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(54) Title: THERMAL NEUTRON POROSITY FROM NEUTRON SLOWING-DOWN LENGTH, FORMATION THERMAL NEUTRON CAPTURE CROSS SECTION, AND BULK DENSITY

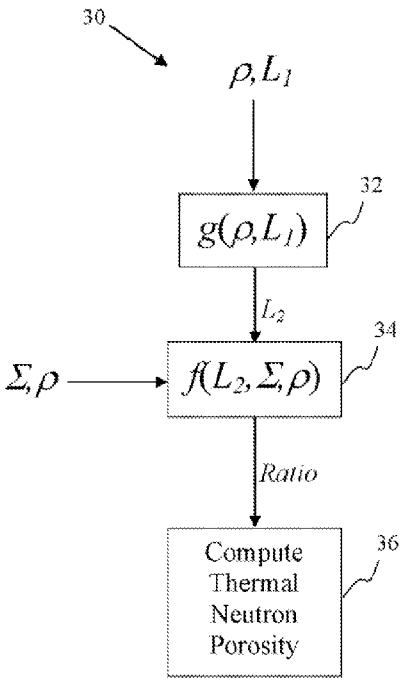

FIG. 3

(57) Abstract: A method for determining at least one formation property calculated from neutron measurements acquired with a downhole tool includes emitting neutrons from a source in the tool into the formation, detecting neutrons with at least one detector in the downhole tool, calculating a first slowing-down length (L_1) based on the detected neutrons, and deriving a second slowing-down length (L_2) based on the first slowing-down length (L_1). Further steps include deriving a correlation function for relating slowing-down lengths from a first tool to slowing-down lengths associated with a different source, wherein the correlation function depends on formation properties such as bulk density; and applying the correlation function to the slowing-down length of the first tool to derive the slowing-down length of the second tool. A method for determining a thermal neutron formation porosity based on a slowing-down length from epithermal neutron measurements from an electronic neutron source includes converting the slowing-down length into a computed neutron slowing-down length from thermal neutron measurements from a chemical neutron source, wherein the converting uses a correlation function that depends on formation bulk density; deriving a thermal neutron countrate ratio based on the computed neutron slowing-down length, wherein the deriving uses a function that depends on the formation bulk density and formation sigma; and computing the thermal neutron formation porosity from the thermal neutron countrate ratio.

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