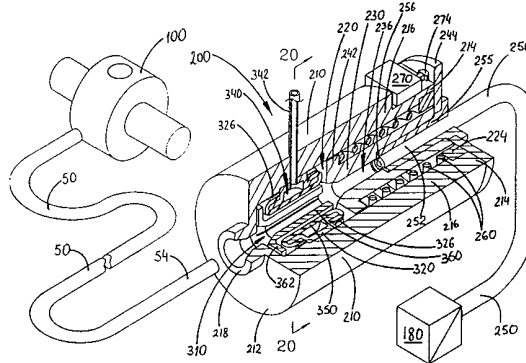
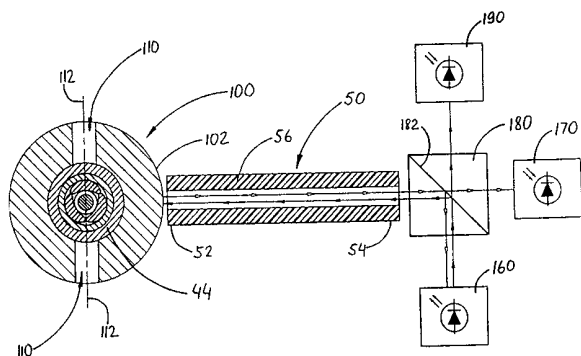




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : A61B 17/22, G01P 3/486	A3	(11) International Publication Number: WO 99/51148 (43) International Publication Date: 14 October 1999 (14.10.99)
(21) International Application Number: PCT/US99/07617 (22) International Filing Date: 7 April 1999 (07.04.99) (30) Priority Data: 09/057,364 8 April 1998 (08.04.98) US (71) Applicant: SHTURMAN CARDIOLOGY SYSTEMS, INC. [US/US]; Suite 2209, 1117 Marquette Avenue, Minneapolis, MN 55403 (US). (72) Inventors: SHTURMAN, Leonid; Suite 2209, 1117 Marquette Avenue, Minneapolis, MN 55403 (US). MOROV, Georgiy; Skakavaya, 152-2-155, Moscow, 125040 (RU). MAL- GICHEV, Vladimir; Kantemizovskaya, 4-3-863, Moscow, 115304 (RU). (74) Agents: HOTCHKISS, Edward, S. et al.; Fredrikson & Byron, P.A., 1100 International Centre, 900 2nd Avenue, Minneapolis, MN 55402-3397 (US).		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, 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), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims</i> <i>and to be republished in the event of the receipt of amendments.</i> (88) Date of publication of the international search report: 6 January 2000 (06.01.00)

(54) Title: ROTATIONAL ATHERECTOMY DEVICE WITH IMPROVED OPTICAL TACHOMETER

**(57) Abstract**

A rotational atherectomy device having an improved optical tachometer which uses a single, monofilament optical fiber to both transmit light from a light source to a light reflector and to return reflected light to a light detector. A fiber optic connector which can be used with such a rotational atherectomy device permits one to releasably optically couple a distal end of an optical fiber to both a light source and a light detector via a beam splitter and a flexible light guide. This fiber optic connector may include a pneumatic clamp which is connected to the same source of compressed gas which drives the prime mover of the rotational atherectomy device.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece			TR	Turkey
BG	Bulgaria	HU	Hungary	ML	Mali	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MN	Mongolia	UA	Ukraine
BR	Brazil	IL	Israel	MR	Mauritania	UG	Uganda
BY	Belarus	IS	Iceland	MW	Malawi	US	United States of America
CA	Canada	IT	Italy	MX	Mexico	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NE	Niger	VN	Viet Nam
CG	Congo	KE	Kenya	NL	Netherlands	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NO	Norway	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	NZ	New Zealand		
CM	Cameroon			PL	Poland		
CN	China	KR	Republic of Korea	PT	Portugal		
CU	Cuba	KZ	Kazakstan	RO	Romania		
CZ	Czech Republic	LC	Saint Lucia	RU	Russian Federation		
DE	Germany	LI	Liechtenstein	SD	Sudan		
DK	Denmark	LK	Sri Lanka	SE	Sweden		
EE	Estonia	LR	Liberia	SG	Singapore		

INTERNATIONAL SEARCH REPORT

International Application No

PCT/JS 99/07617

A. CLASSIFICATION OF SUBJECT MATTER

IPC C A61B17/22 G01P3/486

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 6 A61B G01P

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.
Y	US 5 314 407 A (AUTH ET AL.) 24 May 1994 (1994-05-24) cited in the application column 5, line 61 - column 6, line 33; figure 7 ---	1-7
Y	EP 0 112 143 A (FORD AEROSPACE & COMMUNICATION) 27 June 1984 (1984-06-27) page 1, line 2 - line 3 page 4, line 1 - line 36; figures 1,2 ---	1-7
A	US 5 059 901 A (VAN VOORHIS JAMES B) 22 October 1991 (1991-10-22) column 6, line 14 - line 27; figure 1 ---	3,6,7
A	EP 0 380 810 A (KABUSHIKI KAISHA TOSHIBA) 8 August 1990 (1990-08-08) column 5, line 33 - line 35; figure 1 -----	3,6,7



Further documents are listed in the continuation of box C.



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

"E" earlier document 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

2 August 1999

Date of mailing of the international search report

17.11.1999

Name and mailing address of the ISA

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

Authorized officer

MOERS, R

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 99/ 07617

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:

see additional 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.:

1-7

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 1-7:

Rotational atherectomy device having tachometer comprising optical reflector shaft with a transverse bore.

2.- Claims 8-18:

Fiber optic connector for optical tachometer or rotational atherectomy device having a clamp.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PC 1, US 99/07617

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5314407 A	24-05-1994	AU 7930391 A	12-09-1991
		AU 8114987 A	19-05-1988
		CA 1320889 A	03-08-1993
		DE 3751691 D	14-03-1996
		DE 3751691 T	19-09-1996
		EP 0268228 A	25-05-1988
		JP 1854044 C	07-07-1994
		JP 5060747 B	02-09-1993
		JP 63212339 A	05-09-1988

EP 0112143 A	27-06-1984	JP 59151014 A	29-08-1984

US 5059901 A	22-10-1991	NONE	

EP 0380810 A	08-08-1990	JP 1977662 C	17-10-1995
		JP 2181607 A	16-07-1990
		JP 7006812 B	30-01-1995
		JP 2181608 A	16-07-1990
		JP 2567934 B	25-12-1996
		JP 2184719 A	19-07-1990
		PH 27211 A	04-05-1993
		SG 46494 G	14-10-1994
		US 5057685 A	15-10-1991
