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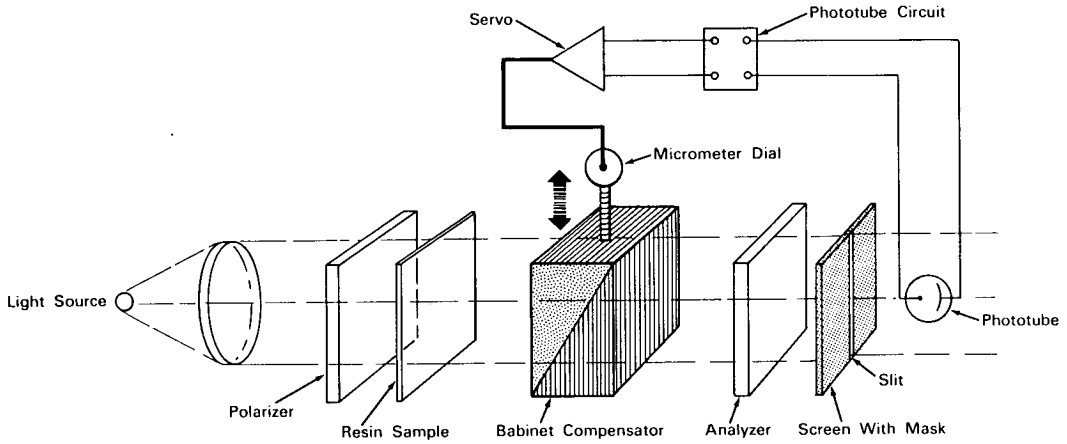
Brief 64-10280

NASA TECH BRIEF

Servo System Facilitates Photoelastic Strain Measurements on Resins



The problem: To facilitate photoelastic measurements (the analysis of changes produced in a polarized light beam passing through a stressed specimen) of the strains developed by stresses applied to samples of birefringent resins.

The solution: A servo system used in conjunction with apparatus operating on the principle of photoelasticity.

How it's done: A beam of white light on passing through the optical system consisting of a polarizer, a Babinet compensator, and an analyzer (a polarizer with its plane of polarization at right angles to that of the first polarizer), appears on a screen placed behind the analyzer as a parallel series of spectral color fringes separated by parallel dark lines. When a sample of the resins is positioned between the polarizer and the Babinet compensator and subjected to stress (tensile or compressive), a phase difference will be introduced which will cause a shift in the central dark line on the screen. The amount of shift corresponding to the applied stresses furnishes an index to the stress-strain characteristics of the resin.

In making a measurement, a movable mask with a central slit is placed over the screen, and the mask is positioned so that the slit is centered over the central dark line of the fringes. The light passing through the slit is intercepted by the phototube which provides an output to a servo. The servo rebalances the Babinet compensator to restore the dark line to its original (null) position in the slit, and the amount of shift of the line is indicated on a micrometer dial or recorder. To obtain accurate readings, the system is biased to null on the outer edge of the central dark line. The response time of the servo should not be exceeded in applying stresses to the resin sample in order to prevent the system from locking on one of the adjacent fringes.

(continued overleaf)

Notes:

1. This apparatus should be useful in production control and development testing of transparent birefringent films of various compositions.
2. Inquiries concerning this innovation may be directed to:

   Technology Utilization Officer
   Jet Propulsion Laboratory
   4800 Oak Grove Drive
   Pasadena, California, 91103
   Reference: B64-10280

Patent status: NASA encourages commercial use of this innovation. No patent action is contemplated.

Source: J. W. Otts
(JPL-504)