

US005683382A

United States Patent [19]

Lenihan et al.

Patent Number: [11]

5,683,382

Date of Patent: [45]

Nov. 4, 1997

OTHER PUBLICATIONS [54] MICROWAVE ANTENNA CATHETER

[75] Inventors: Timothy J. Lenihan, Reading, Pa.; Kenneth L. Carr, Harvard; Mark Guetersloh, Bedford, both of Mass.

[73] Assignees: Arrow International Investment Corp., Reading, Pa.; Microwave

Medical Systems, Acton, Mass. [21] Appl. No.: 440,716

[22] Filed: May 15, 1995 [51] Int. Cl.⁶ A61N 5/02

[52] **U.S. Cl.** **606/33**; 607/101; 607/156 Field of Search 606/33; 607/101, [58]

607/102, 154, 156, 113; 29/825, 828

References Cited [56]

4 020 510 7/1077 T----

U.S. PATENT DOCUMENTS

4,038,519	7/1977	Fomeras.	
4,154,246	5/1979	LeVeen .	
4,156,429	5/1979	Amundson .	
4,202,336	5/1980	van Gerven.	
4,346,715	8/1982	Gammell .	
4,346,716	8/1982	Carr.	
4,448,198	5/1984	Turner .	
4,557,272	12/1985	Carr.	
4,583,556	4/1986	Hines et al	
4,641,649	2/1987	Walinsky et al	
4,643,186	2/1987	Rosen et al	
4,825,880	5/1989	Stauffer et al	
4,924,863	5/1990	Sterzer .	
4,945,912	8/1990	Langberg.	
4,979,510	12/1990	Franz et al	
5,150,717	9/1992	Rosen et al	
5,254,088	10/1993	Lundquist et al	
5,257,451	11/1993	Edwards et al	
5,273,535	12/1993	Edwards et al	
5,275,162	1/1994	Edwards et al	
5,281,217	1/1994	Edwards et al	
5,293,869	3/1994	Edwards et al	
5,370,677	12/1994	Rudie et al	607/156

FOREIGN PATENT DOCUMENTS

2027594 2/1980 United Kingdom.

"Production of Reversible and Irreversible Atrio-Ventricular

Block by Microwave Energy." Beckman, Wang, et al. "Percutaneous Ablation of the Atrioventricular Junction With a Helical Microwave Antenna: A Novel Means of Coupling Energy to the Endocardium." Langberg, Chin, et

"Microwave Ablation of Ventricular Mycardium: The Effects of Varying Duration on Lesion Volume," Cohen, Coggins, et al.

"Efficacy of Microwave Energy for Ventricular Ablation" Coggins, Cain, et al.

"What is the Radial Temperature Profile Achieved During Microwave Catheter Ablation With a Helical Coil Antenna in Canine Myocardium?" Haines and Whayne.

"Comparison of Thermal Profiles Produced by New Antenna Designs For Microwave Catheter Ablation," Whayne & Haines.

"The Effect of Antenna Design and Microwave Frequency on Tissue Temperature Profiles during Microwave Catheter Ablation in vitro," Whayne, Nath, et al.

"What is the Isotherm and Time Course of Lesion Formation in Microwave versus Radiofrequency Catheter Ablation?" Whayne, Nath, et al.

"Application of Ultrasound Energy for Intracardiac Ablation of Arrhythmias." He, Zimmer, et al.

"Delivery of Radiofrequency Energy to all Four Poles of a Catheter Increases Lesion Size," Mackey, He, et al.

"A New Radiofrequency-Powered, Thermal Balloon Catheter for Ablation of Bypass Tracts Via the Coronary Sinus." Fram, Berns, et al.

(List continued on next page.)

Primary Examiner-Lee S. Cohen Attorney, Agent, or Firm-Amster Rothstein Ebenstein

ABSTRACT

A helical antenna, which is matched to the desired microwave frequency of 915 MHz, comprises a helix having a linear length which is in the range of 74 to 112 mm or a non-zero integer multiple thereof, and which delivers microwave energy in an optimal heating pattern with little reflected power.

7 Claims, 4 Drawing Sheets

