

78034



US005781508A

# United States Patent [19]

[11] Patent Number: **5,781,508**

**Peloquin**

[45] Date of Patent: **Jul. 14, 1998**

[54] **OPTIMIZING THE COMPRESSIONAL WAVE ENERGY RESPONSE OF AN ELASTIC FLUID-FILLED CYLINDER**

Viscoelastic Cylinder With Inner and Outer Fluid Loading Subject to Forced Harmonic Excitation. NUWC-NPT Technical Report 11.067 29 Dec. 1995.

[75] Inventor: **Mark S. Peloquin**, Uncasville, Conn.

*Primary Examiner*—Daniel T. Pihulic  
*Attorney, Agent, or Firm*—Michael J. McGowan; Prithvi C. Lall; James M. Kasischke

[73] Assignee: **The United States of America as represented by the Secretary of the Navy**, Washington, D.C.

[57] **ABSTRACT**

[21] Appl. No.: **870,263**

A method and system are provided to optimize filtering of compressional wave energy in the wavenumber domain for a given frequency range using a fluid-filled elastic cylinder. The fluid is selected based on its fluid density  $\rho_f$  and dilatational wave phase velocity  $c_p$ . The selected fluid must satisfy the relationship

[22] Filed: **May 29, 1997**

[51] Int. Cl.<sup>6</sup> ..... **H04R 1/44**

[52] U.S. Cl. .... **367/154; 367/901**

[58] Field of Search ..... 367/166, 154,  
367/171, 901, 106, 130

$$10 \log \left( \frac{P_i(r_i)}{P_o} \right)^2 \geq 0$$

[56] **References Cited**

**U.S. PATENT DOCUMENTS**

5,532,979 7/1996 Hansen et al. .... 367/130

**OTHER PUBLICATIONS**

Peloquin, Mark S.; A Closed-Form Dynamic Elasticity Solution to the Fluid/Structure Interaction Problem of a Two-Layer Infinite.

for the given frequency range where  $P_i$  is the magnitude of the pressure field in the fluid at a point within the fluid defined by a distance  $r_i$  from the cylinder's central longitudinal axis and  $P_o$  is the magnitude of the impinging compressional wave, and must control at least one of the breathing wave response, the extensional wave response and the fluid P-wave response.

**21 Claims, 3 Drawing Sheets**

