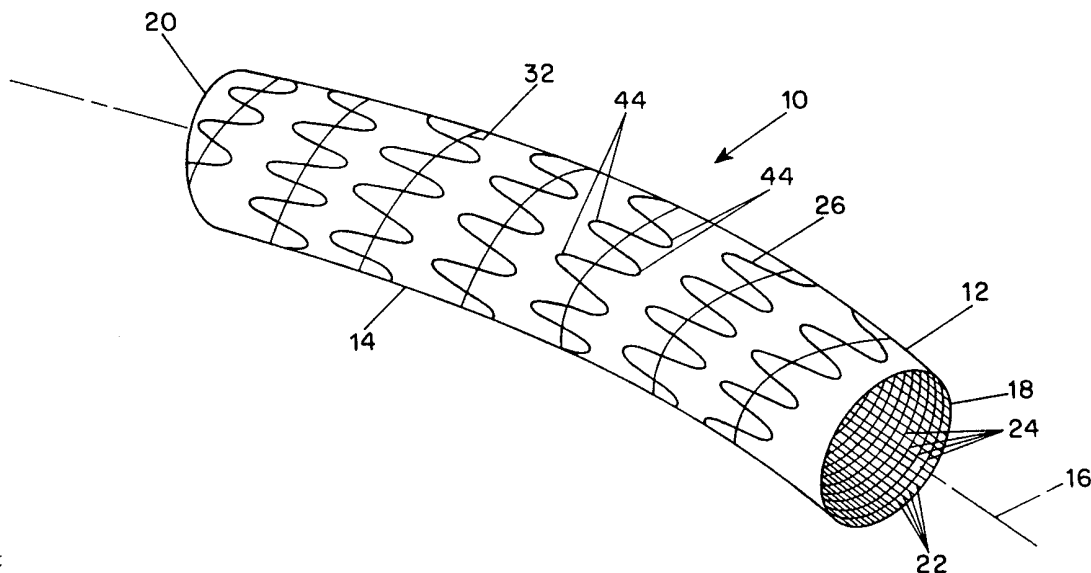




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification <sup>7</sup> : <b>A61F 2/06, D03D 13/00, D03J 5/00</b></p>	<p><b>A3</b></p>	<p>(11) International Publication Number: <b>WO 00/09059</b> (43) International Publication Date: 24 February 2000 (24.02.00)</p>
<p>(21) International Application Number: PCT/US99/17646 (22) International Filing Date: 4 August 1999 (04.08.99) (30) Priority Data: 09/134,192 14 August 1998 (14.08.98) US (71) Applicant: PRODESCO, INC. [US/US]; 700 Park Avenue, Perkasio, PA 18944 (US). (72) Inventor: GREENHALGH, E., Skott; 7943 Pleasant Avenue, Wyndmor, PA 19038 (US). (74) Agent: BERKLEY, Richard, G.; Baker &amp; Botts, LLP, 30 Rockefeller Plaza, New York, NY 10112-0228 (US).</p>	<p>(81) Designated States: AU, CA, JP, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).  <b>Published</b> <i>With international search report.</i> (88) Date of publication of the international search report: 29 June 2000 (29.06.00)</p>	

(54) Title: WOVEN STENT/GRAFT STRUCTURE



(57) Abstract

A combined stent/graft structure for repair of a body tube in a living body. The structure includes a textile graft adapted to enhance fluid integrity of the body tube and a stent expandable between a first position permitting easy insertion of the stent into the body tube and a second position wherein the stent presses securely against the inside surface of the body tube. The stent includes a first elongate wire-shaped stent member with both a stent member global axis and a stent member local axis, and is integrally secured to the graft by at least one graft yarn of which the graft is formed. Substantial portions of the first stent member global axis form a non-orthogonal angle with the graft main portion axis when projected into a plane containing the graft main portion axis. This permits repeatable, reliable manufacturing and allows the stent member to extend over substantially the whole length of the structure to provide uniform flexural properties and support throughout. Embodiments wherein the first stent member global axis forms an orthogonal angle with the graft main portion axis are also contemplated. A method of forming a textile with an undulating wire is also provided. Further, a woven textile is also part of the invention as is a method of manufacturing such a woven textile, which can be used to produce stent/graft structures according to the invention. Inventive weaving shuttles suitable for manufacturing structures in accordance with the invention are also set forth. Methods utilizing shape-memory stent members for ease in manufacturing are also disclosed.

