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

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(54) **METHODS AND SYSTEMS FOR USING  
RESONANT ACOUSTO-EM ENERGY AND  
ACOUSTO-EM SIGNATURES TO DISRUPT  
BIOLOGIC STRUCTURES**

(58) **Field of Classification Search** ..... 73/579;  
600/427, 429, 439; 601/2, 3, 4; 607/97,  
607/51; 604/22; 435/173.1, 173.7  
See application file for complete search history.

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(56) **References Cited**

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U.S. PATENT DOCUMENTS

(\*) Notice: Subject to any disclaimer, the term of this  
patent is extended or adjusted under 35  
U.S.C. 154(b) by 0 days.

- 4,216,766 A \* 8/1980 Duykers et al. .... 600/586
- 4,315,514 A \* 2/1982 Drewes et al. .... 600/427
- 4,803,995 A \* 2/1989 Ishida et al. .... 600/439
- 5,908,444 A \* 6/1999 Azure ..... 607/88
- 6,156,549 A \* 12/2000 Drewes et al. .... 435/173.7
- 6,622,731 B2 \* 9/2003 Daniel et al. .... 128/898
- 7,416,535 B1 \* 8/2008 Kenny ..... 601/2

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FOREIGN PATENT DOCUMENTS

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- EP 324948 A \* 7/1989
- JP 06098917 A \* 4/1994
- WO WO 98/55605 \* 12/1998

(65) **Prior Publication Data**

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\* cited by examiner

**Related U.S. Application Data**

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(57) **ABSTRACT**

(51) **Int. Cl.**

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- C12N 13/00* (2006.01)
- A61B 17/225* (2006.01)
- A61N 5/00* (2006.01)
- A61N 2/00* (2006.01)

The present invention makes use of resonant acousto-EM energy (alone or in combination with resonant acoustic energy) applied to biologic structures for the disruption of at least one function of the biologic structure. In particular, the invention provides methods of generating acousto-EM energy in biologic structures such as virus, bacteria, fungi, worms and tumors for the disruption of these structures.

(52) **U.S. Cl.** ..... 73/579; 601/2; 435/173.1;  
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**48 Claims, 28 Drawing Sheets**

