Jan. 4, 1944. L. P. PODESTA 2,338,537

HARDNESS TESTING MACHINE

Filed Feb. 26, 1940 3 Sheets-Sheet 1

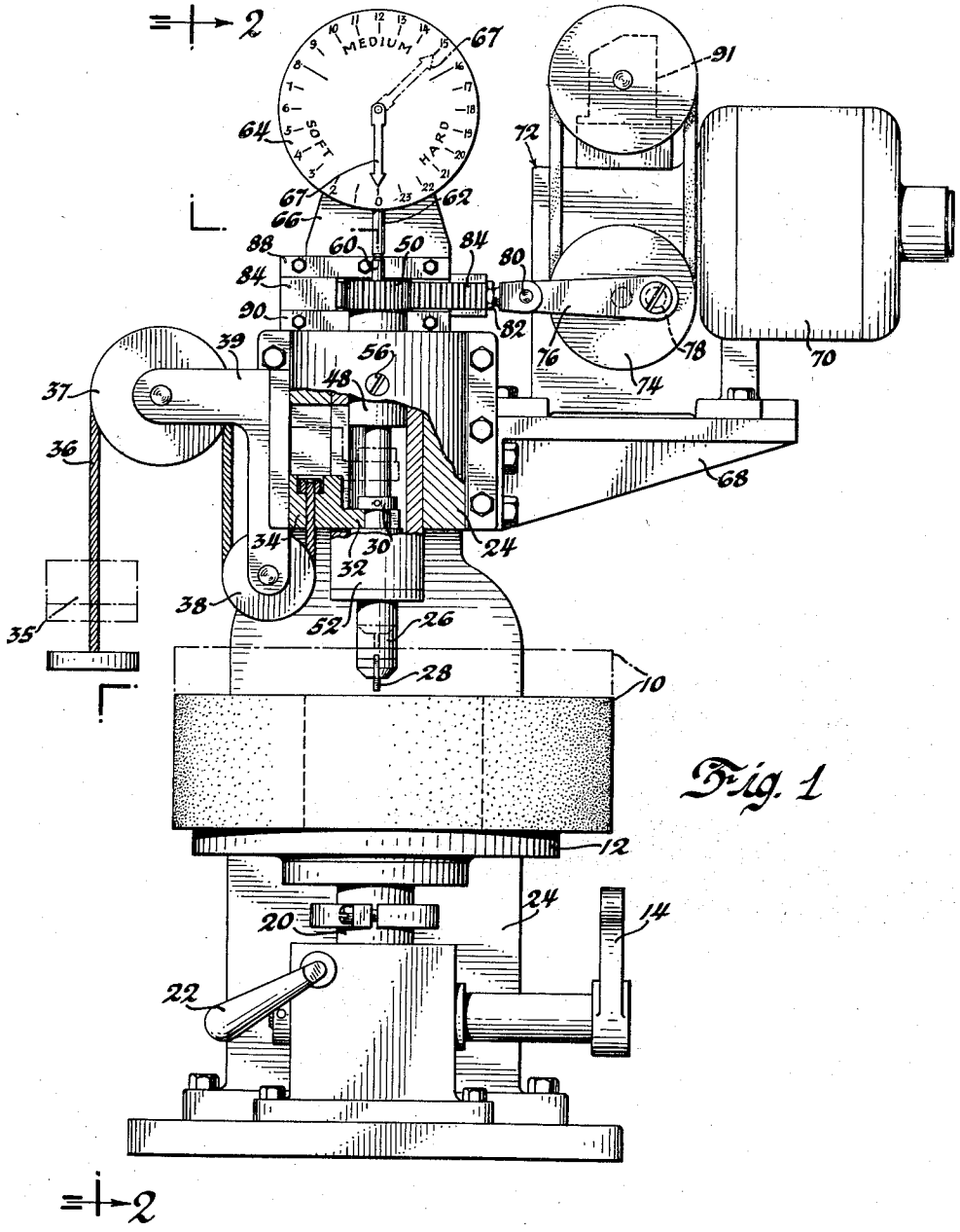


