

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
5 December 2002 (05.12.2002)

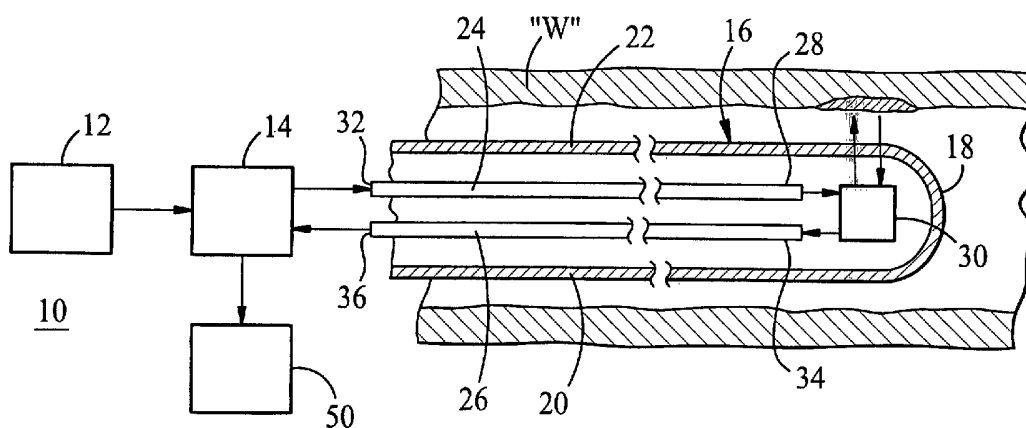
PCT

(10) International Publication Number  
**WO 02/096484 A3**

- (51) International Patent Classification<sup>7</sup>: **A61B 6/00**
- (21) International Application Number: PCT/US02/17202
- (22) International Filing Date: 30 May 2002 (30.05.2002)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:  
09/871,578 31 May 2001 (31.05.2001) US
- (63) Related by continuation (CON) or continuation-in-part (CIP) to earlier application:  
US 09/871,578 (CON)  
Filed on 31 May 2002 (31.05.2002)
- (71) Applicant (for all designated States except US): **INFRA-REDX, INC.** [US/US]; 125 Cambridge Park Drive, Cambridge, MA 02140 (US).
- (72) Applicant and  
(72) Inventor (for US only): **TANG, Jing** [CN/US]; 49 Hooker Street, Apt. 3, Allston, MA 02134 (US).
- (72) Inventors; and  
(75) Inventors/Applicants (for US only): **RYAN, S. Eric** [US/US]; 274 Ash Street, Hopkinton, MA 01748 (US). **BOUMA, Brett, E.** [US/US]; 12 Monmouth Street, Quincy, MA 02171 (US). **TEARNEY, Guillermo, J.** [US/US]; 118 Kinnaird Street 3, Cambridge, MA 02139-2914 (US). **FURNISH, Simon** [US/US]; 124 North Clay Street, Apt. 2, Louisville, KY 40202-1057 (US). **ZULUAGA, Andres** [CO/US]; 130 Bowdoin Street, Boston, MA 02108 (US).
- (74) Agents: **LICHAUCO, Faustino A.** et al.; Fish & Richardson, P. C., 225 Franklin Street, Boston, MA 02110-2804 (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,

[Continued on next page]

(54) Title: APPARATUS AND METHOD FOR THE OPTICAL IMAGING OF TISSUE SAMPLES



(57) Abstract: A catheter based optical system (10) for generating data as to the condition of a tissue sample of a mammalian vessel (W). The system includes an elongated catheter shaft (16) having a tissue engaging distal end (18) and a coupled proximal end (20) and an elongated optical delivery fiber arrangement (24) disposed through a lumen of said catheter (16), said optical delivery fiber arrangement (24) having a distal end (28) and a proximal end (32). The distal end of the delivery fiber arrangement (28) has a re-director light emitter (30) thereon for directing light against mammalian tissues (W). An elongated optical collection fiber arrangement (26) is disposed through a lumen of the catheter (16), the optical collection fiber arrangement (26) having distal end (34) and a proximal most end (36). The distal end of the collection fiber arrangement (34) has a re-director light receiver (30) thereon for receiving light reflected from the mammalian tissue (W) by the light emitter (30). The light emitter (42) and the light receiver (40) are longitudinally spaced apart from one another in the distal end of the catheter (18). The catheter apparatus includes a light source (12) in communication with the delivery fiber (24) and a signal (50) in communication with the receiving fiber (26) for receiving and presenting data collected.



WO 02/096484 A3



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

**Published:**

- with international search report
- with amended claims

**(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, 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).

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

24 July 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/US02/17202

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : A61B 6/00

US CL : 600/476

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. : 600/476, 473, 407, 310, 109, 104

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)  
MEDLINE

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages       | Relevant to claim No.         |
|------------|------------------------------------------------------------------------------------------|-------------------------------|
| X          | US 6,238,348 B1 (CROWLEY et al.) 29 May 2001(29.05.2001), Abstract, Fig. 1B.             | 1-2, 8, 9, 16-18              |
| ---        |                                                                                          | -----                         |
| Y          |                                                                                          | 3-7, 10-14, 19-40             |
| Y          | US 5,773,835 A (SINOFSKY) 30 June 1998 (30.06.1998), Figs. 1-3, columns 1-4.             | 3, 4, 5, 7, 12-14, 19-32, 39  |
| Y          | US 5,304,173 A (KITTRELL et al.) 19 April 1994 (19.04.1994), columns 13-14, lines 66-26. | 6, 10-11, 23-25, 28-29, 32-40 |
| A          | US 6,119,031 A (CROWLEY) 12 September 2000 (12.09/2000), see entire document.            | 1-40                          |
| A          | US 5,844,239 A (KIMURA) 01 December 1998 (1.12.1998), see entire document.               | 1-40                          |
| A          | US 5,127,405 A (ALCALA et al. ) 07 July 1992 (07.07.1992), see entire document.          | 15, 26-27                     |

☐ Further documents are listed in the continuation of Box C.

☐ See patent family 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 application or patent 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

30 September 2002 (30.09.2002)

Date of mailing of the international search report

09 APR 2003

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

Marvin Lateef

Telephone No. (703) 308-0858