May 21, 1963 S. A. BOETTCHER 3,090,169

LAPPING MACHINE FIXTURE

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Fig. 1.

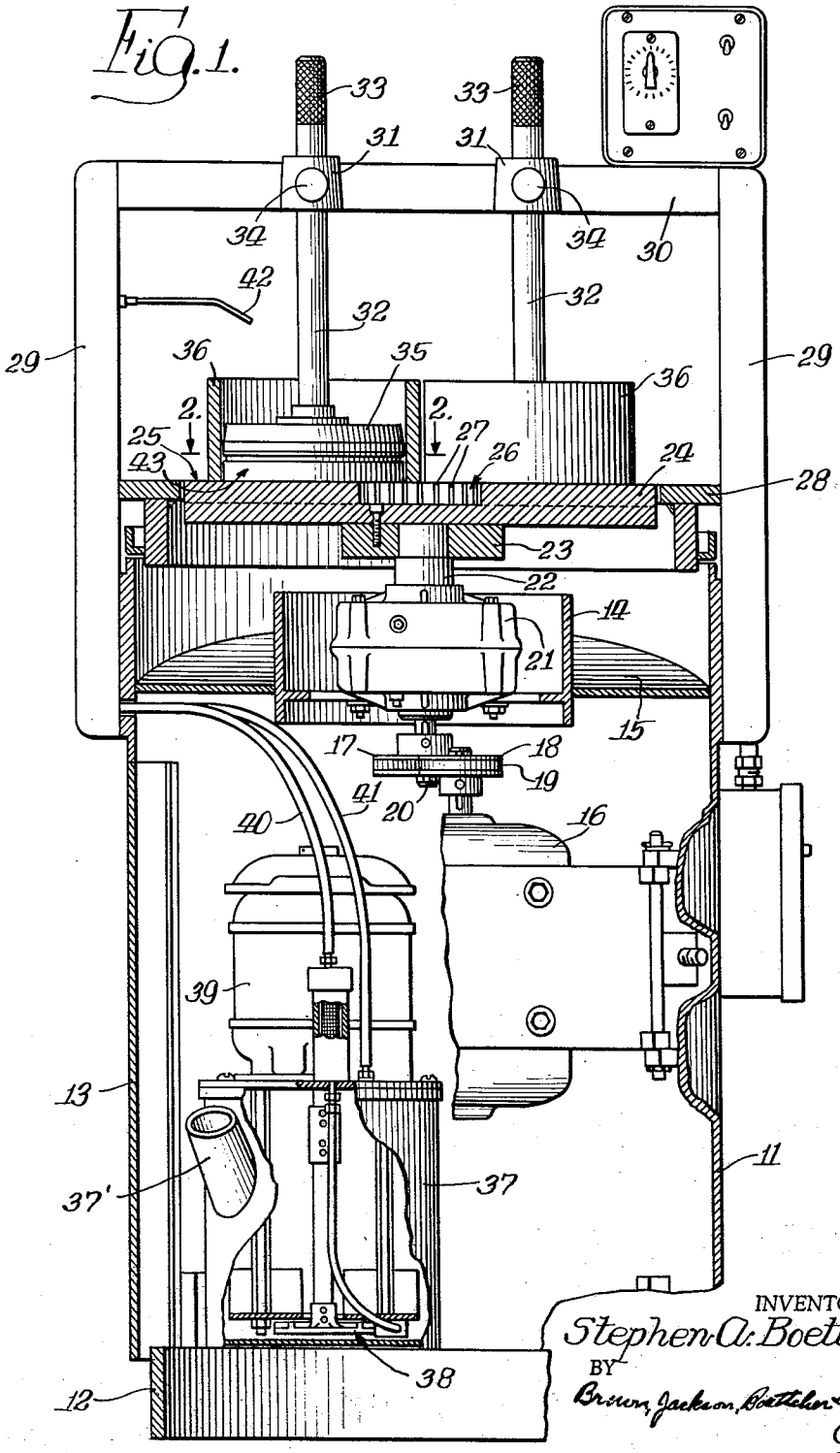

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Fig. 2.