Fig. 1

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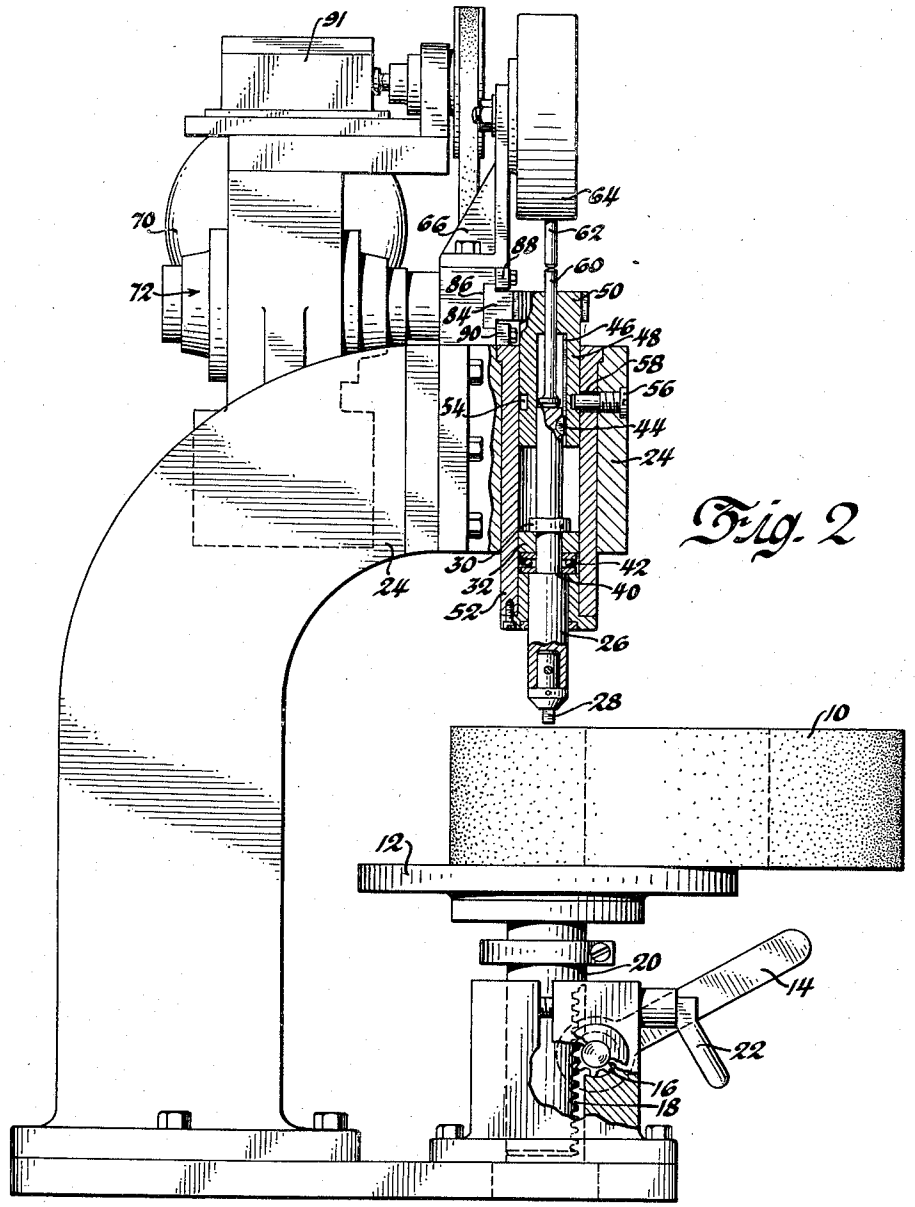


