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LAPPING MACHINE FIXTURE

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Fig. 1.

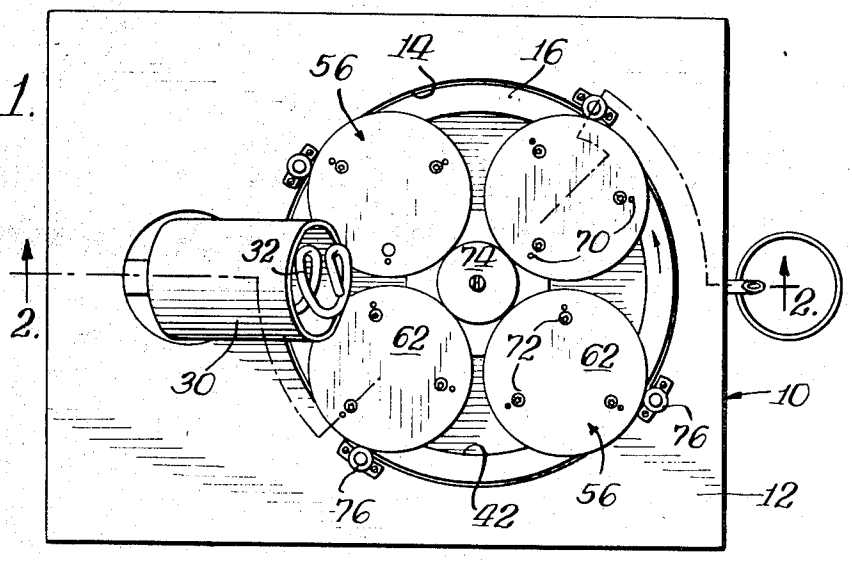


Fig. 2.

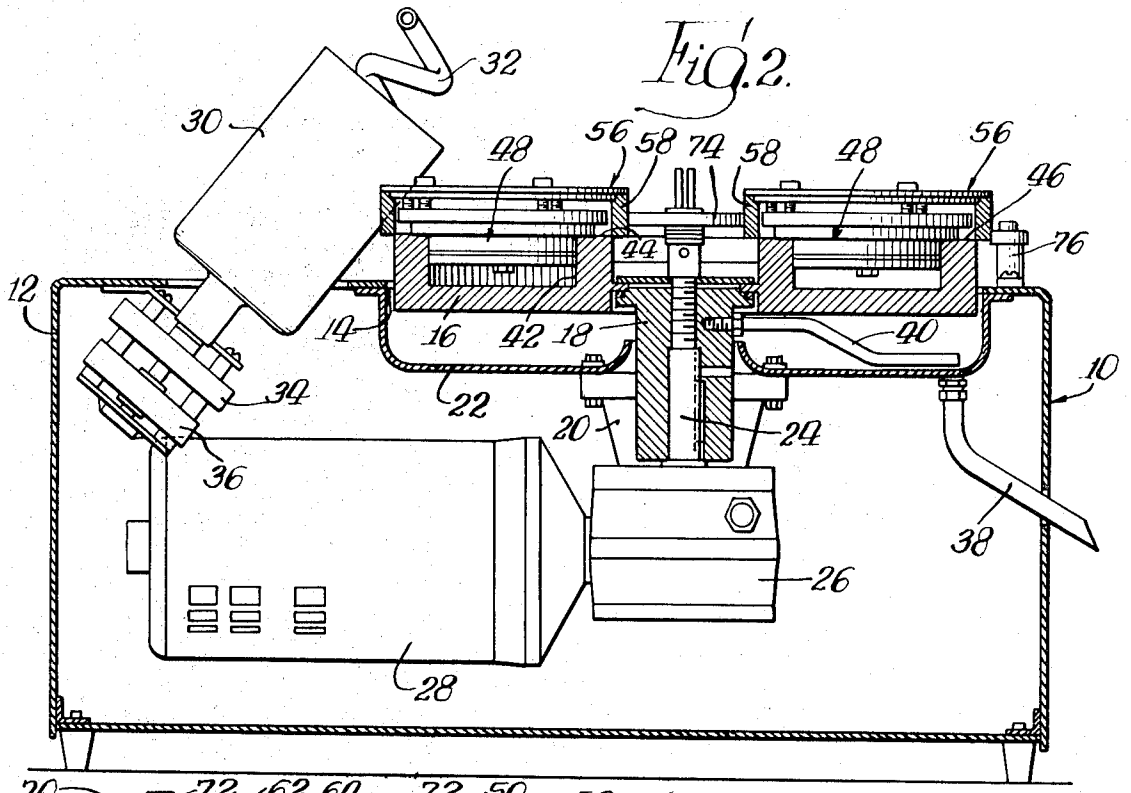
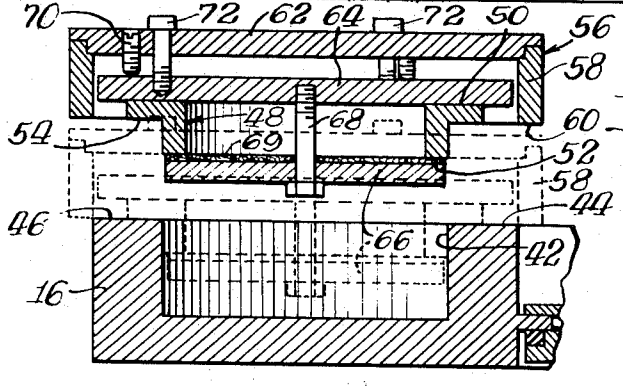


