The present invention relates to a device for stressing a deformable material specimen. The apparatus consists of top plate 11 and bottom plate 12 sandwiching a guide cylinder 13. The specimen 14 is positioned on the bottom plate 12 and attached to a load piston 20 (FIG. 2). Force is applied through top plate 11 into guide cylinder 13. Once specimen 14 has been loaded, the stress is maintained by tightening tie bolt nuts 17.

3 Claims, 3 Drawing Figures
FIXTURE FOR ENVIRONMENTAL EXPOSURE OF STRUCTURAL MATERIALS UNDER COMPRESSION LOAD

ORIGIN OF THE INVENTION

The invention described herein was made by employees of the United States Government and may be used by or for the Government for governmental purposes without the payment of any royalties thereon or therefor.

BACKGROUND OF THE INVENTION

The present invention relates to a device for stressing a deformable material specimen and maintaining the load on the specimen after the stressing force has been removed.

Mechanical tests of a small specimen often are used to simulate the behavior of a material under conditions of its service usage. Materials used in the construction of vehicles and equipment for use in aerospace applications must be able to withstand both extreme compression loads and extreme fluctuations in environmental conditions. To test the qualities of various materials, it is necessary to be able to simultaneously stress the materials and subject the specimens, while under stress, to changes in environmental conditions.

PRIOR ART

The prior art devices for stressing material specimens are not suitable for tests involving exposure of the stressed material to extreme environmental conditions. The prior art devices, although adequate for producing compression load, are too large and complex to be efficiently useful in the study of environmental effects on the test material.

Thus, a need exists for an economical and compact device suitable for the simultaneous testing of material specimens under compression load and during exposure to extreme environmental fluctuations.

Accordingly, it is an object of the present invention to provide an apparatus which permits the simultaneous testing of the effects of compression load and environmental fluctuations on material specimens.

It is a further object of the present invention to provide an apparatus for stressing materials which is both compact and economical.

These and other objects are achieved by providing a specimen loading fixture of two plates sandwiching a guide cylinder and held together by two tie bolts. A material specimen is positioned within the guide cylinder and load is transmitted to the specimen by a load piston. Load is applied to the specimen by adjusting a loading bolt to a desired value; placing the fixture in a test machine; applying load to the fixture until the plates are secured against the guide cylinder; and tightening the tie bolt nuts to maintain the specimen at the load value.

BRIEF DESCRIPTION OF THE DRAWINGS

A more complete appreciation of the present invention and many of the attendant advantages thereof will be readily apparent as the same becomes better understood with reference to the following detailed description when considered in connection with the accompanying drawings wherein:

FIG. 1 is a side perspective view of the specimen loading fixture of the present invention;

FIG. 2 is a sectional view of the specimen loading fixture shown in FIG. 1 and taken along line II—II thereof, and

FIG. 3 is a view of the specimen loading fixture taken along line III—III of FIG. 2.

DETAILED DESCRIPTION OF THE INVENTION

Referring now more particularly to FIG. 1, there is shown a loading fixture comprising a top plate and a bottom plate sandwiching a guide cylinder. A load piston is located within guide cylinder. A material test specimen is secured to bottom plate by retainers and screws. Specimen is also secured by retainers and screws to load piston (FIG. 2). Loading bolt extends through the center of top plate and into guide cylinder where it contacts load piston (FIG. 2). Tie bolts are provided with hex heads and extend from bottom plate to top plate and are bolted on the upper surface of top plate by tie bolt nuts. An area, indicated by reference numeral of guide cylinder is cut away near specimen to permit exposure of the specimen to varying environmental conditions.

The positions of material test specimen within guide cylinder can be readily seen by reference to FIG. 2. Retainers are attached to bottom plate by screws. Retainers are attached to load piston by screws. Screws are attached to bottom plate (FIG. 2) and fit into slots in retainers, and in similar slots, not shown, in retainers and screws. Screws are attached to load piston by screws. Screws are loosened, retainers, and screws are free to move in the slots either toward or away from specimen. To secure specimen, retainers, screws, and screws are moved to snugly contact specimen and screws are tightened. Thus, loosening or tightening screws retainers, screws, and screws can be adjusted to accommodate varying specimen dimensions. As can be seen, guide cylinder provides axial alignment for load piston.

