



(12) **United States Patent**  
**Hall et al.**

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(54) **BENDABLE CATHETER ARMS HAVING VARIED FLEXIBILITY**

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(58) **Field of Classification Search**  
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See application file for complete search history.

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(56) **References Cited**

U.S. PATENT DOCUMENTS

4,940,064	A	7/1990	Desai	
5,345,936	A	9/1994	Pomeranz et al.	
5,400,783	A	3/1995	Pomeranz et al.	
5,411,025	A	5/1995	Webster, Jr.	
5,465,717	A *	11/1995	Imran	..... <i>A61B 5/0422</i> 600/374
5,471,982	A	12/1995	Edwards et al.	

(Continued)

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FOREIGN PATENT DOCUMENTS

WO	9634560	A1	11/1996
WO	2006058251	A2	6/2006
WO	2008141150	A2	11/2008

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(51) **Int. Cl.**

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<i>A61B 18/00</i>	(2006.01)

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(57)

**ABSTRACT**

In various embodiments, a catheter comprising an expandable electrode assembly or basket is provided. In specific embodiments, the basket is particularly useful for mapping electrical activity at one or more locations within the heart. The basket can comprise a plurality of bendable or deflectable arms. At least one of the arms may have varied flexibility over its length in the form of one or more discontinuities of stiffness or flexibility at an elbow region or other variances in flexibility over the arm's length. Such variance in flexibility may allow the arm to assume a different bent configuration or respond to external factors more positively than possible with an arm having a static or near static flexibility or stiffness over its length.

**17 Claims, 14 Drawing Sheets**

