



(12) **United States Patent**  
**Brooks**

(10) **Patent No.:** **US 7,349,556 B2**  
(45) **Date of Patent:** **Mar. 25, 2008**

(54) **GENERATION AND DETECTION OF INDUCED ACOUSTIC ENERGY USING ELECTRIC OR MAGNETIC ENERGY**

(75) Inventor: **Juliana H. J. Brooks**, Columbus, OH (US)

(73) Assignee: **GR Intellectual Reserve, LLC**, Havre de Grace, MD (US)

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

(21) Appl. No.: **10/152,187**

(22) Filed: **May 20, 2002**

(65) **Prior Publication Data**  
US 2003/0133596 A1 Jul. 17, 2003

**Related U.S. Application Data**  
(62) Division of application No. 09/151,581, filed on Sep. 11, 1998, now Pat. No. 6,507,662.

(51) **Int. Cl.**  
**G06K 9/00** (2006.01)

(52) **U.S. Cl.** ..... **382/115**

(58) **Field of Classification Search** ..... 382/115, 382/118, 128; 902/3-6; 235/379, 380, 381, 235/382; 73/579, 585, 587; 600/559; 128/746, 128/920, 630, 647, 660.01; 340/5.53, 5.83  
See application file for complete search history.

(56) **References Cited**

**U.S. PATENT DOCUMENTS**

4,385,634 A 5/1983 Bowen  
5,868,682 A \* 2/1999 Combs et al. .... 600/559  
6,460,413 B1 10/2002 Diebold  
6,645,144 B1 11/2003 Wen et al.

**OTHER PUBLICATIONS**

Digital image processing, by Gregory Baxes (p. 218-219) 1994.\*  
H. Wen and R.S. Balaban, "The Potential for Hall Effect Breast Imaging", *Breast Disease* 10(3,4) IOS Press (1998) pp. 191-195.  
H. Wen and R.S. Balaban, "Ultrasonic imaging of the electroacoustic effect in macromolecular gels", *Ultrasonic imaging* Oct. 1998; 20(4): pp. 288-297.  
H. Wen, J. Shah and R. Balaban, "Hall Effect Imaging", *IEEE Transactions on Biomedical Engineering*, 45(1) Jan. 1998; pp. 119-124.

\* cited by examiner

*Primary Examiner*—Vikkram Bali  
(74) *Attorney, Agent, or Firm*—Mark G. Mortenson

(57) **ABSTRACT**

A method and apparatus for detecting electric and/or magnetic properties of an individual living organism injects electric and/or magnetic energy into the organism and detects acoustic energy which represents the electric and/or magnetic properties of the organism.

**20 Claims, 50 Drawing Sheets**

