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Flaw Identification by Angle Beam Electromagnetic Acoustic Transducers

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Electromagnetic acoustic transducers (EMATs) can transmit and detect ultrasonic waves in a conductive specimen without any contact. This process can be given theoretical modeling and formulation based on elastodynamics and electromagnetics. It suggests some possibility of quantitative nondestructive evaluation using EMATs. This research deals with angle beam EMATs which can transmit ultrasonic waves in oblique directions as plane waves. FEM-BEM simulations show us some relation between the receiver signal's peaks and wave propagation, and also explain effects of a flaw. Numerical results of receiver signals agree well with experimental ones, which verifies our mathematical modeling. Flaw identification is formulated as a problem of parameter optimization. The initial guesses of the parameter were successfully evaluated from the computed relationship between flaw size and the peak's area of the receiver signal. Through optimization, the flaw size was well identified from measured receiver signals, which verified our present method of flaw identification.

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