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(54) **METHOD AND TOOL FOR PRODUCING A FORMATION VELOCITY IMAGE DATA SET**

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(52) U.S. Cl. **702/6; 181/104**

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(57) **ABSTRACT**

Methods and tools are provided for real time velocity imaging of a borehole wall with sufficiently high resolution to identify vugs, worm holes, thin beds, dip angles, fractures and breakouts, for both open hole logging and logging while drilling in the presence of OBM's. A method is provided which includes transmitting an ultrasonic pulse through the borehole wall, receiving at first and second spaced-apart receivers an ultrasonic pulse refracted from the borehole wall, and producing a velocity image data value indicative of difference of arrival times at first and second spaced-apart receivers. This is repeated at a plurality of azimuths and depths to produce a velocity image data set. The method uses compressional pulses and/or pseudo-Rayleigh pulses.

A tool is provided for wireline use having an ultrasonic transmitter for transmitting ultrasonic pulses into the borehole wall, and a plurality of ultrasonic receivers. A processor in the tool produces real time velocity image data values indicative of time of flight of an ultrasonic pulse in the borehole wall. A similar tool is provided for logging while drilling (LWD).

78 Claims, 26 Drawing Sheets

