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Lesniak

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[54] FULL FIELD PHOTOELASTIC STRESS ANALYSIS

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[58] **Field of Search** 356/33, 34, 32, 356/35, 364, 365–369, 381, 382; 73/800

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[57] **ABSTRACT**

A structural specimen coated with or constructed of photoelastic material, when illuminated with circularly polarized light will, when stressed; reflect or transmit elliptically polarized light, the direction of the axes of the ellipse and variation of the elliptically light from illuminating circular light will correspond to and indicate the direction and magnitude of the shear stresses for each illuminated point on the specimen. The principles of this invention allow for several embodiments of stress analyzing apparatus, ranging from those involving multiple rotating optical elements, to those which require no moving parts at all. A simple polariscope may be constructed having two polarizing filters with a single one-quarter waveplate placed between the polarizing filters. Light is projected through the first polarizing filter and the one-quarter waveplate and is reflected from a sub-fringe birefringent coating on a structure under load. Reflected light from the structure is analyzed with a polarizing filter. The two polarizing filters and the one-quarter waveplate may be rotated together or the analyzer alone may be rotated. Computer analysis of the variation in light intensity yields shear stress magnitude and direction.

28 Claims, 4 Drawing Sheets