

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
6 March 2003 (06.03.2003)

PCT

(10) International Publication Number
WO 03/019160 A3

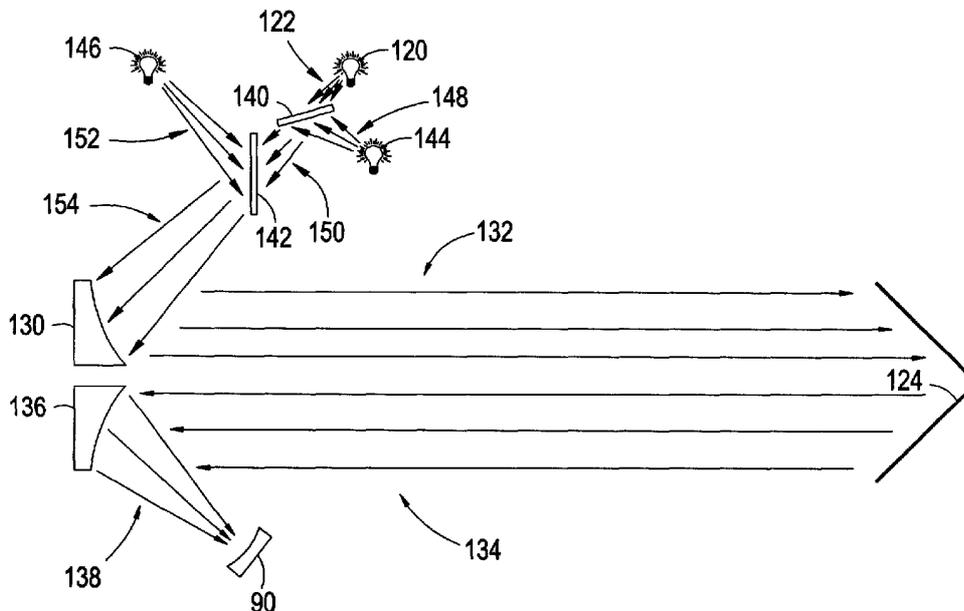
- (51) International Patent Classification⁷: G01N 21/53, (71) Applicant (for all designated States except US): SPX CORPORATION [US/US]; 13535 Ballantyne, Corporate Place, Charlotte, NC 28277 (US).
G01M 15/00, G01N 21/33, 21/35, 21/61
- (21) International Application Number: PCT/US02/25173
- (22) International Filing Date: 9 August 2002 (09.08.2002)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:

09/934,272	21 August 2001 (21.08.2001)	US
10/028,723	28 December 2001 (28.12.2001)	US
10/028,724	28 December 2001 (28.12.2001)	US
10/028,725	28 December 2001 (28.12.2001)	US
10/142,061	10 May 2002 (10.05.2002)	US
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): RENDAHL, Craig, S. [US/US]; 4642 W. Globeberry Street, Tucson, AZ 85741-4618 (US). DIDOMENICO, John [US/US]; 8810 Bear Paw Place, Tucson, AZ 85749 (US). GENTALA, Robert, A. [US/US]; 10170 Rio De Oro Drive, Tucson, AZ 85749 (US). FOLEY, Theresa, A. [US/US]; 4324 Highland Drive, Delevan, WI 53115 (US).
- (74) Agents: SHEEHAN, Kenneth, J. et al.; Baker & Hostetler, LLP, Washington Square, Suite 1100, 1050 Connecticut Avenue, N.W., Washington, DC 20036 (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, OM, PH, PL, PT, RO, RU, SD, SE, SG,
- (63) Related by continuation (CON) or continuation-in-part (CIP) to earlier application:

US	09/934,272 (CIP)
Filed on	21 August 2001 (21.08.2001)

[Continued on next page]

(54) Title: OPEN PATH EMISSION SENSING SYSTEM



(57) Abstract: An open path device for measuring particulate matter and/or gaseous components in an air sample, for example in a vehicle emissions, includes one or more light sources (120, 144, 146) for emitting visible and/or infrared and/or ultraviolet light and a detection unit (90) for detecting light emitted by the one or more light sources, transmitted through the air sample and reflected back to the detection unit by a reflection unit (124). In a configuration with plural light sources (120, 144, 146) the light beams (122, 148, 152) emitted from the light sources are combined by beam splitter/combiner means (140, 142) to follow essentially the same optical path (132, 134) to the detection unit. Particulate matter and/or gaseous component concentrations are derived from light intensities measured by a detection unit using the Lambert-Beer law.



WO 03/019160 A3



SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ,
VC, VN, YU, ZA, ZM, ZW.

Published:

— *with international search report*

(84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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

14 August 2003

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.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 02/25173

A. CLASSIFICATION OF SUBJECT MATTER		
IPC 7	G01N21/53	G01M15/00
	G01N21/33	G01N21/35
		G01N21/61
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 7	G01N	G01M
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	PAGANINI E ET AL: "Instrument for long-path spectral extinction measurements in air: application to sizing of airborne particles" APPLIED OPTICS, vol. 40, no. 24, 20 August 2001 (2001-08-20), pages 4261-4274, XP002226218	1-6,8-19
A	* sections 1-3; figures 1 and 9 *	7,20
X	--- US 5 009 064 A (GROB FERDINAND ET AL) 23 April 1991 (1991-04-23) * column 5, lines 25-55 * --- -/--	1,4,6, 11,13, 17,19
<input checked="" type="checkbox"/> Further documents are listed in the continuation of box C. <input checked="" type="checkbox"/> Patent family members are listed in annex.		
° Special categories of cited documents :		
"A" document defining the general state of the art which is not considered to be of particular relevance	"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	
"E" earlier document but published on or after the international filing date	"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	
"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)	"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.	
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family	
"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	Date of mailing of the international search report	
3 January 2003	10.04.03	
Name and mailing address of the ISA	Authorized officer	
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Hoogen, R	

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 02/25173

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>EP 0 869 349 A (AVL LIST GMBH) 7 October 1998 (1998-10-07)</p> <p>* column 1, lines 13-19; column 5, lines 11-33 *</p> <p style="text-align: center;">-----</p>	<p>1,4,6, 11,13, 17,19</p>

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 02/25173

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. 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.:

1-20

Remark on Protest

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

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

1. Claims: 1-20

Device (claims 1-7 and 14-19) for optically measuring an amount of particulate matter and method (claims 8-13) of using said device.

2. Claims: 21-41

Device (claims 21-33 and 38-41) for optically measuring concentrations of a gas component and method (claims 34-37) of using said device.

3. Claims: 42-63

Optical system (claims 42-62) with plural light emitters and receivers wherein light beams emitted by the plural light emitters overlap at least along a portion of their respective light paths; method (claim 63) of operating such a system.

4. Claims: 64-109

Optical system (claims 64-85 and 87-108) comprising a light emitter, a light receiver, and spinning filter means for consecutively selecting different predetermined wavelengths; method (claims 86,109) of operating such a system.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/US 02/25173

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5009064 A	23-04-1991	DE 3839348 A US 4922714 A BR 8905859 A EP 0370248 A JP 2184743 A	01-06-1989 08-05-1990 12-06-1990 30-05-1990 19-07-1990
EP 0869349 A	07-10-1998	AT 2037 U DE 29805267 U FR 2761778 A	25-03-1998 20-05-1998 09-10-1998