DEVICE FOR TESTING THE FLATNESS OF THE SURFACE OF A LAPPING PLATE OF A LAPPING MACHINE

Inventor: Lawrence Day, Chicago, Ill.

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ABSTRACT

A device for testing the flatness of the surface of a flat lapping plate of a lapping machine, the device including a probing device manipulated over the surface of the lapping plate and having a probing finger riding on and in engagement with a wire cable stretched taut over and above the surface of the lapping plate and supported upon the lapping plate at opposite corresponding portions thereof. The probing device has an indicator receptive to the flat condition of the surface of the lapping plate to indicate the minutest variation in the flatness of such plate.

1 Claim, 7 Drawing Figures
DEVICE FOR TESTING THE FLATNESS OF THE SURFACE OF A LAPPING PLATE OF A LAPPING MACHINE

SUMMARY OF THE INVENTION

Perfection in flat lapping of work by means of a lapping machine having a flat lapping plate depends upon the surface of the lapping plate being flat throughout its area. Any deviation of the flatness of the surface will result in the work being imperfectly lapped. My invention has to do with a probing device which includes a simple and effective arrangement for detecting any variation of the minutest degree in the flatness of the lapping plate.

The several objects of my invention are best accomplished by the preferred form of construction shown in the accompanying drawings and in which:

FIG. 1 is a fragmentary perspective view of a flat lapping machine showing my probing device associated therewith;

FIG. 2 is a top plan view of the probing device embodied in my invention;

FIG. 3 is an elevation view taken substantially on line 3—3 of FIG. 2;

FIG. 4 is an enlarged sectional detail view taken substantially on line 4—4 of FIG. 1;

FIG. 5 is an enlarged sectional view taken substantially on line 5—5 of FIG. 3;

FIG. 6 is an enlarged sectional detail view taken substantially on line 6—6 of FIG. 1;

FIG. 7 is an enlarged top plan view of the dial of the indicator shown in FIG. 1.

The several objects of my invention are accomplished by the preferred form of construction shown in the accompanying drawings and in which the lapping machine with which my invention is adapted to be associated, includes a base 10 supporting a circular flat lapping plate 11. The lapping machine with which my invention is associated may be of a construction similar to that shown in my U.S. Pat. No. 3,377,750.

The probing device includes an elongated bar 12 substantially rectangular and hollow in cross section. The opposite ends of the bar are bifurcated as at 13. Mounted in the bifurcations of the bar 12 are grooved wheels 14, there being provided for such mountings, pintles 15. Extending about the wheels 14 and therebetween is a wire cable 16 having its opposite ends 17 connected together by means of a turnbuckle 18, by means of which the cable is stretched about the wheels 14. Any suitable turnbuckle may be used, but for convenience I have illustrated in FIG. 5 a detailed sectional view of a preferred turnbuckle 18. As there shown, the screw 19 of the turnbuckle is threaded upon the end portions of threaded studs 20, which studs are formed as an integral part of a block 21 having a counterbore 22 in the end portion thereof. Mounted in this counterbore 22 is a plug 23. Each end 17 of the cable 16 is projected through a longitudinal bore 24 formed in the plug 23, with the end embracing as at 25 a bolt 26. The ends 17 of the cable 16 are secured in the plug 23 by means of suitable set screws 27, thus completing a secure and permanent connection between the ends of the cable 16 and the turnbuckle 18.

The bar 12 with the cable 16 tightly stretched thereabout is supported on the lapping plate 11 by providing at one end thereof a supporting leg 28. This leg 28 includes a crossbar 29 attached to the bar 12 by means of screws 30. The ends of the crossbar 29 are supported by feet 31 which may be either threaded or frictionally fitted into openings 32 formed in the outer end portions of the crossbar 29.

The opposite end of the bar 12 is supported by a screw 33 having an elongated shank 34 threaded through and extending beyond the lower or bottom surface of the bar 12 into engagement with the adjacent edge portion of the lapping plate 11, as at 35. The shank 34 is threaded through a block 36 positioned within the bar 12 and secured therein by suitable bolts 37. The block 36 has a slit 38 formed therein, and adjacent sides of the block 36 are bifurcated as at 39 so that a draw screw 40 when manipulated will draw the sides of the block opposite the slit 38 tightly against the shank 34 of the adjustable screw 33 to firmly hold the screw in an adjusted position.