Fig. 2

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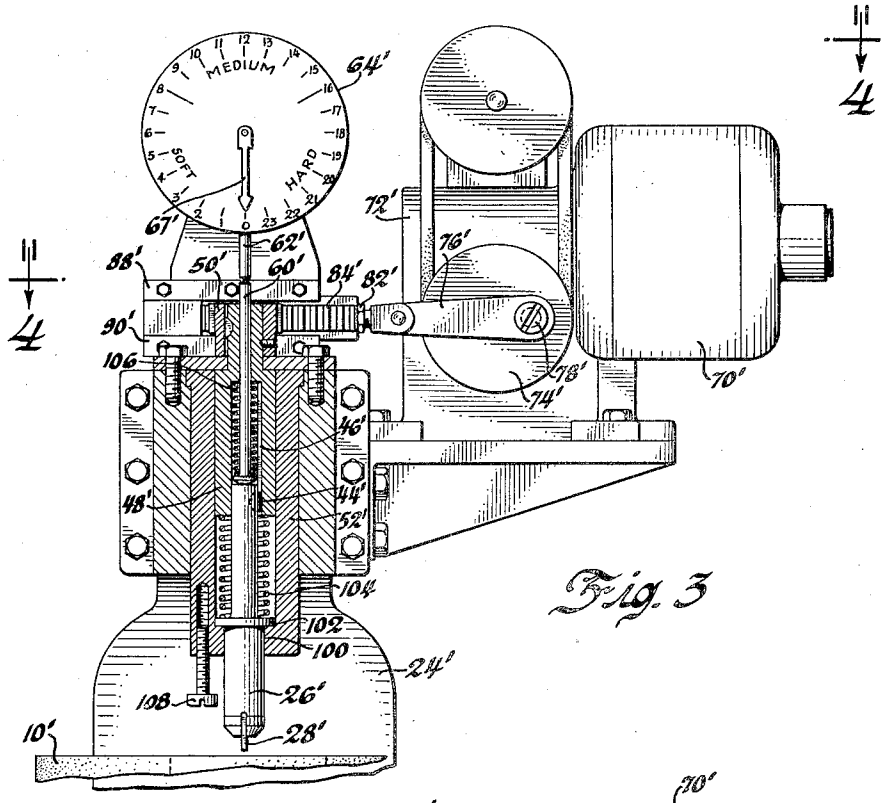


Fig. 3

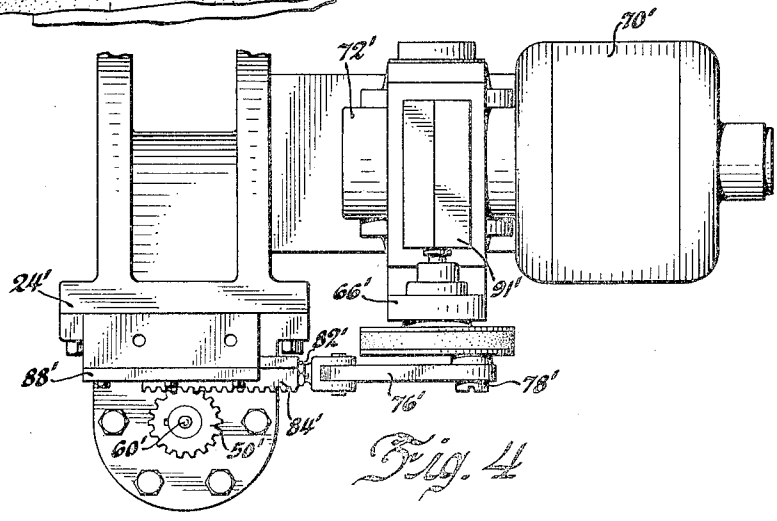


Fig. 4

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Patented Jan. 4, 1944

2,338,537

UNITED STATES PATENT OFFICE

2,338,537

HARDNESS TESTING MACHINE

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Application February 26, 1940, Serial No. 320,819

1 Claim. (Cl. 265—12)

This invention relates to hardness testing machines and more particularly to machines for testing the hardness of grinding wheels and the like.

A common method of testing grinding wheels for hardness is the hand method. In this method the one doing the testing uses a tool shaped like a screw driver which is pressed against the grinding wheel to be tested and twisted by hand back and forth. In this way the amount of pressure required to release the grain from the bond is determined. It is necessary for the tester to compare the wheel to be tested against a standard or master wheel. By forcing the screw driver against the master wheel and twisting the hand, and then doing the same with the wheel being tested a comparison between the two can be obtained. The results depend on the skill of the man doing the testing.

In an attempt to obviate the disadvantages of the hand method certain machines have been heretofore proposed. These have been slow in operation and have presented little, if any, advantages over the hand method. For this reason the prior art machines have not been used to any great extent so far as I am aware, and the hand method is still commonly employed.

The primary objects of my invention are to provide an apparatus or machine for testing grinding wheels and the like that eliminates the disadvantages of the hand method, and to provide a hardness testing machine that is characterized by speed, accuracy and ease of operation as compared with the prior art machines.

Reference is herewith made to the accompanying drawings forming a portion of this specification and illustrating preferred embodiments of my invention.

Figure 1 is an elevational view with parts broken away of a hardness testing machine in accordance with my invention.

Figure 2 is a view substantially on line 2—2 in Figure 1.

Figure 3 is a view generally similar to Figure 1 of a modified form of hardness testing machine in accordance with my invention.

Figure 4 is a view on line 4—4 in Figure 3.

