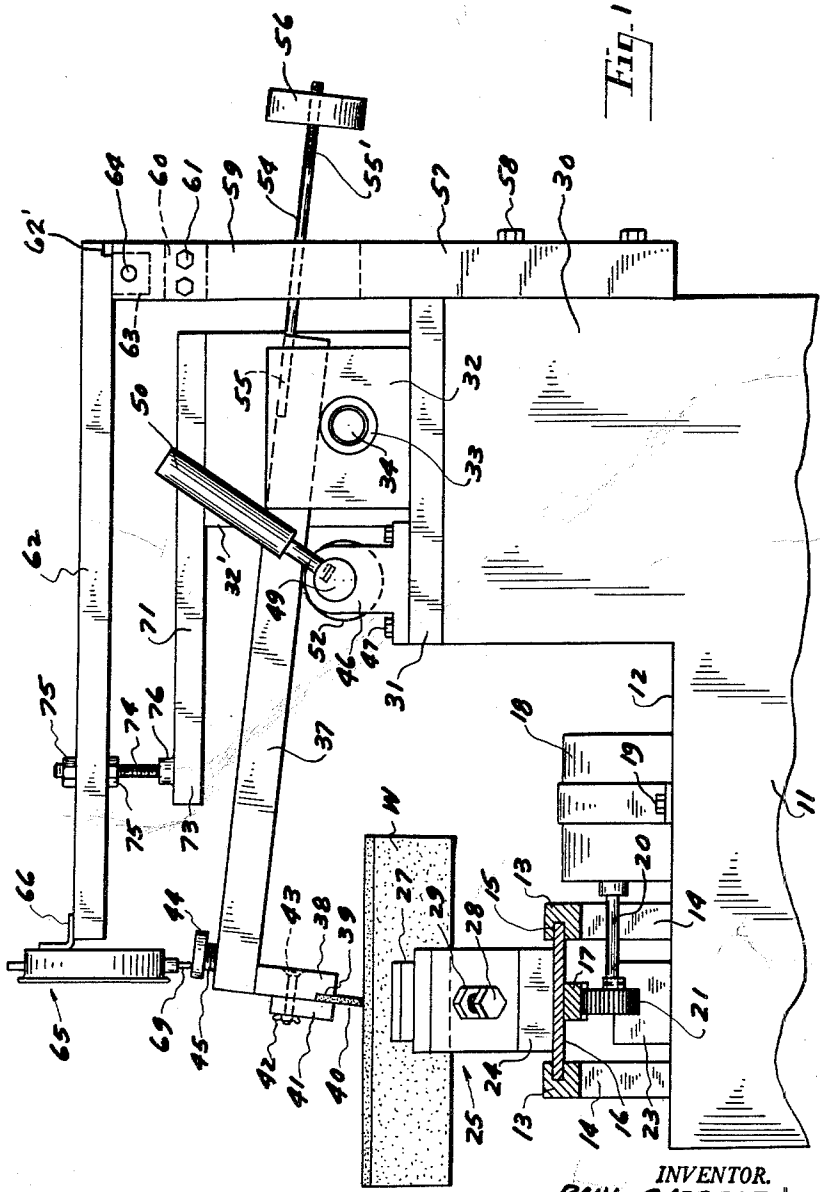
Dec. 25, 1962 P. R. GJERTSEN 3,069,892

MACHINE FOR TESTING HARDNESS AND WEAR CHARACTERISTICS OF ABRASIVE MATERIALS

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FIG. 1



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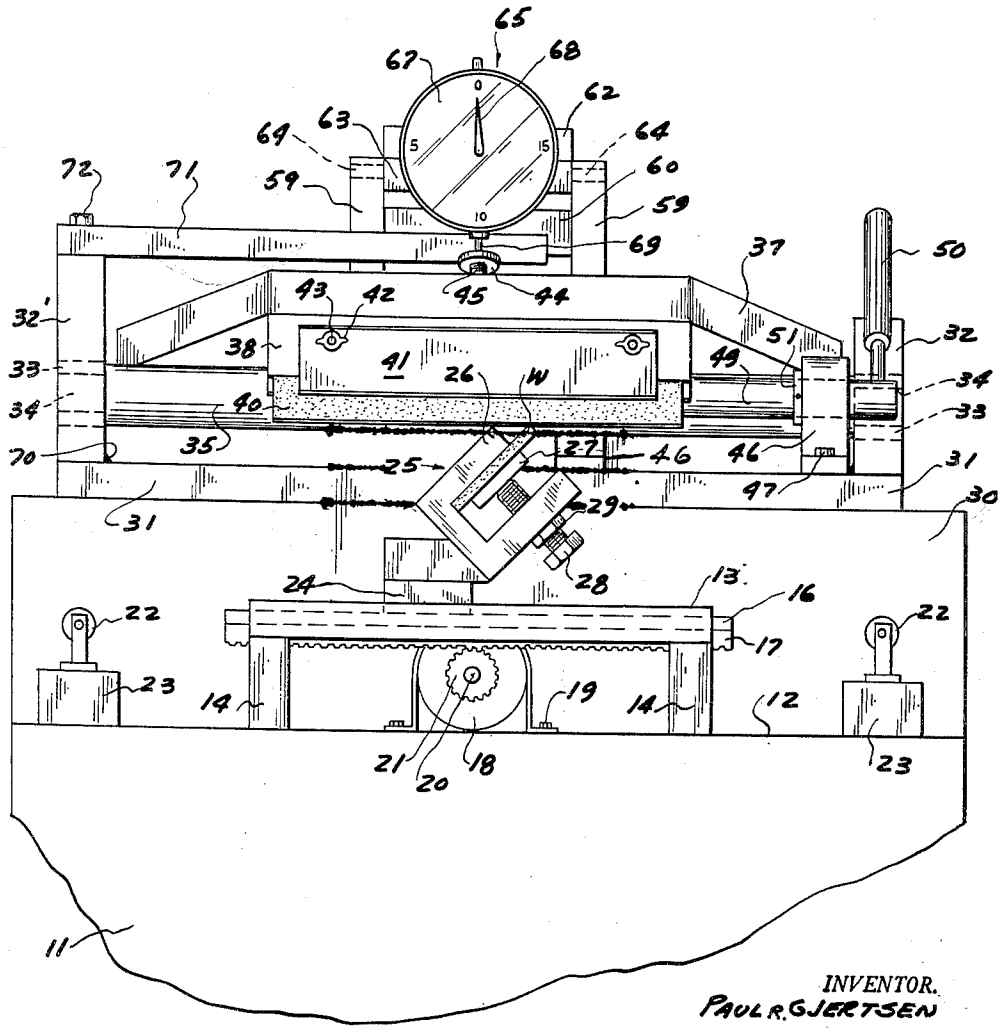
