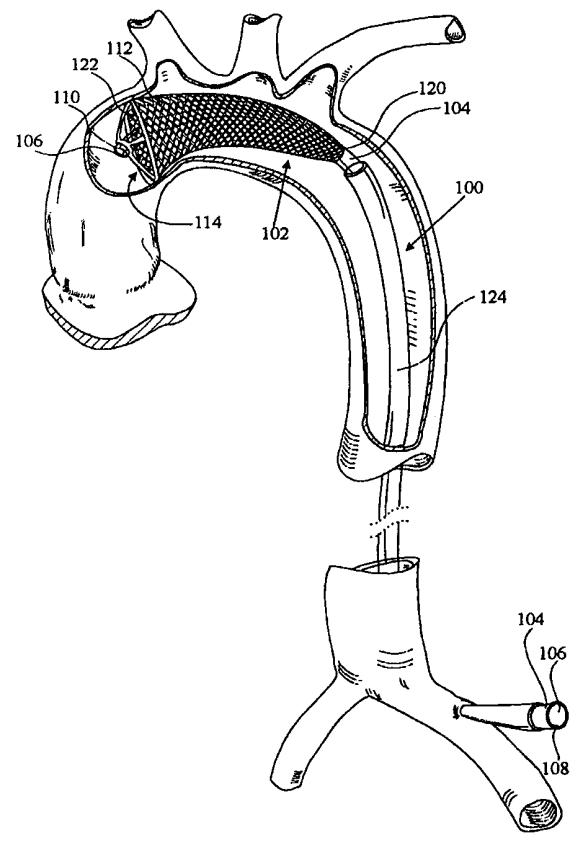


INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification ⁶ : A61F 2/01, A61B 17/22</p>	<p>A3</p>	<p>(11) International Publication Number: WO 99/16382</p> <p>(43) International Publication Date: 8 April 1999 (08.04.99)</p>
<p>(21) International Application Number: PCT/US98/19777</p> <p>(22) International Filing Date: 23 September 1998 (23.09.98)</p> <p>(30) Priority Data: 60/060,117 26 September 1997 (26.09.97) US</p> <p>(71) Applicant (for all designated States except US): CARDEON CORPORATION [US/US]; 10161 Bubb Road, Cupertino, CA 95014 (US).</p> <p>(72) Inventors; and (75) Inventors/Applicants (for US only): MACOVIAK, John, A. [US/US]; 1167 Avenida Amantea, La Jolla, CA 92037 (US). LEARY, James, J. [US/US]; 823 Poplar Avenue, Sunnyvale, CA 94086 (US). SAMSON, Wilfred, J. [US/US]; 19691 Farwell Avenue, Saratoga, CA 95070 (US).</p> <p>(74) Agent: HANKE, Gunther; Fulwider Patton Lee & Utecht, LLP, Suite 1550, 200 Oceangate, Long Beach, CA 90802 (US).</p>		<p>(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, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, 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).</p> <p>Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i></p> <p>(88) Date of publication of the international search report: 5 August 1999 (05.08.99)</p>
<p>(54) Title: PERFUSION FILTER CATHETER</p>		
<p>(57) Abstract</p>		
<p>A perfusion filter catheter is used to capture potential emboli within the aorta during heart surgery and cardiopulmonary bypass. An expandable embolic filter assembly having fine filter mesh for capturing macroemboli and microemboli is mounted on a catheter shaft having a perfusion lumen with perfusion ports located upstream of the filter. The embolic filter assembly can be actively or passively deployed within the ascending aortic. An optional outer tube covers the embolic filter assembly to prevent premature deployment. Radiopaque markers, sonoreflective markers and/or an aortic transillumination system are provided to monitor the position of the catheter and the deployment state of the embolic filter assembly. The embolic filter assembly is configured to maximize the effective filter surface area when deployed. Embolic filter assembly configurations described include an elongated cone, a frustum of a cone, a trumpet-shape, a modified trumpet-shape, and helically, circumferentially and longitudinally convoluted shapes, as well as configurations having standoff members for centering the filter and holding the filter mesh away from the aortic walls when deployed. Oxygenated blood is perfused through the perfusion lumen and any embolic materials that might be dislodged are captured in the deployed embolic filter assembly. Embodiments are also described that combine the perfusion filter catheter with an aortic occlusion device, which may be a toroidal balloon, an expandable balloon or a selectively deployable external catheter flow control valve. The combined device allows percutaneous transluminal administration of cardiopulmonary bypass and cardioplegic arrest with protection from undesirable embolic events.</p>		

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 98/19777

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 A61F2/01 A61B17/22

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

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 ^o	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 97 17100 A (EMBOL X INC) 15 May 1997 see page 20, line 1 - line 32; claims 1-5; figures see page 23, line 9 - page 26, line 2 see page 14, line 14 - line 35 ---	1-7, 18-23
X	US 5 662 671 A (PASTRONE GIOVANNI ET AL) 2 September 1997 see column 10, line 29 - line 49; figures ---	1-5,7, 18-21,25
A	---	26
X	WO 96 01591 A (MICROVENA CORP) 25 January 1996 see page 17, line 12 - line 22; figures see page 7, line 10 - line 26 ---	1,2,6,7, 9,11,13
	-/--	

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

^o Special categories of cited documents :

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"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

4 June 1999

Date of mailing of the international search report

14. 06. 1999

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 98/19777

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 195 09 464 C (JAEGER HORST J DR MED) 27 June 1996 see column 2, line 42 - line 64; figures	1,2,13
A	---	3-7
X	US 5 053 008 A (BAJAJ SANDEEP) 1 October 1991 see column 7, line 55 - line 58; figure 2	32
A	---	40
X	US 4 710 192 A (LIOTTA DOMINGO S ET AL) 1 December 1987 see column 1, line 59 - column 2, line 17; figures	32
A	---	
A	US 5 370 647 A (GRABER JOHN N ET AL) 6 December 1994 see column 7, line 4 - line 35; figures 10-12	32,33
A	FR 2 567 405 A (LEFEBVRE JEAN MARIE) 17 January 1986 -----	

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 98/19777

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.: 42-45
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: 1-31

Perfusion filter catheter comprising a catheter shaft and a porous filter mesh having a filter surface area which is at least twice as big as its expanded cross-section inlet area.

2. Claims: 32-41

Perfusion filter catheter comprising a catheter shaft and an filter assembly comprising a porous filter mesh and means for holding said filter mesh away from the inner wall of the aorta when the filter assembly is in its expanded state.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 98/19777

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