In the form of the invention shown in Figures 1 and 2 the grinding wheel 10 to be tested is placed on a table 12. The table 12 is movable up and down by means of lever 14 having a pinion 16 fixed to one end thereof, the pinion engaging a rack portion 18 of a post 20 which supports the table 12. A handle 22 actuates a clamping means to lock the post and table carried thereby in the desired position.

Mounted above the table in the overhanging portion of the frame 24 is a spindle 26 to which is secured at the lower end thereof a tool 28. Any suitable form of tool may be used, the form illustrated being rectangular in cross-section and being somewhat similar to the blade of a screw driver.

Fixed to the spindle 26 intermediate the upper and lower ends thereof is a collar 30. The collar is above the flange 32 of a slide 34. The slide is normally forced downwardly by means of suitable weights 35 carried by the free end of a rope or flexible cable 36 passing around pulleys 37 and 38 carried by a bracket 39 fixed to the upper part of the frame. Between the lower side of the flange 32 and on a shoulder 40 formed by an enlarged portion of the spindle is a roller thrust bearing 42.

Near the upper end of the spindle 26 and carried thereby is a Woodruff key 44 having a portion thereof in slidable engagement with a splined portion 46 of a sleeve or hub member 48 to which is fixed at its upper end a gear 50. The sleeve member 48 and the gear are mounted for oscillatory movement in a flanged sleeve 52 supported by the overhanging portion of the frame. The sleeve member 48 has a channel-shaped groove 54 extending entirely around its circumference. A screw threaded pin 56 projects into the groove through an opening 58 in the flanged sleeve 52. This fixes the splined sleeve 48 and gear 50 against longitudinal movement with respect to the supporting sleeve 52, but permits the gear and splined sleeve to oscillate back and forth by means later described.

Resting on the upper end of the spindle 26 is a rod 60 which projects above the gear 50 and contacts a rod actuating means 62 of an indicator 64 carried by a bracket 66 fixed to the upper portion of the frame. The pointer of the indicator is indicated at 67.

Supported by another bracket 68 carried by the frame is an electric motor 70. Through a suitable speed reducing mechanism indicated generally at 72 the motor drives a rotary member 74. A connecting rod 76 is connected at one end to a pin 78 fixed to the rotary member 74 at a point spaced from the axis of rotation. The opposite end of the connecting rod is pivotally connected at 80 to a rod 82 having screw threaded engagement with a rack 84, the teeth of the rack being in engagement with the teeth of the gear 50. The reciprocatory movement of the rack thus oscillates the gear 50 and parts actuated thereby. The body of the rack is T-shaped in

cross-section, the head of the T being supported for reciprocatory movement in a groove or channel formed by a cut-away portion of a member 86 and removable strip plates 88 and 90. If desired, a counter mechanism indicated at 91 may be provided.

Preferably the motor controls are such that the motor will stop automatically after a predetermined time or predetermined number of reciprocations of the rack. In this way the same number of oscillations of the spindle and tool carried thereby can be had automatically for each wheel being tested. One way of doing this is to provide the counter mechanism with switch contacts which will open and break the current to the motor after a predetermined number of reciprocations.

The method of operation of the hardness tester disclosed in Figures 1 and 2 may be summarized as follows: The operator places a grinding wheel to be tested on the table 12 and raises the table and grinding wheel until the grinding wheel contacts the tool 28 carried by spindle 26. Further movement raises the spindle, slide 34, weights 35, rod 60, and the indicator actuating means. The splined sleeve or hub 48 permits relative movement between the hub and spindle. The movement is continued until the pointer of the indicator is moved to a predetermined point on the scale of the indicator in the range of hardness desired, whereupon the table is locked in position.

The size of the weight is so chosen as to force the tool into the master or standard grinding wheel a certain distance during a definite number of oscillations of the tool. The tool will penetrate all wheels of similar hardness an equal amount. The dial of the indicator can be calibrated to indicate the degree of penetration. Preferably different sized weights are used for wheels having different hardnesses. Thus the largest weight will be used for the hardest grinding wheel, the smallest weight for grinding wheels of the softest range, and an intermediate weight for grinding wheels of intermediate hardness.

