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HARDNESS TESTING APPARATUS

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4 Claims. (Cl. 73—81)

The present invention relates to testing apparatus and more particularly to hardness testing apparatus for use 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 accompany 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 hardness testing apparatus particularly adapted for performing hardness tests at elevated temperatures. A further object of the invention is the provision of an accurate, convenient and easily operated apparatus by which the Vickers hardness of a sample may be determined at relatively high temperatures. Still another object of the invention is the provision of a hot hardness testing apparatus which preserves the sample and indenting tool against deterioration while the sample is being tested.

In accordance with the present invention there is provided an anvil for supporting the sample to be tested and the anvil is surrounded by a relatively strong chamber which can be rendered air-tight and subjected to a high degree of vacuum. Above the anvil and mounted for axial movement within the chamber is a piston at the lower end of which is mounted the indenting tool which may comprise the usual diamond indenter or penetrator, so located as to be movable into and out of contact with the sample supported on the anvil. The piston is preferably mounted for free movement in a tightly fitted sleeve, and the piston 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 piston is flexibly connected to the usual Vickers loading piston so that the piston may be loaded in the usual manner and may be easily retracted out of contact with the specimen.

Surrounding the anvil and the specimen are provided heating means by which the anvil, specimen and indenting tool are brought to the desired temperature, and a thermocouple is preferably mounted on the anvil at the specimen and leads to a registering instrument 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 means by which the specimen to be tested may be inserted into and removed from the chamber and accurately positioned on the anvil, and this same 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 diamond when it and the specimen 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 Vickers hardness testing apparatus having a stage or foundation member 10 and a loading piston 11 which may be raised and lowered with reference to the stage and may be accurately controlled so as to exert a predetermined pressure toward the stage. On the upper surface of the stage 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 tie bolts 20 passing through suit-