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(54) **OBTAINING AN IMAGE OF AN UNDERGROUND FORMATION**

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(51) **Int. Cl.^{7}** **F21B 7/00**
(52) **U.S. Cl.** **367/68**; 175/45
(58) **Field of Search** 367/68, 73, 25; 175/45, 26; 702/14, 16

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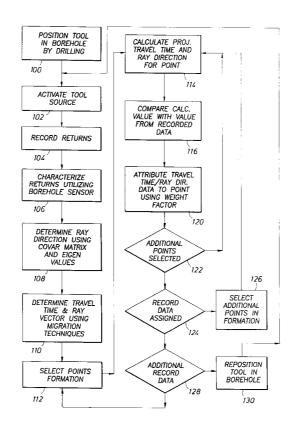|				
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(57) **ABSTRACT**

A method for creating an image of an underground formation around a borehole. An omnidirectional seismic source is activated in the borehole and a three-component receiver records the components of the reflected energy from the formation. The direction or ray of the returned energy is computed as a function of the two-way travel time A position in the formation is selected as a potential formation reflection point compared with the directional ray and two-way travel time. Where the directional ray and two-way travel time substantially correspond to the selected point, the data is attributed to the selected point The process continues with the selection of additional points and calculation of attributed return energy direction and two-way travel time to such points to comprise a set of reflectors which form the image of the formation.

8 Claims, 2 Drawing Sheets

POSITION TOOL IN BOREHOLE BY DRILLING
100

ACTIVATE TOOL SOURCE
102

RECORD RETURNS
104

CHARACTERIZE RETURNS UTILIZING BOREHOLE SENSOR
106

DETERMINE RAY DIRECTION USING COVAR MATRIX AND EIGEN VALUES
108

DETERMINE TRAVEL TIME & RAY VECTOR USING MIGRATION TECHNIQUES
110

SELECT POINTS FORMATION
112

CALCULATE PROJ. TRAVEL TIME AND RAY DIRECTION FOR POINT
114

COMPARE CALC. VALUE WITH VALUE FROM RECORDED DATA
116

ATTRIBUTE TRAVEL TIME/RAY DIR. DATA TO POINT USING WEIGHT FACTOR
120

ADDITIONAL POINTS SELECTED
122

RECORD DATA ASSIGNED
124

SELECT ADDITIONAL POINTS IN FORMATION
126

ADDITIONAL RECORD DATA
128

REPOSITION TOOL IN BOREHOLE
130