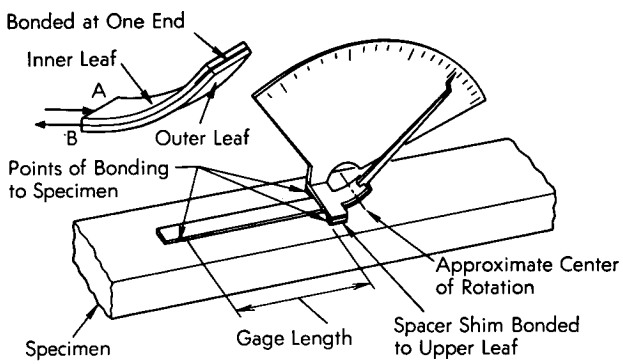
NASA TECH BRIEF

Ames Research Center

Bileaf Mechanical Strain Gage

The problem:

To detect very small displacements or deformations, such as occur in materials under stress, by a simple, inexpensive device which highly magnifies linear displacements.



The solution:

A basic device which is a bileaf lever consisting of two very thin strips of metal (or other suitable material) bonded together at one end and formed into a circular arc.

How it's done:

The bileaf lever gage shown in the diagram is set up to measure deformation of the specimen in the direction of the gage length. Since the two free ends, A and B, of the bileaf lever are free to slide past each other in the direction of the arrows shown in the diagram, any motion causes a change in the angle between the tangent to the tip and the tangent to the free ends. When the free ends of the gage are attached to points on the specimen which move in relation to each other, the bileaf lever produces a highly magnified tip rotation that is directly relatable to the relative motion of the two points. Since uniform sheet and foil materials are commercially available as thin as 0.00018 cm (0.00007 inch), it is possible to construct a bileaf element with a magnification ratio of 10,000 radians (615,000 degrees) per inch of displacement.

One example of application is the employ of the bileaf element as an extensometer to measure the relative displacement of two points on a bar of steel when subjected to tensile forces. This arrangement can achieve magnifications of 1000 to 2000 times greater than the highly precise Tuckerman Gage which produces rotation of a reflecting surface with a maximum magnification of 5 rad/in and utilizes secondary optical magnification to achieve its high sensitivity.

The bileaf lever may be employed in any application where existing strain gages, dial gages, or extensometers are used. It also appears attractive for application to force measuring instruments, pressure cells, and temperature gages since such devices convert physical quantities to mechanical deformations.

Notes:

1. Additional magnification in the usual manner by means of light can be obtained by cementing a small mirror to the mobile end of the bileaf.
2. No additional documentation is available. Specific questions, however, may be directed to:

   Technology Utilization Officer
   Ames Research Center
   Moffett Field, California 94035
   Reference: B72-10197

(continued overleaf)

Patent status:

No patent action is contemplated by NASA.

Source: LeRoy R. Guist
Ames Research Center

(ARC-10303)