STP488-EB/Apr. 1971

DISCUSSION

R. J. O'Kane[1]—The Schmieder paper offers results on a number of creep machines sufficient to establish a measure of the scatter of such data. One way to achieve optimum performance is to reduce friction between the testing machine head and the load train coupling.

A marked improvement in alignment over a simple spherical seat like that shown in ASTM Specifications for Tension Testing of Metallic Materials (E 8 - 69) was achieved by Jones and Brown[2] by positioning a ball between two parts of a loading yoke. Recent tests by Satec Systems (Figs. 1 and 2) indicate that an alignment device with crossed knife edges (Fig. 3) can further reduce specimen bending, especially at low levels of loading. In these figures, percent bending refers to the ratio of the difference between maximum and minimum longitudinal surface stress on the specimen and the average axial stress, which bending increases directly with the eccentricity of load application. All specimens had a gage length of 2 in., but specimen diameters were 0.505 and 0.252 in. for the data of Figs. 1 and 2, respectively. In all instances, bending was measured by resistance strain gages mounted on the gage section.

To consistently achieve less than 10 percent bending at loads of 400 lb or greater, all elements of the load train, including the threaded end specimen, were machined with tolerances not greater than 0.0005 in. Care also was taken to ensure that the head of the load train pull rod was seated firmly in the coupling and that there were no burrs. Our conclusion that the crossed knife edge can reduce significantly the amount of misalignment contributed by the machine was supported by tests run purposely with the lower coupling displaced 1 in. from the center position. In no case was a significant change detected in the amount of bending. In one tester a special crossed knife edge alignment coupling was mounted directly to the specimen, achieving a mere 3 percent bending at a load of only 17 lb.

Present ASTM Specifications E 21 and E 139 recognize that different tests may have quite different percent bending strain due to chance orientation of a loosely fitted specimen. To assure proper alignment of each and every specimen requires that the percent bending be determined in place on the actual specimen prior to testing and that the test then be

[1] Vice president for sales, SATEC Systems, Inc., Grove City, Pa.
[2] Jones, M. H. and Brown, W. F., Jr., *ASTM Bulletin*, ASTBA, Jan. 1956, pp. 53–60.

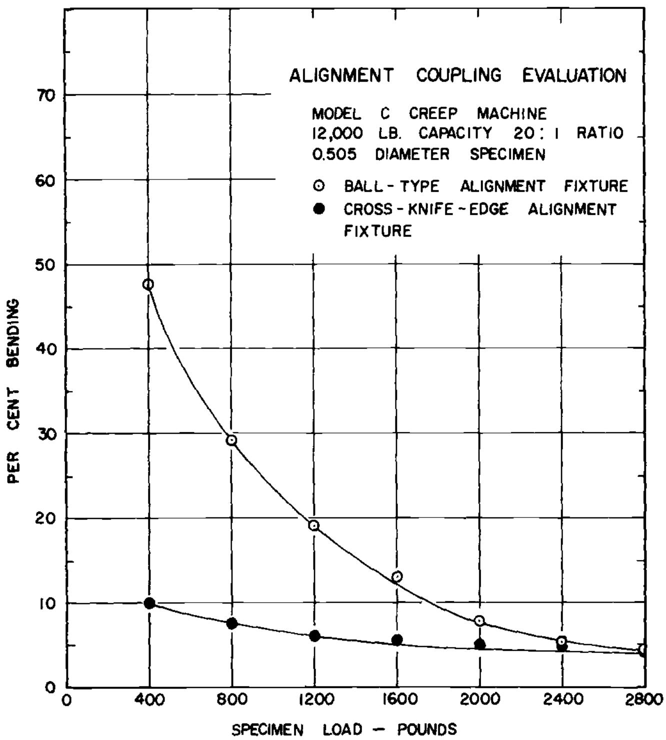
ALIGNMENT COUPLING EVALUATION
MODEL C CREEP MACHINE
12,000 LB. CAPACITY 20 : 1 RATIO
0.505 DIAMETER SPECIMEN
BALL - TYPE ALIGNMENT FIXTURE
CROSS - KNIFE - EDGE ALIGNMENT FIXTURE
PER CENT BENDING
0
10
20
30
40
50
60
70
0
400
800
1200
1600
2000
2400
2800
SPECIMEN LOAD — POUNDS

