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Greenwood

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(54) **SELF CALIBRATING SYSTEM AND
TECHNIQUE FOR ULTRASONIC
DETERMINATION OF FLUID PROPERTIES**

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patent is extended or adjusted under 35
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73/61.79; 73/64.53; 73/602

(58) **Field of Search** **73/597-600, 602,**
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(57) **ABSTRACT**

A system and technique for determining fluid properties
includes an ultrasonic transducer **30** on a first surface **42** of
a solid member **40**. An opposed second surface **44** of the
member **40** is in contact with a fluid **25** to be monitored. A
longitudinal ultrasonic pulse is delivered through the solid
member, and a multiplicity of pulse echoes caused by
reflections of the ultrasonic pulse between the solid-fluid
interface and the transducer-solid interface are detected and
processed by a processing apparatus **22**. The apparatus **22**
determines the decay rate of the detected echo amplitude as
a function of echo number and compares this value to a
calibrated decay rate to determine an acoustic property of
the fluid. The speed of ultrasound in the fluid is also
determined and the fluid density is determined as a function
of the speed of ultrasound and the determined acoustic
property. When coupled with a shear wave transducer,
additional properties corresponding to the fluid viscosity,
shear modulus, or shear speed are also determined. Both a
fixed in place sensing system and a clamp-on sensing system
are disclosed.

45 Claims, 3 Drawing Sheets

