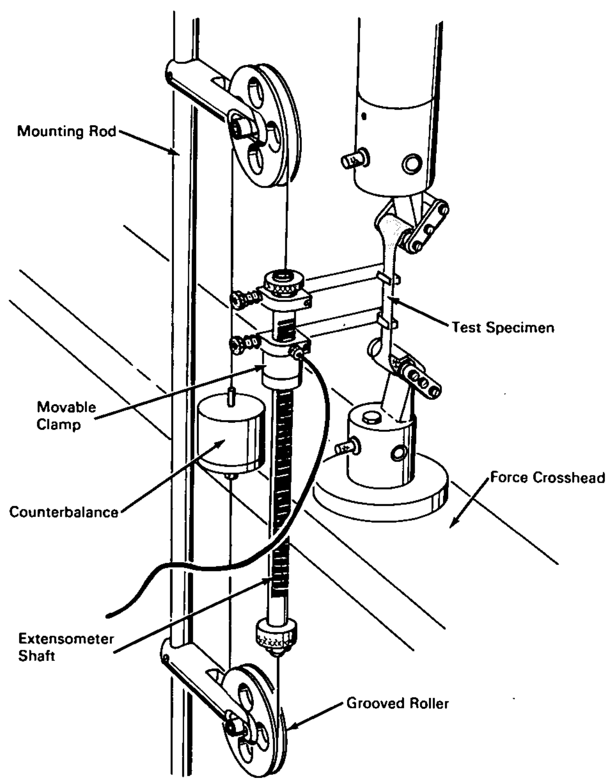
July 1966 Brief 66-10284

NASA TECH BRIEF

Extensometer Automatically Measures Elongation in Elastomers



The problem:

To design an instrument to automatically measure the elongation of elastomers. Previous methods of measuring elastomer elongation consist of manually measuring the length between two reference points, or of using a thin film bonded to the test fixture. The manual measuring technique is dependent on operator skill, and the use of thin film is expensive because it must be replaced periodically.

The solution:

An instrument with a calibrated shaft that measures the extent of the elongation and automatically records this distance on a chart. It may be used effectively by operators with a minimum of experience.

How it's done:

A stainless steel mounting rod is used to locate the assembled instrument between the top and bottom sections of the testing instrument. This rod is equipped

(continued overleaf)

with a screw-type height adjustment, providing a two-inch variable up or down which can be modified to fit other types of rubber-testing instruments. Two V-grooved stainless steel rollers are centered in roller guides and attached to the mounting rod. The guides are designed with a 1½ inch adjustment slot for varying the position of the rollers and may be adjusted to any point on the mounting rod by means of recessed set screws.

The rollers are equipped with precision ball bearings to minimize friction in the roller assembly. A flexible stainless steel wire is positioned about the rollers and attached to each end of the extensometer shaft. This shaft is a stainless steel rod that has been pregrooved in 0.2-inch increments, and potted with a nonconductive resin that is machined to a mirror finish, the resin being removed from each groove. On this shaft are located two self-releasing, spring loaded clamps; the top being stationary. The lower clamp is equipped with precision recirculating bearings and follows the lower gage of the specimen. These horizontal bearings allow the clamp to move freely down the shaft with no significant friction during the test. This entire shaft and clamp assembly is then carefully counterbalanced to remove all weight from the specimen when the instrument is in operation.

A spring loaded steel sphere, inside the bearing housing, rolls freely down the shaft with only enough pressure to ensure contact as it passes over the grooved metal contact. The spring and sphere are activated by a 1½ volt battery that charges a capacitor which, when the contacts are closed by the sphere passing over the metal contacts, causes a momentary pulse of current through a series resistor located in the testing instrument recorder. The voltage across this resistor is applied to the input of the recorder and results in a rapid "pip" at a marking pen. This produces a small disturbance on the chart at each contact point. Thus the strain (elongation) at any stress value may be observed directly on the chart.

When the test specimen ruptures, the quick contraction of the specimen ends releases the clamps and the lower clamp falls to a foam rubber cushion which absorbs the shock from the bearing assembly. The counterbalance allows the extensometer to rest in a free position, making it ready for attachment to the next test specimen.

Notes:

1. This instrument is adaptable to almost any tensile testing machine, can be fabricated at relatively low cost, and provides accuracy that is independent of the operator's experience.
2. Inquiries concerning this invention may be directed to:

   Technology Utilization Officer
   Marshall Space Flight Center
   Huntsville, Alabama, 35812
   Reference: B66-10284

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C., 20546.

Source: C. D. Hooper
(M-FS-517)