FIG. 1

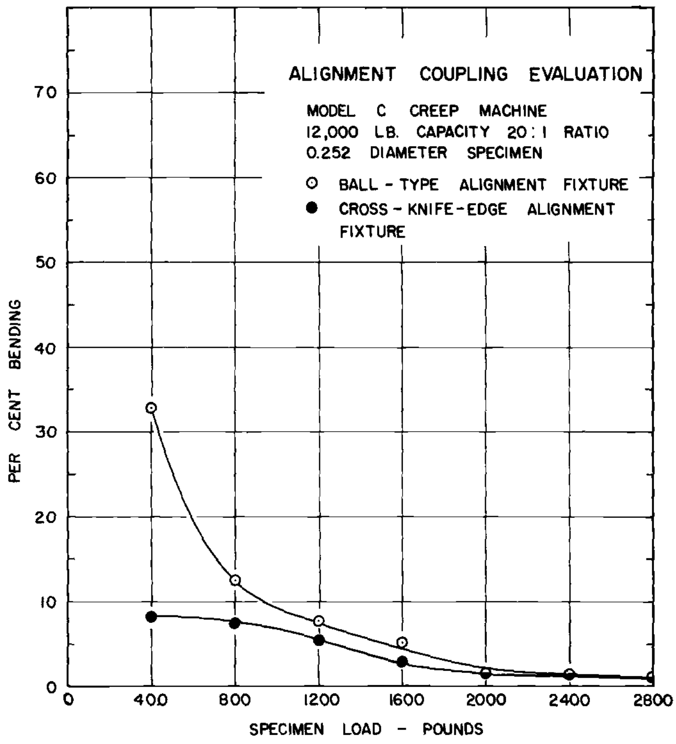
ALIGNMENT COUPLING EVALUATION
MODEL C CREEP MACHINE
12,000 LB. CAPACITY 20:1 RATIO
0.252 DIAMETER SPECIMEN
BALL - TYPE ALIGNMENT FIXTURE
CROSS - KNIFE-EDGE ALIGNMENT FIXTURE
PER CENT BENDING
0
10
20
30
40
50
60
70
0
400
800
1200
1600
2000
2400
2800
SPECIMEN LOAD - POUNDS

FIG. 2

conducted without further manipulation of the load train. A device has been developed which can be mounted onto the specimen to measure the percent bending and then removed without disturbing the alignment. Such devices can shed light on the significance of percent bending in tests under axial load and may lead to more meaningful future specification of alignment requirements.

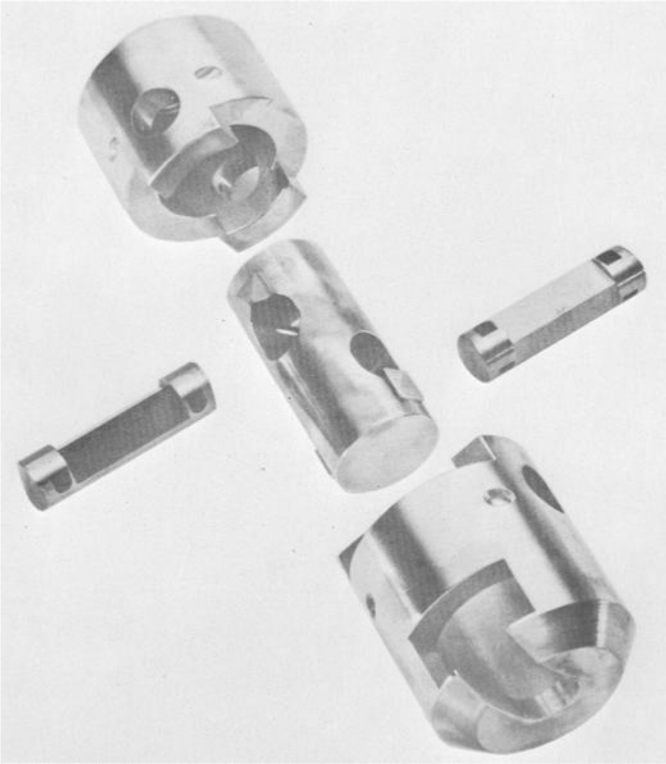

FIG. 3