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(54) **ACTIVE REDUCTION OF TOOL BORNE NOISE IN A SONIC LOGGING TOOL**

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(57) **ABSTRACT**

A sonic logging tool that can be positioned within a fluid-filled borehole includes an axially distributed active vibration control system to reduce tool borne noise. The tool includes an acoustic transmitter, an axial array of acoustic receivers, and actuator assemblies that are coupled to cancel tool mode vibrations at stations along the receiver section of the tool. In a preferred embodiment, force is applied in feedback mode based on tool mode vibrations sensed at each station. The force at each station is applied by a real-time computational algorithm using feedback. The feedback includes weighting to accommodate monopole or dipole tool mode vibration. The computational algorithm includes FIR processing of signals received from a vibration sensor assembly. The force applied at a given station is a function of tool mode vibration measured at that station and the predetermined values of a set of FIR filter coefficients associated with the given station. The predetermined FIR filter coefficients are determined by an iterative optimization technique. Alternatively, the force at each station may be applied using feed-forward.

**26 Claims, 17 Drawing Sheets**