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Fig. 2



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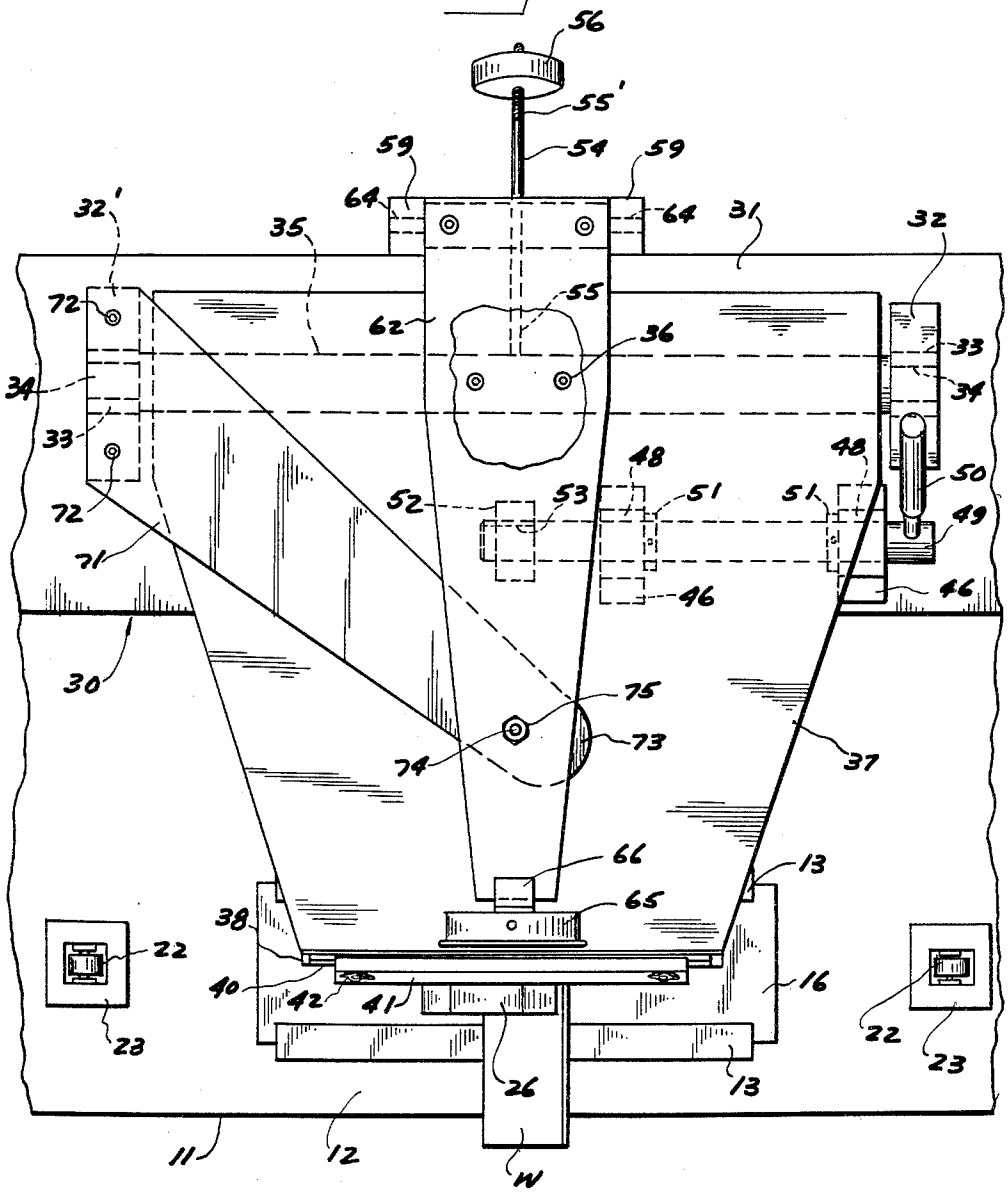
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MACHINE FOR TESTING HARDNESS AND WEAR CHARACTERISTICS OF ABRASIVE MATERIALS

