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[Continued on next page]

(54) **Title**: MULTIPLE ANISOTROPIC PARAMETER INVERSION FOR A TTI EARTH MODEL

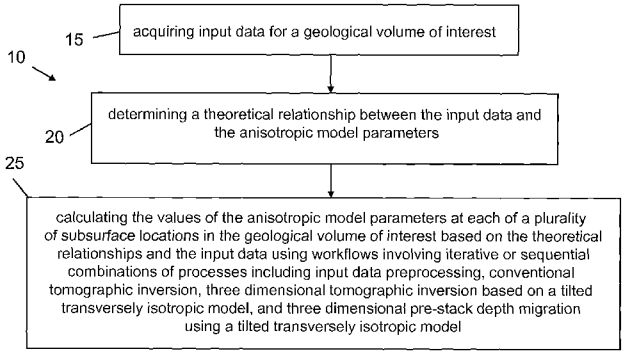


Figure 1

(57) **Abstract**: A method for determining values of anisotropic model parameters of a Tilted Transversely Isotropic (TTI) Earth model, the anisotropic parameters including P-wave velocity (Vp_0) along a tilted symmetry axis, the Thomsen anisotropy parameters δ and ε (or $\eta = (\varepsilon - \delta)/(1+2\delta)$) representative of variations of wave velocities as a function of wave propagation angle from the symmetry axis, the method including acquiring input data for a geological volume of interest; determining a theoretical relationship between the input data and the anisotropic model parameters; and calculating the values of the anisotropic model parameters at each of a plurality of subsurface locations in the geological volume of interest based on the theoretical relationships and the input data using workflows involving iterative or sequential combinations of processes including input data preprocessing, conventional tomographic inversion, three dimensional tomographic inversion based on a tilted transversely isotropic model, and three dimensional pre-stack depth migration using a tilted transversely isotropic model.

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