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Ultrasonic Guided Wave Inspection in a Plate Structure by Magnetostrictive

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By aiming at the ultrasonic NDE (Non-Destructive Evaluation) of airplanes, an ultrasonic guided wave inspection method using a magnetostrictive transducer for a plate structure is presented. The transducer consists of a circular magnetostrictive patch, a specially-designed coil supplying dynamic magnetic field to the patch and a set of permanent magnets supplying a bias magnetic field to the patch. Among others, two kinds of transducers developed mainly by the authors and colleagues, called the orientation-adjustable patch-type magnetostrictive transducer and the planar solenoid array orientation-adjustable patch-type magnetostrictive transducer will be presented. By controlling the relative angle between the directions of the bias and actuating magnetic fields, one can effectively select the mode of the generated and measured wave such as the Lamb or shear-horizontal wave modes. Even if the circular magnetostrictive patch is bonded to a test plate, a housing, housing the magnet and the coil, can freely rotate over the patch to focus the generated ultrasonic wave along a desired direction. If the coil is so configured as to form a planar solenoid array, highly-focused beam directivity can be achieved. A recent study shows that if a set of such transducers are used to cover a two-dimensional inspection area, a quite effective two-dimensional imaging method is possible. An imaged result by the transducer applied to an aluminum plate having two 1 mm cracks will be presented as a demonstrating example.

Ключевые слова:

Содержание.

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