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Fig. 3



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3,069,892

MACHINE FOR TESTING HARDNESS AND WEAR CHARACTERISTICS OF ABRASIVE MATERIALS

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Filed Mar. 4, 1960, Ser. No. 12,366
1 Claim. (Cl. 73—7)

This invention relates to a machine for testing the hardness and wear characteristics of abrasive materials.

It is the object of this invention to provide a grading device which determines the hardness of various materials by a wearing action.

It is another object to provide a hardness grading device, particularly adaptable in the field of ceramics as applied to the abrasive industry in connection with grinding wheels, honing stones, etc. Heretofore various devices have been provided seeking to accomplish satisfactory testing of the hardness and wear characteristics of abrasive materials. The devices heretofore presented for this purpose have been ineffective or cumbersome, or unnecessarily expensive in manufacture.

It is the primary object of the present invention to provide in a grading device having a continuously reciprocal horizontally disposed table, and a vise secured upon the table adapted to supportably secure an abrasive workpiece whose hardness is to be tested, together with a pivotally mounted suitably counterbalanced support which overlies the table, but has depending from an edge thereof a strip of abrasive material of known hardness, which etxends in the direction transverse to the general direction of the workpiece to be tested and as inoperative engagement therewith during reciprocal measured movements of the said table and workpiece together with means for effectively measuring the extent to which the strip of abrasive material of known hardness moves downwardly into the strip of unknown hardness after predetermined reciprocations of the said table and workpiece.

The present invention is an improvement over my copending patent application Serial No. 770,330, filed October 29, 1958, now Patent No. 3,011,334 of December 5, 1961, relating to a material hardness grading device.

It is a further object to provide a pivotally mounted support suitably counterbalanced so as to predetermine the extent of load to be transmitted through the abrasive material of known hardness applied to the abrasive workpiece of unknown hardness to thus provide a simplified and time-saving device for measuring the hardness and wear characteristics of abrasive material to be tested.

These and other objects will be seen from the following specification and claim in conjunction with the appended drawings in which:

FIG. 1 is a fragmentary side elevational view of the present hardness testing machine, partially broken away and sectioned, for illustration.

FIG. 2 is a fragmentary front elevational view thereof.

FIG. 3 is a fragmentary plan view thereof.

It will be understood that the above drawings illustrate merely a preferred embodiment of the invention and that other embodiments are contemplated within the scope of the claim hereafter set forth.

Referring to the drawings, the present machine for testing the hardness and wear characteristics of abrasive materials includes a solid bed 11 having a work table defining surface 12 upon the top thereof over which are mounted a pair of horizontally disposed opposed spaced parallel guides 13 having interior elongated slots 15 adapted to slidably mount the reciprocal table 16.

