

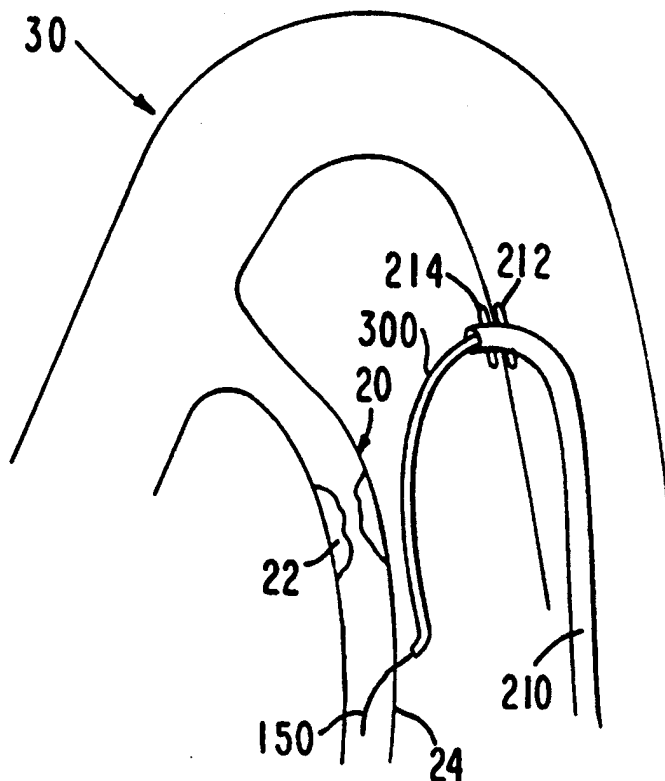


INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : A61F 2/06, A61B 17/32, 17/11, A61M 25/04	A3	(11) International Publication Number: WO 98/19634 (43) International Publication Date: 14 May 1998 (14.05.98)
(21) International Application Number: PCT/US97/20244 (22) International Filing Date: 5 November 1997 (05.11.97) (30) Priority Data: 08/745,618 7 November 1996 (07.11.96) US 08/844,992 23 April 1997 (23.04.97) US (71) Applicant: VASCULAR SCIENCE INC. [US/US]; Suite 202, 701 Decatur Avenue North, Minneapolis, MN 55427 (US). (72) Inventors: SULLIVAN, Daniel, J.; 1245 Oak View Road, Medina, MN 55356 (US). BACHINSKI, Thomas, J.; 19059 Orchard Trail, Lakeville, MN 55044 (US). GOLDSTEEN, David, S.; 4885 East Lake Harriet Parkway, Minneapolis, MN 55409 (US). (74) Agents: JACKSON, Robert, R. et al.; Fish & Neave, 1251 Avenue of the Americas, New York, NY 10020 (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, 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, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, 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: 11 September 1998 (11.09.98)

(54) Title: MEDICAL GRAFTING METHODS AND APPARATUS**(57) Abstract**

Methods and apparatus for delivering and installing a new length of tubing between two sections of a patient's existing body organ tubing and at least partly outside of that existing structure. For example, the new length of tubing may be for the purpose of providing the patient with a coronary bypass. The new tubing may be an artificial graft, a natural graft (harvested elsewhere from the patient), or both. The new tubing is delivered to and installed at the operative site primarily by working through the patient's existing tubular body organ structure. This avoids the need for any significant surgery on the patient.



