Patented May 1, 1945

2,375,032

UNITED STATES PATENT OFFICE

2,375,032

TENSILE STRENGTH TESTING APPARATUS

Robert M. Parke and Frederick P. Bens, Detroit, Mich., assignors to Climax Molybdenum Company, New York, N. Y., a corporation of Delaware

Application May 5, 1943, Serial No. 485,711

4 Claims. (Cl. 73—95)

The present invention relates to testing apparatus and more particularly to testing apparatus for measuring tensile strength at elevated temperatures.

Objects and advantages of the invention will be set forth in part hereinafter and in part will be obvious herefrom, or may be learned by practice with the invention, the same being realized and attained by means of the instrumentalities and combinations pointed out in the appended claims.

The invention consists in the novel parts, constructions, arrangements, combinations and improvements herein shown and described.

The accompanying drawing, referred to herein and constituting a part hereof, illustrates the present preferred embodiment of the invention, and together with the description, serves to explain the principles of the invention.

The single figure of the drawing is a vertical section showing a typical and illustrative embodiment of the present invention.

The present invention has for its object the provision of a novel and improved testing apparatus particularly adapted for measuring tensile strength at elevated temperatures. A further object of the invention is the provision of an accurate, convenient and easily operated apparatus by which the tensile strength of a sample may be determined at relatively high temperatures. Still another object of the invention is the provision of a tensile strength testing apparatus which preserves the sample and apparatus against deterioration while the sample is being tested.

In accordance with the present invention there is provided a specimen holder for supporting and securely anchoring the sample to be tested and the holder is surrounded by a relatively strong chamber which can be rendered air-tight and subjected to a high degree of vacuum. Above the specimen holder and mounted for axial movement within the chamber is a plunger at the lower end of which is mounted means for securely engaging and clamping the upper end of the specimen so located as to be movable toward and away from the other specimen holder so as to exert tension on the specimen. The plunger is preferably mounted for free movement in a tightly fitted sleeve, and the plunger and sleeve are both preferably made of some material having a negligible temperature coefficient of expansion so that the fit remains substantially unchanged over a wide temperature range. The plunger is rigidly connected to the usual tensioning mechanism, while the specimen holder is firmly secured to the stationary base of the machine so that a predetermined or measurable load may be applied to the specimen.

Surrounding the holder and the specimen are provided heating means by which the holder, specimen and plunger are brought to the desired temperature, and thermocouples are preferably mounted on the specimen and lead to registering instruments externally of the chamber so that the temperature of the specimen may be accurately determined. Between the specimen and the wall of the chamber is provided refractory and insulating material so as to keep the exterior of the apparatus as cool as possible and to minimize the heat loss from the heating element.

The chamber and insulating and refractory elements are apertured and provided with leads to the heating elements and thermocouples, and another aperture may conveniently serve for the connection to the vacuum pump or other means by which the interior of the chamber is exhausted. The exhaustion of the chamber not only prevents corrosion of the specimen at high temperatures, but also prevents deterioration of the holder and plunger when they are subjected to temperatures in the neighborhood of 1500° F. Preferably the apparatus is constructed with separable top and bottom portions and the refractory material is made in several sections so that the apparatus may be easily disassembled for replacement of the heating element or other repairs.

It will be understood that the foregoing general description and the following detailed description as well are exemplary and explanatory of the invention but are not restrictive thereof.

Referring now in detail to the present preferred and illustrative embodiment of the invention as shown in the accompanying drawing, the invention is shown as adapted for use with a conventional form of tension testing apparatus having a base or foundation member 10 and a tensioning plunger 11 which may be raised and lowered with reference to the stage and may be accurately controlled so as to exert a predetermined tension load on the specimen. On the upper surface of the base 10 is mounted the chamber 15 which comprises a bottom plate 16, a top plate 17 and a cylindrical wall portion 18, the top and bottom plates and the cylindrical wall preferably being made of steel of substantial thickness. These parts are held together by means of the screws 20 passing through suitable apertures in the top and bottom plates 16 and 17 and lugs 19 attached to the cylinder wall 18, a suf-