The motor is then started and by means of the speed reducing means the rotary member 74 is rotated at a desired speed, preferably considerably slower than the speed of rotation of the electric motor. The rotary movement of member 74 is translated into reciprocatory motion to move the rack 84 back and forth, thus oscillating the gear 50, which in turn moves the spindle 26 and tool 28. The number of reciprocations of the rack is fixed so that each wheel is given the standard test. The oscillatory movement causes the tool to move into the grinding wheel a certain amount depending on the hardness of the grinding wheel being tested. If the grinding wheel to be tested has the same hardness as that of the master or standard wheel, the tool will move into the grinding wheel to the same depth as it does when the standard or master grinding wheel is similarly tested. The dial of the indicator is first calibrated with the master or standard wheel. Grinding wheels having the same hardness as the master wheel thus will have the same dial reading. If the tool moves deeper into the grinding wheel as indicated on the dial of the indicator, the grinding wheel is of a softer grade than the standard or master grinding wheel, while if the tool does not move as far into the grinding wheel being tested as it does in the case of the test on the master grinding wheel, the wheel being tested is harder than the standard.

In Figures 3 and 4 is shown another embodiment of the invention. In this form the table, elevating mechanism for the table and table locking means are not shown as they are similar to those provided in the form of the invention of Figures 1 and 2. In Figures 3 and 4, 10' represents the grinding wheel to be tested. Above the grinding wheel is a tool 28' carried by a spindle 26'. The spindle is mounted within a flanged sleeve member 52' carried by the upper part of the frame 24'. Resting on an inwardly extending flange 100 of the sleeve member 52' is an enlarged portion 102 of the spindle 26'. A coil spring 104 having one end resting on the upper side of portion 102 and its other end contacting the lower end of a sleeve member 48' normally biases the enlarged portion of the spindle into engagement with the flange 100. The sleeve 48' is splined at 46' and is connected by means of a Woodruff key 44' with the spindle 26'. Contacting the upper end of spindle 26' is a rod 60' which extends upwardly through the hub and engages an actuating means 62' for an indicator 64' having a hand or pointer 67'. A coil spring 106 biases the rod 60' into pressure contact with the upper end of spindle 26'. Fixed to the upper end of the sleeve 48' is a gear 50' having engagement with the teeth of a rack 84', the rack being reciprocated by means of screw-threaded rod 82', connecting rod 76', pin 78', rotary member 74', speed reducing means 72' and electric motor 70'.

In the lower end of sleeve 52' and having screw-threaded engagement therewith is an adjustable stop 108.

The operation of the modification of the invention shown in Figures 3 and 4 is generally similar to that of Figures 1 and 2. The table and grinding wheel to be tested are first moved to bring the grinding wheel into contact with the tool 28'. Further movement causes the spindle to move relative to the sleeve 48', thus compressing coil springs 104 and 106 and moving the pointer of the indicator to a desired point on the dial. The stop 108 may be adjusted to contact the upper side of the grinding wheel when the proper position is reached. The electric motor is started and the spindle and tool oscillated back and forth for a predetermined number of cycles, the compressed springs causing the tool to feed into the grinding wheel an amount dependent on the hardness of the grinding wheel.

It will thus be seen that in both of the embodiments of my invention disclosed herein that the spindle and tool are positively oscillated back and forth by means of the electric motor reciprocating the rack for a desired number of cycles, the connection between the spindle and splined sleeve permitting relative longitudinal movement between these parts so that the loaded spindle and tool may move downwardly into the grinding wheel an amount dependent on the hardness of the grinding wheel being tested.

Various changes in the embodiments of my invention disclosed herein may be made without departing from the spirit and principles of my invention and I do not intend to limit the patent granted thereon except as necessitated by the prior art.

I claim:

In a machine for testing the hardness of grinding wheels and the like, a work support, a

spindle, a tool carried by the spindle, means for raising the work support to bring the work to be tested into contact with the tool, a sleeve extending above the spindle for oscillating back and forth the spindle and tool, the upper portion of the spindle being within the lower portion of sleeve and in slidable engagement therewith, a splined connection between the sleeve and spindle permitting relative longitudinal movement between the two while securing the spindle to the sleeve to oscillate back and forth therewith, means for applying a load to the spindle and tool, a gear fixed to the upper end of the sleeve, a reciprocatory rack engaging said gear, means for reciprocating the rack to oscillate back and forth the gear, sleeve, spindle and tool while the load is applied to the spindle and tool to cause the tool to penetrate the work to a depth dependent on the hardness of the work being tested, an indicator above the gear and spindle for measuring the depth of penetration of the tool into the work being tested, and a slidable rod for actuating the indicator passing through the gear and through the upper portion of the sleeve thereby engaging the upper end of the spindle and operating the indicator.

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