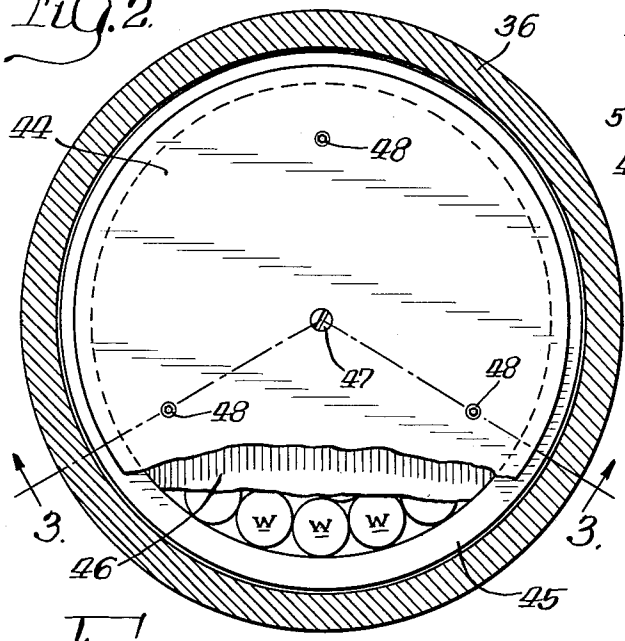


Fig. 4.

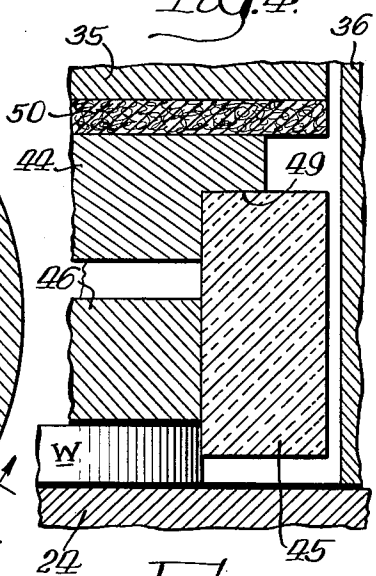


Fig. 3.

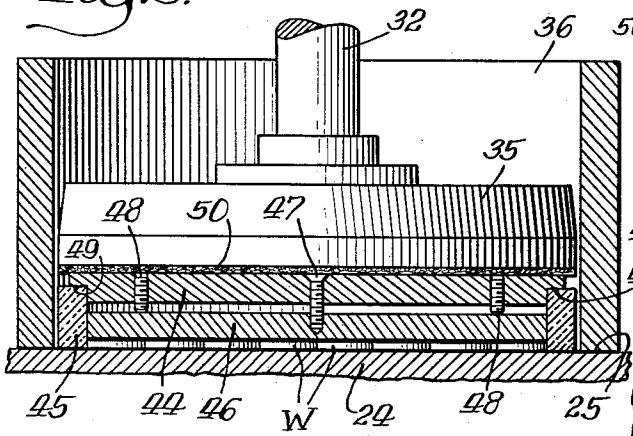
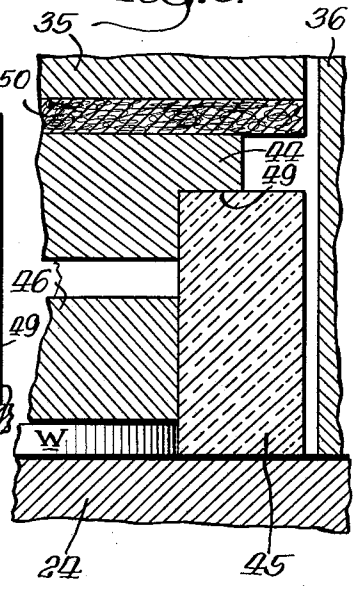


Fig. 5.



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LAPPING MACHINE FIXTURE

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6 Claims. (Cl. 51—131)

This invention relates to lapping machines and provides a fixture for lapping thin planar parts to an accuracy of one ten-thousandth of an inch or less.

