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(54) **LASER-ULTRASONIC MEASUREMENT OF ELASTIC PROPERTIES OF A THIN SHEET AND OF TENSION APPLIED THEREON**

(75) Inventors: **Alain Blouin**, Montreal (CA); **Benoit Reid**, Montreal (CA); **Jean-Pierre Monchalin**, Montreal (CA)

(73) Assignee: **National Research Council of Canada**, Ottawa (CA)

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(58) **Field of Search** 73/643, 645, 646, 73/655, 657, 159

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Primary Examiner—Daniel S. Larkin
Assistant Examiner—Rose M. Miller
(74) *Attorney, Agent, or Firm*—Marks & Clerk

(57) **ABSTRACT**

A method and an apparatus for non-contact and non-invasive characterization of a moving thin sheet and in particular of a paper web on a production line. The method uses a laser for the generation of sonic and ultrasonic waves in the thin sheet and a speckle insensitive interferometric device for the detection of these waves. The generation is performed in conditions to avoid damage impeding further use of the sheet. When the generation and detection spots overlap, the method provides a measurement of the compression modulus. When the generation and detection spots are separated by a known distance and plate waves (Lamb waves) are generated and detected, the method provides a measurement of the in-plane modulus and of the tension applied to the sheet. By detecting waves propagating in various directions, either by rotating the detection sensor head or multiplexing the signals provided by several detection or generation locations, the anisotropy of the in-plane modulus is determined.

43 Claims, 7 Drawing Sheets