Referring now to FIG. 3, there is shown a top view of retainers and screws sandwiching specimen. Slots are approximately 0.3 inches in length, accommodate screws. Retainers are free to move either toward or away from specimen. In assembly, retainers and screws are moved to contact specimen, screws are tightened to secure retainers and screws to bottom plate. Screws are tightened to secure retainers to specimen. Retainers and screws are adjustable in like fashion and further description thereof is omitted herein in the interest of clarity.

OPERATION OF THE INVENTION

The operation of the present invention apparatus is now believed apparent. The calibrated loading fixture and a specimen are assembled, and retainers and screws are adjusted to assure axial loading of the specimen. The tie bolt nuts are loosened, and the loading bolt is adjusted to achieve the desired compression load by noting the angular position indicated by reference point relative to reference lines scribbled on top plate. The tightening of tie bolt nuts pushes top plate and bottom plate securely against guide cylinder and concurrently pushes loading bolt against load piston, thereby delivering the desired load to specimen. With the tie bolt nuts tightened, the load on the specimen will be maintained and the
The loading fixture can be placed in an environmental testing apparatus.

The calibration of the loading fixture is achieved by the following steps: (1) A gaged specimen is positioned in loading fixture 10. (2) Loading bolt 15 is loosened to clear load piston 20; tie bolt nuts 17 are tightened; and the loading bolt 15 is tightened to contact load piston 20. The angular position indicated by reference point 30 of loading bolt 15 is noted on the upper surface 26 of top plate 11 by reference lines 25 scribed on top plate 11. This represents the zero-load position. (3) Tie bolt nuts 17 are loosened and loading bolt 15 is advanced to the estimated position of the specimen target strain level. Tie bolt nuts 17 are tightened. (4) Loading fixture 10 is positioned in a test machine (not shown) which loads the fixture through bottom plate 12 and top plate 11. Loading force is applied to bottom plate 12 on the tie bolt heads 23. Loading force is applied to top plate 11 at points indicated by reference numeral 27. (5) Load/strain recording equipment (not shown) records specimen strain versus load. The loading fixture 10 is loaded to the estimated target strain level by the test machine. The tie bolt nuts 17 are tightened. The strain reading at this point is the strain locked in the specimen. Because the specimen is loaded through the fixture with the test machine and not by deflecting the loading bolt, no torque is applied to the specimen.

Although the invention has been described relative to a specific embodiment thereof, it is to be understood that numerous modifications may be made therein without departing from the spirit and scope of the instant invention. It is therefore to be understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described herein.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. An apparatus for stressing deformable materials which comprises:
   a top plate;
   a bottom plate;
   A guide cylinder positioned between said top plate and said bottom plate;
   a load piston positioned within said guide cylinder;
   an adjustable loading bolt positioned in the center and extending through said top plate to contact said load piston;
   means for positioning a deformable material specimen between said bottom plate and said load piston;
   said adjustable loading bolt serving to apply a compression load force to said load piston;
   means for maintaining the compression load force on said load piston, said means for maintaining the compression load force consisting of two tie bolts; each said tie bolt extending from the upper surface of said top plate to the lower surface of said bottom plate;
   said tie bolts being fixably attached to said bottom plate; and
   each of said tie bolts extending through a tie bolt nut positioned on the upper surface of said top plate;

2. An apparatus as in claim 1 wherein said means for positioning a deformable material specimen between said bottom plate and said load piston comprises: adjustable retainers, each retainer having two slots with the lengthwise dimension of said slots oriented transverse to the lengthwise dimension of said retainer;
   two adjustable retainers connected to said bottom plate by first screw means inserted through said slots and with space between said retainers;
   two adjustable retainers connected to said load piston by second screw means inserted through said slots and with space between said retainers;
   whereby the deformable material specimen is positioned in the space between said retainers connected to said bottom plate and positioned in the space between said retainers connected to said load piston such that a clamping force is exerted on the deformable material specimen by loosening said first and said second screw means, moving said retainers to snugly contact the specimen and tightening both said first and said second screw means.

3. An apparatus as in claim 1 wherein said top plate has angular reference lines positioned around said adjustable loading bolt and wherein said adjustable loading bolt is provided with a reference point to facilitate the setting of the compression load force by said reference lines and said reference point.

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