The fixture intervenes between the weight or pressure plate and the work pieces on the lapping surface within the truing retainer ring the basic idea being to allow lapping of the work pieces to finish thickness, and then automatically discontinuing the lapping by removal of the down pressure, without stopping the machine.

The invention is illustrated in the accompanying drawings, in which:

FIGURE 1 is a cross-sectional view of the machine in general, taken approximately on its vertical center line;

FIGURE 2 is a horizontal cross-sectional view, taken on the plane of the line 2—2 of FIGURE 1, looking downwardly, and on a larger scale, portions being broken away;

FIGURE 3 is a vertical cross-sectional view, taken on the planes of the dot-and-dash line 3—3 of FIGURE 2, looking in the direction of the arrows; and

FIGURES 4 and 5 are two corresponding sectional views of a portion of FIGURE 3, on a still larger scale, showing respectively, the positions of the fixture before and after the lapping operation, the vertical dimension of the work piece being exaggerated for clarity.

Referring firstly to FIGURE 1:

The machine has a substantially cylindrical pedestal **11** supported by a base ring **12**. The pedestal has an access door **13**. A cylindrical collar **14** is disposed within the upper end of pedestal **11**, the same being mounted by means of an inclined wall **15** forming a drip pan for receiving abrasive and carrier mixture used in the lapping operation above.

Mounted within the pedestal is a main drive motor **16** operatively connected by means of sheave wheels **17** and **18** and a V-belt **19** with shaft **20** of a conventional gear reducer unit **21**, the output shaft **22** of which carries a hub member **23**, upon which the horizontal circular plate or disk **24**, which provides the lapping surface **25**, is mounted for rotation. This disk has a central well-bore **26**, leaving an annular lapping area, and a plurality of radial slots **27** to lead the used abrasive and carrier mixture to the drip pan **15**.

Surrounding the lapping disk is a staging table **28** from which work pieces can be moved onto the lapping surface and to which they can be returned when the lapping operation is completed.

Vertical channel columns **29, 29** are mounted in upright position at diametrically opposite sides of the pedestal housing **11**, joined at the top by bridge member **30**, which is provided with two intermediary transverse arms **31, 31**, having vertical bores for receiving vertically adjustable spindles **32**, two of which are shown. Each spindle has a knurled upper end **33** for manual grasping, and is held by a set screw **34**. The lower end of each spindle is journaled in the center of a circular weight or pressure plate **35** and thus defines the axis of rotation of such plate.

Each weight or pressure plate **35** fits, with slight clearance, within a truing-retainer ring **36** which rests on the lapping surface **25** of the plate or disk **24**, and the weight or pressure plate rests upon the fixture to be described, which, in turn, rests upon the work pieces on the lapping surface. The rings **36** function continuously to dress the lapping wheel for maintenance of its planar condition.

In the lower portion of the pedestal housing **11** there is provided a tank **37** for the abrasive and carrier mixture, having a filling tube **37'** and, within it, means **38**, powered by motor **39**, for agitating the said mixture and for circulating it, by means of tubing **40** and **41**, passing through one of the channel columns **29**, to the level of the bleed-off spout **42**, disposed in overlapping relation to the plate or disk **24**, for drop-by-drop feed of the mixture to the lapping surface **25**.

The fixture of the present invention, indicated as a whole in FIGURE 1 by the reference numeral **43**, is there shown in elevation, disposed within the truing-retainer ring **36** between the weight plate **35** and the lapping disk **24** as above stated.

Reference is now made to FIGURES 2, 3, 4 and 5, illustrating the fixture in detail and on larger scales.

It comprises three elements, i.e. circular back plate **44**, stop ring **45**, and circular reference plate **46**, together with retaining screw **47** and three set screws **48**.

