

June 1965

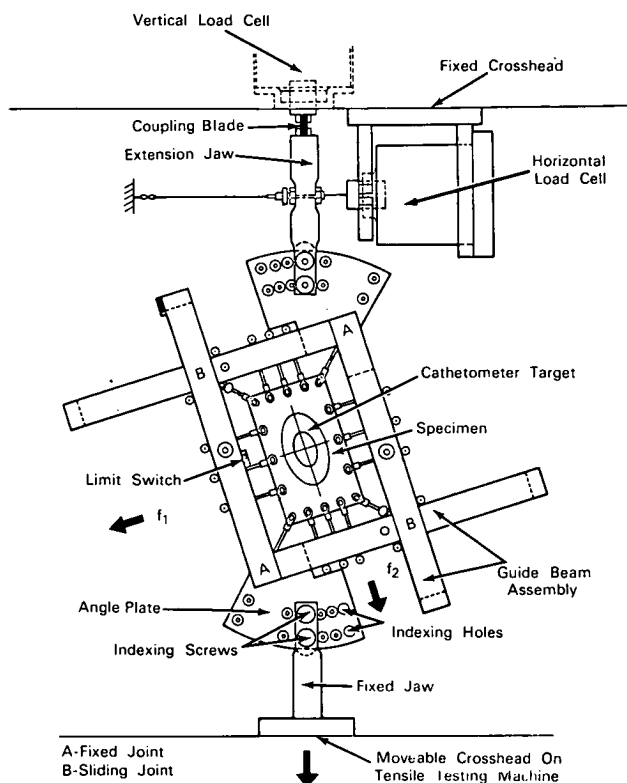
Brief 65-10189

NASA TECH BRIEF



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Testing Device Subjects Elastic Materials to Biaxial Deformations



The problem: To provide a testing device capable of stretching elastic materials biaxially over large deformation ranges and with varying strain ratios in two perpendicular directions.

The solution: An apparatus, used in conjunction with a tensile testing machine, which holds the specimen and permits control over the direction and magnitude of the stresses applied to it in biaxial directions.

How it's done: The complete apparatus is shown in the sketch as it is mounted in a test machine. The

apparatus incorporates a moveable guide beam assembly supported on two angle plates. The guide beams are rigidly attached at points A and are free to slide at points B. Multiple index holes are provided in the angle plates and allow for reorientation of the beam assembly. Thus, by selecting the proper set of index holes for attachment, a force of predetermined direction and magnitude can be applied to the specimen. Commercial load cells are attached to the extension jaw to measure the force components in the horizontal and vertical directions. The specimen is held within the

(continued overleaf)

guide beam assembly by hooks inserted in reinforced eyelets in the specimen body. A double circle target with cross lines is printed on the specimen for measurement of the deformations with a cathetometer.

As the moveable crosshead of the machine moves downward the guide bar assembly expands and stretches the elastic specimen in the predetermined manner. The forces f_1 and f_2 applied to the specimen can be calculated from the output of the load cells and the system geometry. The stress/strain relationships can be quickly determined from these forces and the cathetometer readings for any elastomer sample under various biaxial loading arrangements.

Notes:

1. The testing device provides a maximum deformation of 270% along both perpendicular axes. For convenience and safety, limit switches can be

mounted on the guide bars to stop the machine drive motor in the maximum travel position.

2. The direction and ratio of stresses can be varied over a wide range so that biaxial tensions with different strain ratios in the range from 0 to 1 can be obtained.
3. Inquiries concerning this innovation may be directed to:

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Reference: B65-10189

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

Source: Dr. Gerhard W. Becker
(JPL-616)