Fig. 3.



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LAPPING MACHINE FIXTURE

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ABSTRACT OF THE DISCLOSURE

A fixture comprising a ring portion engaging the lapping surface of a rotating lapping disc, and means for mounting in the fixture a workpiece having an exterior annular radial shoulder positioned for lapping on the lapping surface.

BACKGROUND OF THE INVENTION

Field of the invention

The present invention relates generally to lapping machines, and more particularly to a fixture for use therewith in lapping an exterior annular radial shoulder of a workpiece.

Description of the prior art

One type of lapping machine adapted for shoulder lapping includes a lapping disc having an upwardly facing annular channel and presenting a horizontal lapping surface comprised of inner and outer annular zones. A ring-like workpiece may be disposed to extend axially into the annular channel with the intermediate exterior annular radial shoulder thereof positioned for lapping on the lapping surface. As the lapping disc is rotated, the workpiece is permitted to rotate on its own axis while being held against rotation about the axis of the lapping disc. This shoulder lapping arrangement has not proved to be entirely satisfactory. Because of the small area of essentially two-point contact between the shoulder and the lapping surface at the opposite sides of the annular channel, the workpiece during lapping is unstable. As a consequence, difficulty has been experienced in obtaining a truly flat shoulder and a shoulder that is parallel to the top of the workpiece.

SUMMARY OF THE INVENTION

In accordance with the present invention, there is provided a fixture which supports the workpiece from above. More specifically, the fixture comprises a ring portion having a bottom surface engaging the lapping surface, and means for mounting the workpiece in the fixture with the shoulder of the workpiece positioned on the lapping surface. The ring portion overlaps the inner and outer peripheries of the inner and outer annular lapping zones respectively. In this manner, the ring portion provides a four-point support for the workpiece on the lapping surface and increases the supporting contact area with the lapping surface whereby the workpiece is stabilized during lapping and only the high spots on the shoulder are lapped. The ring portion also serves to dress the lapping surface and eliminates the need for a separate conventional truing ring. In addition, the workpiece is adjustably mounted in the fixture whereby the shoulder of the workpiece may be positioned in the plane of the bottom of the ring portion for parallel and flat lapping. Other features and advantages of the present invention will become apparent from the following detail description.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a plan view of a lapping machine with which are associated fixtures of the present invention;

FIG. 2 is a vertical sectional view on an enlarged scale, taken substantially along the line 2—2 in FIG. 1, looking in the direction indicated by the arrows; and

FIG. 3 is a sectional view, on a further enlarged scale, of one of the fixtures, and a portion of the lapping disc, of FIG. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIGS. 1 and 2, there is indicated generally by the reference numeral **10** a bench-type lapping machine with which fixtures of the present invention may be used. The lapping machine **10** includes a generally rectangular housing **12** in the top wall of which is provided a circular opening **14** for receiving a horizontal lapping wheel or disc **16**.

