US005425723A

United States Patent [19]

Wang

[11] Patent Number: 5,425,723

[45] Date of Patent: Jun. 20, 1995

[54] **INFUSION CATHETER WITH UNIFORM DISTRIBUTION OF FLUIDS**

[75] Inventor: **James C. Wang**, Norton, Mass.

[73] Assignee: **Boston Scientific Corporation**, Watertown, Mass.

[21] Appl. No.: **179,507**

[22] Filed: **Dec. 30, 1993**

[51] **Int. Cl.**[6] **A61M 25/00**

[52] **U.S. Cl.** **604/280**; 604/264; 138/114

[58] **Field of Search** 604/29, 39, 43, 48, 604/246, 247, 258, 264, 275, 280; 137/844, 845, 849; 138/111, 114, 118

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,384,089	5/1968	Shriner	604/247
3,426,544	2/1969	Curtis .	
3,601,320	8/1971	Du Plessis	138/114 X
3,698,195	10/1972	Chapin	61/12
4,318,402	3/1982	Vaillancourt	604/280
4,927,418	5/1990	Dake et al.	604/264
4,961,731	10/1990	Bodicky et al.	604/264
4,968,306	11/1990	Huss et al.	604/264
4,968,307	2/1991	Dake et al.	604/264
4,995,865	2/1991	Gahara et al.	604/43
5,021,044	6/1991	Sharkawy	604/53

OTHER PUBLICATIONS

S. Mehta et al., "Rational Approach to Intracoronary Thrombolyis," *J. Invasive Cardiology* 4[6] Jul./Aug. 1992, pp. 306–311.

S. L. Kaufman et al., "Urokinase Thrombolysis Using a Multiple Side Hole Multilumen Infusion Catheter," Cardiovasc Intervent Radiol (1991) 14:334–337.

"The Unique Delivery System", Brochure, Peripheral Systems Group, ACS Co., 1989 (3 pp.).

"A Multiple-Flow Catheter with Multiple Advantages," Brochure, Mallinckrodt, undated (1 p.).

"McNamara Coaxial Catheter Infusion Set", Brochure, Cook, undated (2 pp.).

"Pulse* Spray Pulsed Infusion System", Brochure, Angiodynamics, E-Z-EM, Inc. (Nov. 91) (3 pp.).

"Pulse* Spray Pulsed Infusion System", Brochure, Angiodynamics, E-Z-EM, Inc., undated (28 pp.).

Hicks et al., "Multilevel Infusion Catheter for Use with Thrombolytic Agents," *J. Vascular & Interventional Radiology 2* [1] Feb. 1991, pp. 73–75.

Primary Examiner—Corrine Maglione

Attorney, Agent, or Firm—Frances P. Craig

[57] **ABSTRACT**

An infusion catheter including an elongated catheter body, and an infusion section at its distal end for delivery of therapeutic fluid to bodily passages. The infusion section includes an outer tube and an inner tube concentric with the outer tube, each tube having a multiplicity of ports therethrough. The inner tube delimits a central, fluid delivery lumen. The inner tube is uniformly spaced apart from the outer tube to provide an annular passageway, the radial depth of the passageway being sufficient to permit fluid flow therewithin. Each of the ports through the outer tube provides fluid communication between the annular passageway and the exterior of the catheter, while each of the ports through the inner tube provides fluid communication between the central lumen and the annular passageway. Thus, therapeutic fluid can flow from the central lumen through the annular passageway to the catheter exterior. The catheter provides a uniform average flow rate of therapeutic fluid along the length of the infusion section by (a) providing a higher ratio of inner tube ports to outer tube ports in the distal portion than in the proximal portion of the infusion section, and/or (b) positioning the inner tube ports and outer tube ports relative to one another so that the average fluid flow distance in the annular passageway between the inner tube ports and the outer tube ports is smaller in the distal portion than in the proximal portion of the infusion section.

10 Claims, 3 Drawing Sheets