



US006550329B2

(12) **United States Patent**
Watson

(10) **Patent No.:** **US 6,550,329 B2**
(45) **Date of Patent:** **Apr. 22, 2003**

- (54) **HIGH Q ANGULAR RATE SENSING GYROSCOPE**
- (75) Inventor: **William S. Watson**, Eau Claire, WI (US)
- (73) Assignee: **Watson Industries, Inc.**, Eau Claire, WI (US)
- (*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 196 days.

(58) **Field of Search** 73/504.13

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,151,964 A * 11/2000 Nakajima 73/504.13

* cited by examiner

Primary Examiner—Richard A. Moller

(74) *Attorney, Agent, or Firm*—Moore & Hansen

(57) **ABSTRACT**

A structure and arrangement for improving the accuracy and efficiency of an angular rate sensing gyroscope is herein disclosed. Voltage pick-off conductors are applied to an area of the surface of a resonating element of an angular rate sensing gyroscope that is subject to substantially zero stress when the gyroscope is rotationally stationary. Actuator conductors are similarly applied to a resonating element at a location bounded by areas of the resonating element subject to substantially uniform levels of stress when the gyroscope is rotationally stationary. A method for improving the voltage response of a piezoelectric resonating element is also disclosed.

- (21) Appl. No.: **09/880,433**
- (22) Filed: **Jun. 13, 2001**
- (65) **Prior Publication Data**
US 2001/0042403 A1 Nov. 22, 2001

Related U.S. Application Data

- (62) Division of application No. 09/397,718, filed on Sep. 16, 1999, now Pat. No. 6,272,925.
- (51) **Int. Cl.**⁷ **G01C 19/00**
- (52) **U.S. Cl.** **73/504.13**

4 Claims, 8 Drawing Sheets

