

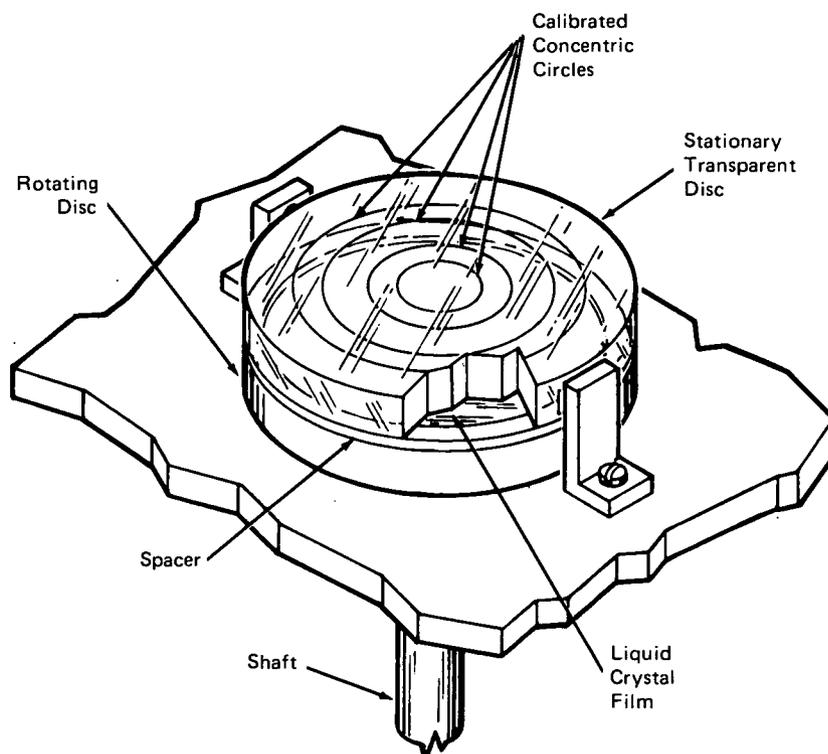
NASA TECH BRIEF

Lewis Research Center



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Angular Velocity and Acceleration Meter



A novel device has been invented which measures and indicates values of angular velocity and acceleration. The device uses a liquid crystalline film which changes coloration due to shear-stresses produced by a rotating disc and thus indicates both angular velocity and acceleration. The device has the advantage that it is not subject to bearing failure or electrical burnouts as are conventional electro-mechanical devices used for the same purpose.

A diagram of the device is shown by the figure. A film of cholesteric phase liquid crystalline material is sandwiched between a rotatable disc and a transparent stationary disc. A coupling shaft rotates the rotatable disc in response to the angular movement being measured. In response to the differential shear-stress forces induced in the liquid crystal film by the relative rotational move-

ment between the stationary and rotating discs, concentric colored rings appear in the crystalline material. The rings appear at positions in the liquid crystalline film in which the shear threshold is exceeded. Since the shear rate generated at any position in the liquid crystalline film is dependent upon both its radial position and the rotation rate, the radii of the colored rings are proportional to the rotation rate of the rotating disc. In addition, the radial velocity of a given colored band is directly proportional to the angular acceleration of the rotating disc. Thus, both angular velocity and angular acceleration can be determined by observing, through the transparent disc, the color changes induced in the liquid crystalline material by the rotating disc.

(continued overleaf)

The transparent stationary disc contains radially calibrated indicia that afford a direct readout of the rotating disc velocity. The surface of the rotating disc in contact with the liquid crystalline film is blackened to furnish a good visual contrast for the changing color rings produced.

Note:

No further documentation is available. Technical questions, however, may be directed to:

Technology Utilization Officer
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Reference: B72-10183

Patent status:

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