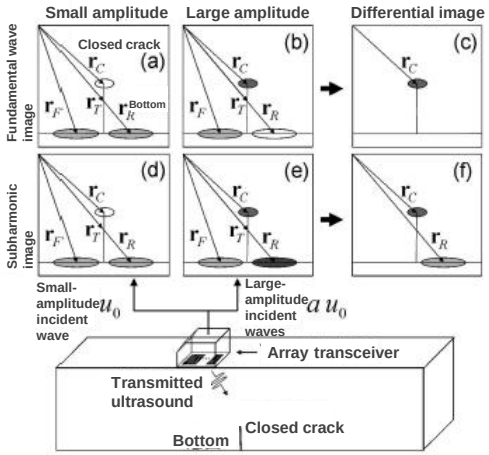
Tohoku Univ. Technology

Apparatus for imaging closed crack

To provide an apparatus improved in distinguishability of closed cracks, bubbles, or lesions



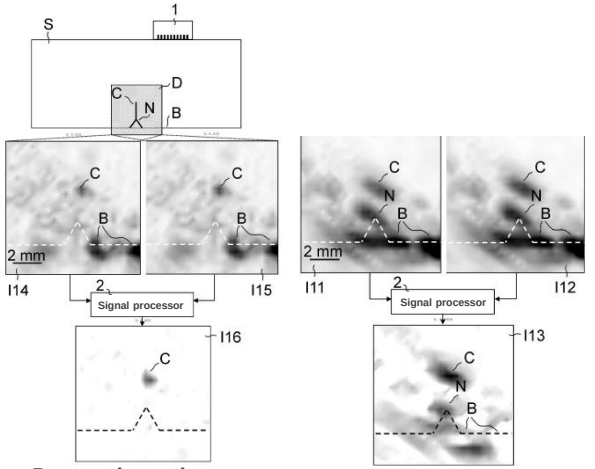
In (c), only the crack ($\mathbf{r}_C$) can be visualized by utilizing the nonlinear characteristics of fundamental wave, while the ghost ($\mathbf{r}_R$ in (f)) in the subharmonic image is removed.

Overview

Nondestructive evaluation (NDE) of cracks, delamination, and kissing bonds is important for safely managing and operating structures and components. Ultrasonic NDE is widely used, and ultrasonic phased array has become one of the primary methods for imaging internal defects. However, there are problems regarding measurement errors of closed defects, such as closed cracks, and discrimination of cracks against other defects and geometric changes.

With the present invention, it has become possible to provide an imaging apparatus capable of detecting defects represented by closed cracks with high accuracy and high discrimination. Further application of the apparatus can be expected to detect bubbles and lesions contained in tissues. In the present invention, by utilizing the incident-wave-amplitude dependence of the fundamental scattered waves, the closed cracks can be visualized with a higher signal-to-noise ratio than the existing technology.

Use of fundamental waves enhances the discrimination of closed cracks



Present invention: fundamental wave images

Conventional technology: demultiplexed image

Crack (C) can be visualized with high selectivity.

Product Application

- Infrastructure facilities such as power plants (nuclear reactors, etc.), aircraft, and railways
- Produced materials and their welds and bonding

Related Works

[1] M. Ikeuchi, et al., Jpn. J. Appl. Phys., 52 (2013) 07HC08.
[2] Y. Ohara, et al., J. Acoust. Soc. Am., 146 (2019) 266.

IP Data

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