**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	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakistan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LJ	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 99/17646

**A. CLASSIFICATION OF SUBJECT MATTER**  
 IPC 7 A61F2/06 D03D13/00 D03J5/00

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 A61F D03D D03J

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	WO 92 16166 A (ALBANY RESEARCH) 1 October 1992 (1992-10-01)	31-33, 38
Y	the whole document	1-6, 20, 23-27, 34-37
Y	WO 97 21403 A (PROGRAFT MEDICAL, INC.) 19 June 1997 (1997-06-19)	1-6, 20, 23-27, 34-37
A	the whole document	28
A	WO 97 25002 A (MEDTRONIC, INC.) 17 July 1997 (1997-07-17) the whole document	1, 17, 21
A	EP 0 263 392 A (MEIDAI CHEMICAL CO.) 13 April 1988 (1988-04-13) the whole document	39, 46
	-/--	

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.
- \*Z\* document member of the same patent family

Date of the actual completion of the international search

17 April 2000

Date of mailing of the international search report

26.04.2000

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

Boutelegier, C

# INTERNATIONAL SEARCH REPORT

International Application No  
 PCT/US 99/17646

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 536 735 A (D.I.M.A. RICERCHE TECNOLOGISCHE S.R.L.) 14 April 1993 (1993-04-14) the whole document ----	39,46
A	GB 935 908 A (IMATEX) 4 September 1963 (1963-09-04) figures 1,2,5 ----	47,48
A	DE 144 171 C (TOBLER) 23 September 1902 (1902-09-23) the whole document -----	47,53

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US 99/17646

## 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.:

### 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/US 99/17646

**FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210**

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

1. Claims: 1-46,58-66

1.1 Claims 1-30,58-62 : A combined stent/graft tubular structure and method of forming a textile.

1.2 Claims 31-38,63,64 : A woven textile.

1.3 Claims 39-46,65,66 : A method of forming a woven textile.

2. Claims: 47-57

A weaving shuttle

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 99/17646

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9216166      A	01-10-1992	AT 152597 T	15-05-1997
		AU 658176 B	06-04-1995
		AU 1422992 A	21-10-1992
		CA 2106971 A, C	26-09-1992
		DE 69219593 D	12-06-1997
		DE 69219593 T	02-01-1998
		EP 0576517 A	05-01-1994
		FI 934176 A	17-11-1993
		IE 71172 B	29-01-1997
		JP 2749447 B	13-05-1998
		JP 6506369 T	21-07-1994
		MX 9201330 A	30-06-1994
		NO 933419 A	24-09-1993
		PT 100297 A	29-04-1994
US 5697969 A	16-12-1997		
WO 9721403      A	19-06-1997	AU 1413897 A	03-07-1997
		CA 2246157 A	19-06-1997
		EP 0866678 A	30-09-1998
		JP 11509130 T	17-08-1999
		US 6042605 A	28-03-2000
WO 9725002      A	17-07-1997	US 5843158 A	01-12-1998
		EP 0955954 A	17-11-1999
EP 263392      A	13-04-1988	JP 63092751 A	23-04-1988
		AT 99744 T	15-01-1994
		DE 3788697 D	17-02-1994
		DE 3788697 T	28-04-1994
EP 536735      A	14-04-1993	IT 1251683 B	19-05-1995
		AT 145439 T	15-12-1996
		DE 69215324 D	02-01-1997
		DE 69215324 T	12-06-1997
		JP 6101135 A	12-04-1994
		US 5351722 A	04-10-1994
GB 935908      A		NONE	
DE 144171      C		NONE	