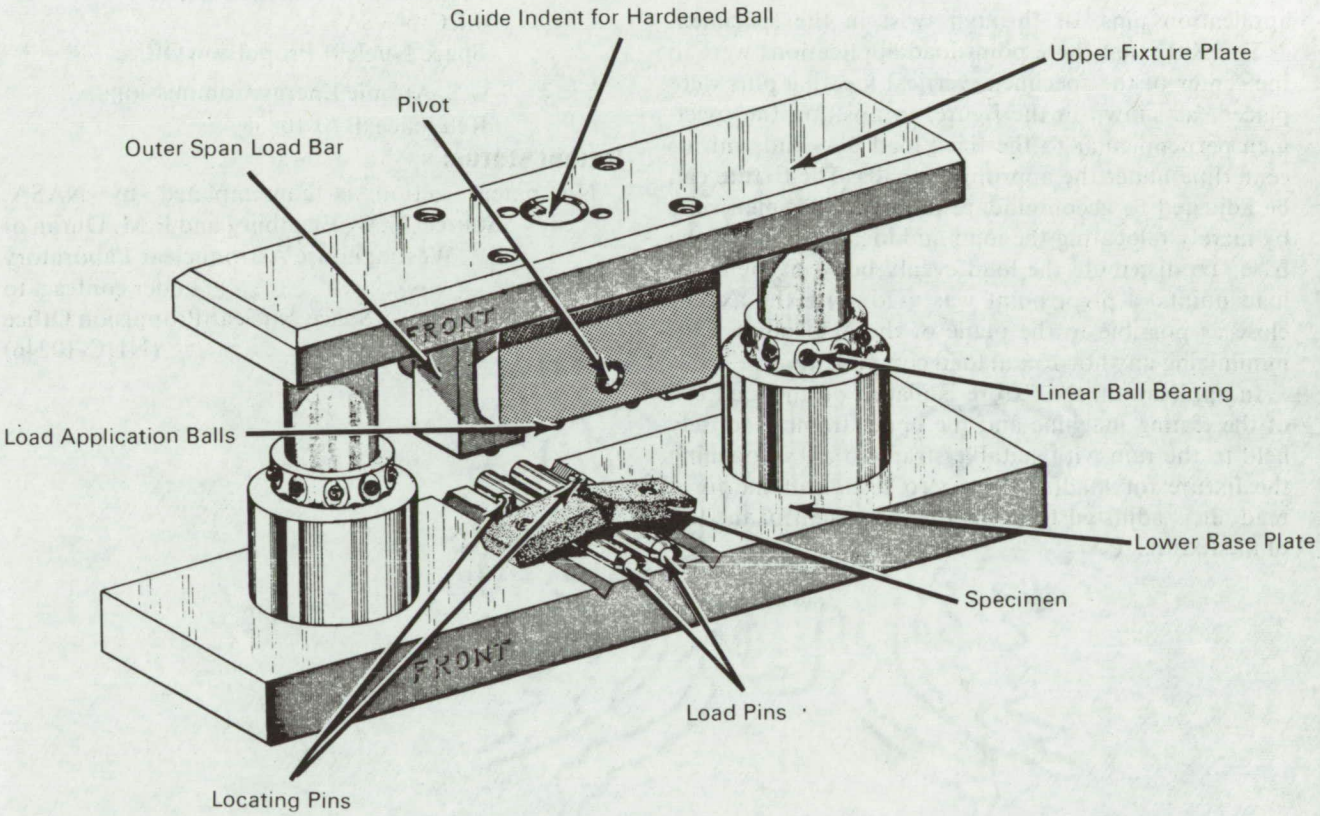
Test Fixture Insures High Degree of Accuracy in Flexure Tests



Flexure Test Fixture

The problem:

To eliminate testing errors normally encountered during flexure tests. The inaccuracies occur most often in parallelism of the four pins where tests require four-point loading; spacing and centering the pins; applying the load at the centerline of the specimen; and perpendicularity of the specimen in relation to the loading pins.

The solution:

To modify a commercially available die set to improve accuracy in load application and to minimize problems of parallelism.

How it's done:

A standard die set normally used in the stamping industry for small components was used as a basic

(continued overleaf)

guide for the fixture. The linear ball bearings on the fixture were reworked to give a slight clearance as contrasted to the original pre-load ball bearing used in the die set. These linear bearings insure a fixed spacing and improvement in the application in the load, even if it is eccentric in the testing machine. To further insure the load application to be within the centerline of the specimen, a hardened ball was inserted in the top of the fixture at the precise centerline of the specimen. To correct the problem of parallelism of the four load application pins found in other fixtures, the inner load pins were located on the bottom in vee-grooves machines during the same setup. The load application points on the outer span were through hardened balls, thus eliminating any twisting action that could be caused by lack of parallelism in the load application pins, or through twist in the specimen.

To insure that these point load applications were in the center of the specimen, vertical locating pins were placed, as shown in the figure, to position the specimen perpendicular to the fixed load pins and with its centerline under the appropriate balls. The fixture can be adjusted to accommodate different specimen sizes by merely relocating the load and locating pins on the base. To distribute the load evenly between the outer load points, a pivot point was used, with the axis as close as possible to the plane of the load point, thus minimizing any horizontal load components.

In application, the fixture is placed on the load cell of the testing machine and the upper frame is loosely held to the ram with suitable straps to aid in opening the fixture for loading. The zero setting of the force readout is adjusted to allow for the weight of the top of the fixture.

Notes:

1. The effectiveness of the fixture was measured by cutting 25 test specimens from one slab of material. Twelve specimens were tested on the standard fixture and 13 specimens on the new fixture. The average value of the modulus of rupture as measured with the new fixture was + 1.2% over the old method; however, the variance of the material properties measured was reduced by 32%. It appears that conventional testing procedures for brittle materials can be improved, particularly on a production basis, by utilization of a fixture that tends to reduce the testing variances described above.
2. Requests for further information may be directed to:

   Technology Utilization Officer
   AEC-NASA
   Space Nuclear Propulsion Office
   U.S. Atomic Energy Commission
   Reference: B70-10358

Patent status:

No patent action is contemplated by NASA.

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