The elongated rack gear 17 is secured to and depends from the central undersurface portion of said table and

is in mesh with a pinion 21 on shaft 20 projecting from the motor 18, secured at 19 upon the bed top 12.

The guides 13 at the respective opposite ends are mounted upon the upright supports 14 suitably secured to the bed top 12. Motor 18 is reversible and for this purpose there are provided a pair of limit reversing switches 22 of conventional construction mounted at 23 upon the bed top 12 in spaced relation to the respective opposite ends of the reciprocal table 16 whereby the said table is adapted to automatically reciprocate upon its guides 13.

An upright 24 is mounted upon the table 16 intermediate its ends and centrally thereof for carrying the angular vise 25 which includes the fixed transverse grip 26 and the adjustable grip 27 operatively engaged by the screw 28 retained in adjusted position by the lock nut 29.

The movable grip 27 or pressure pad is adapted to fixedly retain with respect to the stationary grip 26 the elongated workpiece W of an abrasive material of unknown hardness which is sought to be tested on the present machine.

It is noted from FIGS. 1 and 2 that the said workpiece W normally extends transversely of the direction of reciprocal movement of the table 16.

Bed 11 includes the upright column 30 arranged rearwardly of the bed top 12 upon which is secured the horizontally disposed mounting plate 31.

The upright spaced supports 32 and 32' are mounted upon the plate 31 and fixedly secured thereto as by the welds 70, FIG. 2. Suitable bushings 33 are projected through and retained within transverse apertures in the said supports to cooperatively receive therein the reduced cylindrical ends 34 of the transverse shaft 35, which is arranged below and fixedly secured to the undersurface of the support 37 as by the fasteners 36, as shown in FIG. 3.

The support 37 is thus pivotally mounted adjacent one edge so as to movably overlie the bed and a portion of the column 30 for pivotal movement upon an axis which is parallel to reciprocal movement of table 16. An elongated grip is provided upon the undersurface of the support 37 extending adjacent its other edge and parallel to the pivotal mounting 35 for the said support. This group consists of a fixed gripping plate 38 suitably secured to the undersurface of the support 37 which is undercut as at 39 to receive the elongated transversely arranged abrasive material 40 of known hardness, which is held in position by the removable plate 41 secured by the bolts 43 and wing fasteners 42 or equivalent fastening structure.

Accordingly there is provided depending from the forward edge of the support 37 the elongated abrasive strip 40 of known hardness, which is adapted to operatively engage a top edge or surface of the reciprocal workpiece W of unknown hardness to be tested by the present machine. The adjustable contact button 44 is threaded down into the top surface of the support 37 as at 45 in substantial vertical registry with the abrasive strip 40 for the purpose of cooperatively receiving the reciprocal plunger 69 which depends from the dial indicator 65, as will be hereafter described.

An additional pair of upright supports 46 are secured to the column plate 31 as at 47, being transversely apertured to receive the bushings 48 thru which extends the rotatable shaft 49 carrying handle 50. A pair of collars 51 are adjustably secured to shaft 49 for retaining the said shaft against transverse movement with respect to the supports 46.

The cam 52 is keyed to an end portion of shaft 49 as at 53 and normally underlies the central portion of the support 37 in spaced relation thereto. Upon rotation, however, of the shaft 49 through handle 50 the said cam

is actuated to operatively engage the central undersurface portion of support 37 for elevating the same from the workpiece W, as desired at the end of a testing operation.

The same mechanism may be used for gently lowering the abrasive strip 40 so as to operatively engage the workpiece at the beginning of the testing operation. A suitable counterbalance is provided for the support 37. For this purpose and as shown in FIGS. 1 and 3 there is provided an elongated shaft 54 threaded at 55' and which is secured at one free end as at 55 to the central rear portion of the support 37 extending rearwardly thereof and carrying at its outer free end the rotatively adjustable weight 56 cooperatively threaded thereon. Upright backplate 57 is secured at 58 to the rear portion of the column 30 centrally thereof and has a pair of upright spaced support members 59 bridged adjacent their upper ends by the transverse cross bar 60 and secured thereto by the fasteners 61.

The arm 62 is pivotally mounted at one end from its depending block between the uprights 59 by a pair of outwardly extending pivot pins 64 which project transversely through the supports 59, as shown in FIG. 3.

It is noted that the pivotal mounting 64 for the arm 62 is below the longitudinal axis of the said arm to facilitate pivotal movement of the arm 62 to an upright position or substantially upright position, if desired.

