

INVERSE THERMAL ACOUSTIC IMAGING PART INSPECTION

ABSTRACT OF THE INVENTION

A method of identifying a flaw in a part is provided that includes vibrating a part to induce heat. The heat originates in any flaws in the part. A thermal image is obtained using, for example, an infrared camera. A mathematical representation of the thermophysics, such as the heat conduction or thermal energy equations using the boundary element method or finite element method is used to identify a source and an intensity of the heat identified with the thermal image. Using the source and intensity of the heat, flaw characteristics for the part can be determined. The method is employed using an inspection system that includes a vibration device for vibrating the part. An imaging device, such as an infrared camera, measures temperature on the surface of the part. An assumption is made or additional measurements are taken to obtain values for surface flux or surface heat transfer coefficients. A processor communicates with the imaging device for receiving the surface temperature. The processor includes computer memory having part characteristics and mathematical equations. The processor uses the measured surface temperature, assumed or measured heat flux or heat transfer coefficients, part characteristics and mathematical equations to determine the flaw characteristics in the part.

Figure 1