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(54) **MULTI-LEAD MULTI-ELECTRODE MANAGEMENT SYSTEM**

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(52) **U.S. Cl.**

CPC ***A61N 1/05*** (2013.01); ***A61B 5/04001*** (2013.01); ***A61B 5/4029*** (2013.01); ***A61B 5/6877*** (2013.01); ***A61N 1/0558*** (2013.01); *A61B 5/4076* (2013.01); *A61B 5/6839* (2013.01); *A61B 2562/0209* (2013.01); *A61B 2562/18* (2013.01); *A61B 2562/245* (2013.01); *Y10T 29/49208* (2015.01)

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See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,699,956	A	10/1972	Kitrilakis et al.	
4,934,368	A	6/1990	Lynch	
5,690,691	A	11/1997	Chen et al.	
5,871,530	A *	2/1999	Williams et al.	607/122
6,038,472	A *	3/2000	Williams et al.	607/5
6,178,355	B1 *	1/2001	Williams et al.	607/122
6,281,262	B1 *	8/2001	Shikinami	A61B 17/846 264/230
6,505,075	B1	1/2003	Weiner	
6,999,819	B2 *	2/2006	Swoyer	A61N 1/0558 607/117
7,967,817	B2	6/2011	Anderson et al.	
7,983,755	B2	7/2011	Starkebaum et al.	

(Continued)

FOREIGN PATENT DOCUMENTS

AT	330342	B	6/1976
DE	2437346	A1	2/1975

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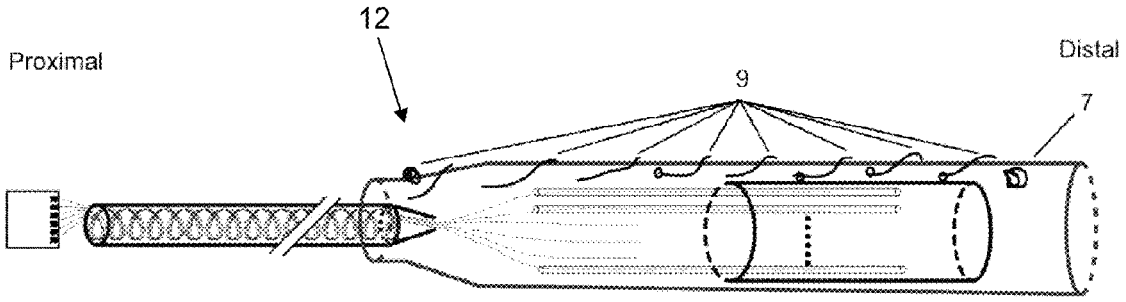
(57) **ABSTRACT**

A multi-lead multi-electrode system and method of manufacturing the multi-lead multi-electrode system includes a multi-electrode lead that may be used to deploy multiple separable electrodes to different spaced apart contact sites, such as nerve or muscle tissues, for example, that are spatially distributed over a large area.

15 Claims, 11 Drawing Sheets