The back plate **44** has a peripheral shoulder **49**, which engages the top of the stop ring **45**, tightly fitted to the reduced periphery of the plate, as shown. The reference plate **46** fits within the stop ring **45** with slight clearance. The work pieces, indicated at *w*, circular disks for instance lie on the lapping surface **25**, within the stop ring **45**, and the under surface of the reference plate engages the work pieces, the heavy black lines above and below them indicating the films of lapping medium, i.e. the abrasive and carrier mixture above mentioned. The lower film of lapping medium of course extends under the stop ring and the truing retainer ring **36**.

The stop ring **45** must not "lap," and, accordingly, I make it of ceramic material and select an aluminum oxide or garnet abrasive for the lapping medium.

The height of the reference plate, relative to the bottom of the stop ring determines the ultimate vertical dimension of the work pieces and is adjustable by means of the set screws **48**, held as adjusted by tightening the retaining screw **47**.

Work pieces which have been lapped on the one side in the usual manner, are inverted and so placed on the lapping surface **25** within the inner area of the stop ring, and then the fixture **43** is placed upon them, followed by the weight or pressure plate **35**, a felt pad **50** between them, if desired. A convenient method of loading the machine with thin work pieces, is as follows: After the fixture has been adjusted for the desired spacing of the under side of the reference plate **46** and the bottom of the stop ring **45**, it may be inverted, a small amount of lapping medium spread on its exposed surface, and then laying the work pieces thereon, with light hand pressure, causing them to adhere; the fixture is then righted and placed on the lapping surface within the truing-retaining ring, followed by the weight or pressure plate **35**, a felt pad **50** intervening, if desired.

FIGURE 4 shows the parts at the start of the operation, and FIGURE 5 shows them at the pre-determined completion of the operation. In these figures the vertical dimension of the work piece has been exaggerated for purposes of clarity.

The fixture provides means for determining in advance the vertical dimension of the work pieces with the utmost accuracy, and when the selected dimension has been attained the lapping ceases automatically, and continued operation of the machine is without effect.

I claim:

1. In a lapping machine fixture for predetermining the extent of lapping work pieces positioned on a rotating lapping disc within a truing and retaining ring thereon, a plate for resting on said work pieces, a second plate parallel thereto and adjustably distanced therefrom, and means carried by said second plate for engaging the lap-

ping disk to arrest the downward movement of said plates.

2. In a lapping machine fixture for predetermining the extent of lapping work pieces positioned on a rotating lapping disc within a truing and retaining ring thereon, a plate for resting on said work pieces, a second plate parallel thereto and adjustably distanced therefrom, and a ring carried by said second plate surrounding said first-named plate for engaging the lapping disk to arrest the downward movement of said plates.

3. In a lapping machine fixture for predetermining the extent of lapping work pieces positioned on a rotating lapping disc within a truing and retaining ring thereon, a plate for resting on said work pieces, a second plate parallel thereto, set screws in one of said plates for engaging the other plate to adjust the distance between them, means for securing said plates together in adjusted position, and a ring carried by said second plate for engaging the lapping disk to arrest the downward movement of said plates.

4. In a lapping machine fixed for predetermining the extent of lapping work pieces positioned on a rotating lapping disc within a truing and retaining ring thereon, a plate for resting on said work pieces, a second plate parallel thereto and adjustably distanced therefrom, and a ceramic ring carried by said second plate surrounding said first-named plate for engaging the lapping disk to arrest the downward movement of said plates.

5. In a lapping machine fixture for predetermining the extent of lapping work pieces positioned on a rotating lapping disc within a truing and retaining ring thereon, a first horizontal plate for resting on said work pieces, a second horizontal plate parallel thereto and adjustably distanced thereabove, said second plate having an annular reduced periphery defining a peripheral shoulder, an annular ring at its upper end forcibly fitted to said reduced periphery and seated against said shoulder in said second plate, said ring having an inner diameter substantially conforming to the outer diameter of said first plate, and said ring extending axially downwardly beyond the plane of the lower face of said first plate for engaging the lapping disc to arrest the downward movement of said plates.

6. The combination of claim 5 characterized by the provision of set screws in one of said plates for engaging the other plate to adjust the distance between them, and means for securing said plates together in adjusted position.

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