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US005475651A

United States Patent [19]

Bishop et al.

[11] **Patent Number: 5,475,651**

[45] **Date of Patent: Dec. 12, 1995**

[54] **METHOD FOR REAL-TIME EXTRACTION OF OCEAN BOTTOM PROPERTIES**

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[21] Appl. No.: **330,142**

[22] Filed: **Oct. 18, 1994**

[51] **Int. Cl.**[6] **G01S 15/89**

[52] **U.S. Cl.** **367/88**; 367/131; 367/124

[58] **Field of Search** 367/88, 131, 135, 367/117, 124; 364/423, 923.4

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,965,732 10/1990 Roy, III et al. 367/124

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[57] **ABSTRACT**

A method for characterizing ocean bottom properties in real-time by exploiting the multipath structure of reverberation to extract values for bottom loss and the bottom scattering coefficient. The bottom parameters are extracted from a measured reverberation energy envelope generated from the reverberation returns of one or more pings from a sonar system. The measured reverberation envelope is compared to a reference reverberation model to identify a period of time in which the measured reverberation energy envelope exhibits properties that allow the extraction of bottom parameters. The bottom parameters are then extracted by direct comparison of the measured reverberation to the reference reverberation model within the time period or by iteratively changing the value of bottom loss or bottom scatter coefficient and recalculating the reference reverberation for the identified time period until the reference reverberation matches the representative reverberation. The accuracy of the reference reverberation model is maintained by continuously monitoring the current sonar state configuration and the current environmental parameters including bottom depth, sound speed profile, and wind speed and rebuilding the model should either the sonar configuration or the environmental parameters change in a manner which would cause a change in the model.

11 Claims, 5 Drawing Sheets