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	KR	Republic of Korea	PL	Poland		
CN	China	KZ	Kazakstan	PT	Portugal		
CU	Cuba	LC	Saint Lucia	RO	Romania		
CZ	Czech Republic	LI	Liechtenstein	RU	Russian Federation		
DE	Germany	LK	Sri Lanka	SD	Sudan		
DK	Denmark	LR	Liberia	SE	Sweden		
EE	Estonia			SG	Singapore		

INTERNATIONAL SEARCH REPORT

Internal Application No
PCT/US 97/20244

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 A61F2/06 A61B17/32 A61B17/11 A61M25/04

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 A61F A61B A61M

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	US 5 451 204 A (YOON INBAE) 19 September 1995 see column 10, line 13 - column 11, line 56; figures 6-10	57,60-67
A	---	58,59
X	US 5 507 769 A (MARIN MICHAEL L ET AL) 16 April 1996 see column 12, line 57 - column 14, line 13; figures	57,60-68
X	DE 19 54 942 A (TANTRIMUDALIGE ANTHONY DON ET AL.) 6 May 1970 see page 7, paragraph 3; figure 3 --- -/--	57,62, 63,66-68

☒ 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

24 July 1998

Date of mailing of the international search report

04.08.98

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

Neumann, E

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 97/20244

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 96 22745 A (SCHNEIDER USA INC ;INDIANA UNIVERSITY FOUNDATION (US); UNIV JOHNS) 1 August 1996 see page 7, line 6 - page 8, line 14; figures ---	1,43-46, 52,57
A	US 4 418 693 A (LEVEEN ERIC G ET AL) 6 December 1983 see column 3, line 21 - column 4, line 19; figures ---	1,43,44, 47
A	US 4 592 754 A (GUPTA PRADEEP M ET AL) 3 June 1986 see claims; figures ---	1,17,21, 43-46
A	US 5 180 362 A (WORST J G F) 19 January 1993 -----	

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 97/20244

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.: 69-92
because they relate to subject matter not required to be searched by this Authority, namely:
Rule 39.1(iv) PCT - Method for treatment of the human or animal body by surgery
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.:

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

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-51,52-56

Apparatus for making a connection between two tubular body structures comprising a piercing instrument which forms an aperture in each tubular body structure and a conduit which extends via the conduit delivery structure between the two apertures.

2. Claims: 57-68

Apparatus for radially enlarging a structure having two elongated elements which are parallel and movable relative to each other.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 97/20244

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5451204 A	19-09-1995	US 5074840 A	24-12-1991
		US 5374261 A	20-12-1994
		US 5556376 A	17-09-1996
		US 5649902 A	22-07-1997
		US 5755724 A	26-05-1998
		AU 689397 B	26-03-1998
		AU 1002597 A	27-02-1997
		AU 5286298 A	21-05-1998
		AU 672722 B	10-10-1996
		AU 7762894 A	12-01-1995
		AU 667787 B	04-04-1996
		AU 7762994 A	12-01-1995
		AU 676383 B	06-03-1997
		AU 7763094 A	12-01-1995
		AU 651843 B	04-08-1994
		AU 8445191 A	18-02-1992
		CA 2088070 A	25-01-1992
		EP 0540682 A	12-05-1993
		JP 5509024 T	16-12-1993
		KR 9604969 B	18-04-1996
		WO 9201433 A	06-02-1992
		US 5484426 A	16-01-1996
		US 5392787 A	28-02-1995
		US 5514085 A	07-05-1996
		US 5439457 A	08-08-1995
		US 5407423 A	18-04-1995
		US 5599292 A	04-02-1997
		US 5733252 A	31-03-1998
		US 5700239 A	23-12-1997
		US 5613950 A	25-03-1997
		US 5514091 A	07-05-1996
		US 5656013 A	12-08-1997
		US 5730725 A	24-03-1998
-----	-----	-----	-----
US 5507769 A	16-04-1996	AU 3825095 A	06-05-1996
		EP 0786972 A	06-08-1997
		WO 9611648 A	25-04-1996
		US 5695517 A	09-12-1997
-----	-----	-----	-----
DE 1954942 A	06-05-1970	FR 2022045 A	24-07-1970

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 97/20244

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 1954942 A		GB 1288033 A	06-09-1972
		JP 49007273 B	19-02-1974
WO 9622745 A	01-08-1996	US 5591226 A	07-01-1997
		US 5755775 A	26-05-1998
US 4418693 A	06-12-1983	NONE	
US 4592754 A	03-06-1986	NONE	
US 5180362 A	19-01-1993	NONE	