



US005440817A

United States Patent [19]

[11] Patent Number: **5,440,817**

Watson et al.

[45] Date of Patent: **Aug. 15, 1995**

[54] VERTICAL REFERENCE AND ATTITUDE SYSTEM

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[21] Appl. No.: **64,225**

[22] Filed: **May 19, 1993**

[51] Int. Cl.⁶ **G01C 9/06**

[52] U.S. Cl. **33/366; 73/1 E; 73/488**

[58] Field of Search **33/366, 304, 313, 365, 33/391; 73/1 E, 505; 364/559, 571.01, 709.11**

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[57] ABSTRACT

The present invention provides a vertical reference that includes sensors providing signals indicative of angular tilt from the predetermined reference axis and the rate of angular tilt; an integrator to integrate the angular rate signal to provide a dynamic angular tilt signal; a pendulum to provide a signal indicative of angular displacement relative to the predetermined axis; a first amplifier for filtering and amplifying the dynamic angular tilt signal and the angular displacement signal to produce a first amplified signal; a second amplifier for filtering and amplifying the dynamic angular tilt signal and the angular displacement signal to produce a second amplified signal; and a dual input amplifier for combining and amplifying the first and second amplified signals to produce an output signal indicative of vertical reference and attitude. In another embodiment of the present invention a vertical reference apparatus includes a cascaded second-order filter or control loop having a first second-order loop that receives its inputs from the pendulum and the angular rate sensor and a second second-order loop that receives as its inputs the output signal of the first loop and the angular rate sensor. The output of the second loop is provided to a control system for the structure whose orientation is desired to be measured or stabilized. In this alternative embodiment of the present invention each control loop includes a summing amplifier, a summing damped integrator, an inverting amplifier, and an integrator.

19 Claims, 5 Drawing Sheets