The probing device of my invention is positioned to span the surface of the lapping plate 11. While I have shown the opposite end portions of my probing device supported by the lapping plate, it is to be understood that the length of the probing device may be such as to permit it to be supported on the circular edge 41 of the lapping machine 10, the result being the same. When the probing device is thus positioned upon the lapping plate, an indicator 42 is employed to detect the variations to the minutest degree in the flatness of the surface of the lapping plate 11. This probing device includes a base plate 43 which is mounted upon the surface of the lapping plate and manually manipulated therewith.

As a part of this probing device is an indicator dial 44 having a needle which indicates the degree of variation in the surface of the flat lapping plate. This needle is sensitive to a probing finger 45 which engages and rides upon the wire cable 16.

To test the flatness of the lapping plate 11 of the lapping machine, the operator places the bar 12 in the position shown in FIG. 1. He then takes the indicator 42 and places it with its probing finger on the wire cable 16 adjacent the end of the bar 12. He then adjusts the bar 12 by means of the adjusting screw 33 until the needle of the indicator dial is in zero position on the dial. When both ends of the bar 12 are thus properly adjusted, that is, with the needle indicating a zero position upon the dial, the operator then moves the indicator 42 transversely across the surface of the lapping plate 11. Should there by any variation in the flatness of the surface of the lapping plate, even to the minutest degree, the probing needle will effect an indication off of zero position to apprise the operator that there exists an unevenness in the flatness of the surface of the lapping plate.

By means of dressing rings shown in my aforementioned patent, the surface is then dressed so as to remove any variation in the flatness of the surface of the lapping plate. This testing of the flatness of the surface of the lapping plate is accomplished in a very simple and expeditious manner, requiring no extensive or complex calculations or special training as has been heretofore necessary where electronic devices or the like have been employed. In a matter of seconds the operator is able to determine whether the surface of the lapping plate requires redressing.

My device for testing the flatness of the surface of a lapping plate may be manufactured at an economical cost and may be operated in the easiest and most expe
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3. A ditious manner, requiring no special training or complex calculations in its use.

To facilitate the contact between the wire cable 16 and the probing finger 45, the finger may, if desired, have its outer end slightly curved upwardly, thus presenting to the wire cable a curved end portion of the finger.

While the probing device described herein is generally mechanical, it should be understood that in its stead an optic or light reflector device may be used to scan the longitudinal plane of the cable 16 and visually or reflectively ascertain any variations between it and the flat surface of the lapping plate being gauged.

As is evident from the foregoing description, the invention is especially designed for use in connection with flat lapping machines. However, it is to be noted that the invention may be used in connection with any surface in which the flatness is to be determined and corrected.

While I have illustrated and described the preferred form of construction for carrying my invention into effect, this is capable of variation and modification without departing from the spirit of the invention. I, therefore, do not wish to be limited to the precise details of construction set forth, but desire to avail myself of such variations and modifications as come within the scope of the appended claims.

Having thus described my invention, what I claim as new and desire to protect by Letters Patent of the United States is:

1. A device for testing the flat surface of a lapping plate, comprising
   a. an elongated generally rectangularly shaped bar adapted to be freely positioned transversely above the surface of the lapping plate to be tested,
   b. means adjacent either end of said bar for supporting said bar in a transverse position above the top surface of the lapping plate,
   c. a cable supported by said bar and extending longitudinally about said bar in the form of a taut loop spaced from the longitudinal sides of said elongated bar,
   d. one of said means adjacent one end of said bar for supporting the same on the lap plate comprising a crossbar extending beneath and beyond the sides of said elongated bar, with another of said means adjacent the other end of said elongated bar comprising an adjustment screw movable vertically through said elongated bar transversely to its longitudinal length and adapted to position said other end of said elongated bar in the same horizontal plane as said one end of said elongated bar, and
   e. an indicator device freely movable longitudinally of said bar over the surface of the lapping plate to be tested and having a dial and a probe finger, with the probe finger in contact with said cable so as to transmit to the dial for registration thereon any degree of unevenness in the surface of the lapping plate.

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