Suitable stop means 62' are employed for limiting the rearward adjustment of the arm 62 to an upright position, when not in use.

The arm 62 overlies the support 37, centrally thereof, and has a pivotal mounting on an axis 64 which is parallel to the pivotal mounting of the support 37.

A suitable dial indicator 65 is mounted upon the outer free end of the said arm as by suitable bracket 66 and includes the calibrated dial 67 and the conventional needle 68 movable with respect thereto in response to longitudinal movement of the conventional depending plunger 69 which is adapted to operatively engage the adjustable button 44 on the support 37.

The plunger 69 is normally biased downwardly into operative engagement with the free end of the support 37 and is thus responsive to downward movement thereof in consequence to wear action of the abrasive material 40 of known hardness into the top surface of the workpiece W of an abrasive material of unknown hardness.

By setting the dial indicator to a zero point at the start of the testing operation, it is seen that with a predetermined amount of downward pressure applied to the abrasive strip 40 that reciprocal movements of the workpiece W will produce a cutting action of the abrasive strip 40 down into the workpiece W to an extent which will indicate the hardness or the wear characteristic of the workpiece being tested.

It is contemplated for the purpose of the present invention that the strip of abrasive material 40 of known hardness will be harder than the workpiece that is to be tested so that the workpiece is cut into rather than the strip 40.

In the normal operation of the present testing machine, the arm 62 is not free swinging, but on the other hand once set into proper position serves the purpose of effectively holding the dial indicator body against vertical movement with the plunger 69 thereof free to move downwardly in response to downward movements of the support 37. For this purpose, there is provided a support means in the nature of an elongated arm 71, which is secured at one end at 72 to the upper end of the support 32' and which extends forwardly and angularly so as to underlie the central undersurface portion of arm 62 as at 63.

The adjustable bolt 74 has a support pad 76 at its lower end which engages the support means 71. The upper end of the bolt 74 is adjustably secured to an outer portion of the pivotal arm 62 as by the securing nuts 75. Accordingly, in operation, once the arm 62 has been set with respect to the support 37, it is restrained against further downward pivotal movements so that the plunger 69 is free to respond to vertical downward movements of the support 37 due to the wear action of the abrasive material 40 into the abrasive workpiece W. Thus the dial indicator will give you a direct index of the hardness and wear characteristics of the workpiece W and by reference to suitable prepared tables one is able to quickly, efficiently and inexpensively determine the relative hardness of the workpiece W for grading purposes.

Field tests of the present machine for testing hardness and wear characteristics of abrasive materials were conducted under standard working conditions at the Bower Roller Bearing Division, Federal-Mogal-Bower Bearings, Inc., at 3040 Hart Street, Detroit, Michigan. The results of these tests as set out hereunder clearly indicate that accurate grading of abrasive products is important for three reasons:

(1) Economical stone life.
(2) Cutting quality.
(3) Quality of finish of the product.

Set out hereunder is the table of the results achieved from these tests pointing up the importance of the machine such as disclosed herein in the selection of the proper abrasive equipment:

Wear Factor No.	Cutting Quality	Finish	Pieces per Stone
8-122	Poor	Poor	56
8-112	do	do	177
8-100	Fair	Fair	254
8-94	do	do	349
8-81	Good	Good	644
8-62	Excellent	Excellent	4,000

Having described my invention, reference should be had to the following claim.

I claim:

In a machine for testing the hardness and wear characteristics of abrasive materials, a bed, a rear upright thereon, a continuously reciprocal horizontally disposed table on said bed forward of said upright, a vise on the table adapted to supportably secure an abrasive workpiece whose hardness is to be tested, a test block support arm pivotally mounted on the rear upright and extending forward of the bed to have a forward end overlying the vise, the pivotal mounting of said support arm being on an axis parallel to the reciprocal movement of said table, an adjustable counterbalance on the rear end of said support arm, an elongated grip on the forward end of said support arm, a strip of abrasive material of known hardness secured within said grip extending lengthwise of said table with its longitudinal bottom edge operatively engaging said workpiece, said workpiece extending crosswise of said abrasive strip; a dial indicator arm on the rear upright overlying said support arm and pivotally mounted on an axis above and parallel to the axis of mounting of the support arm; and a dial indicator on the free end of said dial indicator arm including a depending plunger biased into and operatively engageable with the forward end of said support arm; and means supporting said dial indicator arm including a horizontally disposed auxiliary support bracket overlying said bed and spaced below said dial indicator arm, and a vertically adjustable stop depending from said dial indicator arm and bearing upon said auxiliary support bracket.

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