



US006981417B1

(12) **United States Patent**  
**Oravec**

(10) **Patent No.:** **US 6,981,417 B1**  
(45) **Date of Patent:** **Jan. 3, 2006**

(54) **SCANNING ACOUSTIC MICRO IMAGING METHOD AND APPARATUS FOR NON-RECTANGULAR BOUNDED FILES**

(75) Inventor: **Michael G. Oravec**, Naperville, IL (US)

(73) Assignee: **Sonoscan, Inc.**, Elk Grove Village, IL (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.: **10/423,450**

(22) Filed: **Apr. 25, 2003**

**Related U.S. Application Data**

(60) Provisional application No. 60/376,042, filed on Apr. 26, 2002.

(51) **Int. Cl.**  
**G01N 29/06** (2006.01)

(52) **U.S. Cl.** ..... **73/619**; 73/621; 73/612; 73/614; 73/629; 73/633; 73/634

(58) **Field of Classification Search** ..... 73/602, 73/606, 607, 609, 612, 614, 618, 619, 620, 73/621, 624, 625, 626, 627, 628, 629, 631, 73/633, 634, 640

See application file for complete search history.

(56) **References Cited**

**U.S. PATENT DOCUMENTS**

- 3,496,764 A \* 2/1970 Stouffer ..... 600/445
- 4,131,021 A \* 12/1978 Mezrich et al. .... 73/606
- 4,518,992 A 5/1985 Kessler et al. .... 348/163
- 4,781,067 A 11/1988 Cichanski ..... 73/620
- 4,866,986 A 9/1989 Cichanski ..... 73/600
- 5,331,962 A \* 7/1994 Coleman et al. .... 600/444
- 5,372,042 A \* 12/1994 Jarman et al. .... 73/588
- 5,408,881 A \* 4/1995 Piche et al. .... 73/582
- 5,600,068 A 2/1997 Kessler et al. .... 73/620
- 5,627,320 A \* 5/1997 Moore ..... 73/606

- 5,684,252 A 11/1997 Kessler et al. .... 73/618
- 6,055,861 A \* 5/2000 Banta et al. .... 73/626
- 6,122,223 A \* 9/2000 Hossack ..... 367/11
- 6,357,136 B1 3/2002 Erickson et al. .... 34/60
- 6,374,675 B1 4/2002 DePetrillo ..... 73/610
- 6,460,414 B1 10/2002 Erickson et al. .... 73/603
- 6,500,118 B1 12/2002 Hashimoto ..... 600/437
- 2002/0058871 A1 5/2002 Oravec et al. .... 600/437
- 2003/0023393 A1 1/2003 Oravec ..... 702/39
- 2004/0149021 A1 8/2004 Kessler et al. .... 73/105

**FOREIGN PATENT DOCUMENTS**

JP 55072855 A \* 6/1980

(Continued)

**OTHER PUBLICATIONS**

Brouchure of Sonoscan, Inc., Sonomicroscope System 3100 C-Mode Scanning Acoustic Microscope (C-SAM), six (6) pages; Copyright 1988 Sonoscan, Inc.

(Continued)

*Primary Examiner*—Hezron Williams  
*Assistant Examiner*—Rose M. Miller  
(74) *Attorney, Agent, or Firm*—Welsh & Katz, Ltd.

(57) **ABSTRACT**

Method and implementing apparatus useful in acquiring data on acoustic features within a sample provides a pulsed acoustic probe and a stage system for effecting relative movement between the sample and the probe. The stage system is commanded such that the probe interrogates a non-rectangularly bounded space on the sample surface or within the volume of the sample. Acoustic energy reflected from or transmitted through the sample is sensed. Amplitude signals are developed from the sensed acoustic energy. Data characterizing the developed amplitude signals are stored for subsequent processing.

**16 Claims, 29 Drawing Sheets**

