Extra Sheet.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y --- A --- X	DAHLIN. R. S. Plans for Hot Gas Cleanup Testing at the Power Systems Development Facility. Proceedings of the 13th International Conference on Fluidized Bed Combustion. 1995. pages 449-459, especially pages 453-454	1-7 --- 8-11 --- 26-33
Y	GB 2,254,024 A (BURKARD MANUFACTURING CO LTD) 30 September 1992 (03.09.1992), abstract, Fig. 1, page 4, lines 19-25	1-7
Y	US 3,825,000 A (HUGGINS) 23 July 1974 (23.07.1974), col. 4, line 65 - col. 5, line 5	1-7

Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:	"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
"A" document defining the general state of the art which is not considered to be of particular relevance	"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
"E" earlier document published on or after the international filing date	"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
"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)	"&" document member of the same patent family
"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	

Date of the actual completion of the international search 20 FEBRUARY 2002	Date of mailing of the international search report 11 APR 2002
---	--

Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer THOMAS P. NOLAND Telephone No. (703) 305-4765
---	--

Deborah Perry-Leeper
Deborah Perry-Leeper
Paralegal Specialist
Technology Center 2800

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US01/30028

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- A	US 3,001,914 A (ANDERSEN) 26 September 1961 (26.09.1961), Fig. 2, claim 4	12-15 --- 16-18
A	US 5,992,974 A (MIYATA) 30 November 1999 (30.11.1999)	17-18
A	US 5,173,263 A (LEE) 22 December 1992 (22.12.1992)	19-25

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US01/30028

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international 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:

Please 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 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

International application No.
PCT/US01/30028

B. FIELDS SEARCHED

Electronic data bases consulted (Name of data base and where practicable terms used):

USPAT, USOCR, US-PGPUB, DERWENT, EPO, JPO, IBM-TDB

search terms: sacrificially, sacrificial, disposably, disposable, connect, connected, connection, connector, cyclone, sampler, sampling, collector, collecting, manifold, cap, access, opening, manifold, manifolded, cyclonically, cyclonical, c-ring, c, ring, sacrifice, sacrificed, sacrificer, sacrificing, connecting, cyclonic, sample, sampled, specimen, cup, collection, collected, cascade, impactor, impacter, alignment, aligning, aligner, alignor, aligned, tab, jet, jetting, jetted, jetter, jettor, plate, substrate, spacer, spacing, spaced, spacement, space, spacing, lip, lipped, lipping, lipment, rib, ribbing, ribbed, alkali, vapor, vapour, liner, lining, lined, sorbent, sorb, sorber, sorbing, absorbent, adsorbent, adsorb, absorb, adsorber, absorber, adsorbing, absorbing, activated, bauxite, alumina

BOX II. OBSERVATIONS WHERE UNITY OF INVENTION WAS LACKING

This ISA found multiple inventions as follows:

See: Invitation To Pay Additional Fees (PCT/ISA/206) mailed
29 December 2001.

Applicant elected to pay additional fees.

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

Group I, main invention, claims 1-11, drawn to a cyclone sampler or a cyclone subassembly.

Group II, claims 12-16, drawn to a cascade impactor.

Group III, claims 17-18, drawn to a jet plate for a cascade impactor.

Group IV, claims 19-25, drawn to an alkali vapor collector.

Group V, claims 26-28, drawn to a sampling system.

Group VI, claims 29-33, drawn to a sampling system.

The inventions listed as Groups I-VI do not relate to a single 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:

Group VI lacks unity with Groups I-V because: Group VI does not require the special technical feature of an alkali vapor collector as in Groups IV and V as evidenced by such being at most claimed in dependent claim 31 thereof;

Group VI lacks unity with Group II because Group VI does not require the special technical feature of a cascade impactor as in Group II as evidenced by such at most being claimed in dependent claim 32 of Group VI; Group VI

lacks unity with Group III because Group VI does not require the special technical feature of a jet plate structured as therein; Group VI lacks unity with claims 1-7 of Group I because Group VI does not require the special technical

feature of a cyclone separator as therein as evidenced by such at most being claimed in dependent 33 of Group VI;

Group VI lacks unity with claims 8-11 of Group I because Group VI lacks the special technical feature of a cyclone subassembly structured as therein; and Group VI further lacks unity with Groups I-V since none of them require the special technical feature of an advancing/ reacting probe as in Group VI.

Group V lacks unity with Groups I-IV because Group V does not require the special technical feature of: sacrificial connection means as in Group I; a jet plate with an alignment tab as in Group II; a jet plate with an integral spacer as in Group III; or a fluid impervious liner as in Group IV. Group V further lacks unity with Groups I-IV since none of them require the special technical feature of use for sampling or separating a high-pressure, high temperature gas stream as in Group V.

Group IV lacks unity with Groups I-III because Group IV does not require the special technical feature of: sacrificial connection means as in Group I; a jet plate with an alignment tab as in Group II or a jet plate with an integral spacer as in Group III. Group IV further lacks unity with Groups I-III since even if they are used in combination with an alkali vapor collector they do not require the special technical feature of a fluid impervious liner as in Group IV.

Group I lacks unity with Groups II-III because Group I does not require in order to function in or as a cyclone sampler the special technical feature of a cascade impactor with a jet plate with an alignment tab as in Group II or a spacer as in Group III.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US01/30028

Group II lacks unity with Group III since Group II does not require the special technical feature of an integral spacer as in Group III. Group III further lacks unity with Group II because Group III does not require the jet plate to be used as part of an analyzer as in Group II. For instance Group III could be part of a cleaner but even if part of an analyzer Group III does not require the special technical feature of a slotted collection substrate with an alignment tab as in Group II, etc.