The lapping disc **16** is secured to a driving hub **18** which is journalled in a tubular support **20** suspended from a combined drip pan and supporting member **22** depending from the top wall of the housing **12**. The driving hub **18** is keyed to the drive shaft **24** of a worm-drive gear box **26** which, together with an operatively connected drive motor **28**, is carried by the tubular support **20**. The above-described drive means serves to support the lapping disc **16** and to drive the same in a counterclockwise direction as viewed in FIG. 1.

Mounted at one side of the lapping disc **16** is an inclined cylindrical container **30** having a helically wound tube **32** fixedly mounted therein. The container **30** is adapted to be rotated by a gear box **34** and an electric motor **36**. A liquid carrier, such as light oil, with abrasive particles in suspension is placed in the container **30**, and the abrasive mixture is fed therefrom through the tube **32** to the lapping disc **16** upon rotation of the container. Used abrasive mixture flowing from the lapping disc **16** is collected in the drip-pan supporting member **22** and is drained therefrom through a drain spout **38**. A wiper bar **40** is threaded into the driving hub **18** for rotation therewith, and the free end thereof serves to sweep collected abrasive material toward the drain spout **38**.

For further details concerning the construction and operation of the lapping machine **10**, reference may be had to U.S. Letters Pat. Nos. 3,110,991 and 3,110,992.

For use in shoulder lapping, the lapping disc **16** is formed with an upwardly facing annular channel **42**, and presents a horizontal lapping surface comprised of an inner annular zone **44** and an outer annular zone **46**. One class of workpieces which requires shoulder lapping are indicated at **48** in FIGS. 2 and 3. Each ring-line workpiece **48** has a top surface **50**, a bottom surface **52**, and an intermediate exterior annular radial shoulder **54**. The workpiece **48** is adapted to be disposed to extend axially into the annular channel **42** with the radial shoulder **54** positioned for lapping on the lapping surface of disc **16**.

Associated with each of the workpieces **48** is a lapping fixture **56** which is comprised of a stabilizing ring portion or member **58** having a bottom surface **60**, and means for mounting the workpiece in the fixture. More specifically, the lapping fixture **56** includes a body portion in the form of a first horizontal plate **62** secured to the ring member **58** across the top thereof, a second horizontal plate **64** parallel to the first plate **62** and adjustably distanced therebelow within the confines of the ring **58**, and a third horizontal plate **66** parallel to the second plate **64** and spaced therebelow. A bolt **68** is disposed through the third plate **66** and threaded into the second plate **64** for fastening these plates together with the workpiece **48** therebetween. Preferably, a pad member **69** of felt or the like is interposed between the third plate **66** and the bottom surface **52** of the workpiece. In addition, set screws **70** are provided in the first plate **62** for engaging the second plate **64** to adjust

the distance therebetween whereby the shoulder **54** of the workpiece **48** may be positioned in the plane of the bottom surface **60** of the stabilizing ring **58**, and bolts **72** are inserted through the first plate **62** and threaded into the second plate **64** for fastening these plates together in adjusted position.

After the workpiece **48** has been mounted and properly adjusted within the fixture **56** as shown in solid lines in FIG. 3, the assembled unit is lowered to the position shown in dotted lines. In relation to the size of the lapping disc **16** and workpieces **48** illustrated, four work pieces may be lapped simultaneously by the machine **10**. The fixtures **56** are maintained in circumferentially spaced relation by means of a central horizontal roller spacer **74** carried by the drive shaft **24** and roller stops **76** mounted on the housing **12** slightly offset forwardly from the radial line of the disc and fixture centers as shown in FIG. 1. When the disc **16** is rotating, the fixtures **56** are free to rotate on their own axes due to frictional contact of the rings **58** with the disc **16**, but are prevented from rotating about the axis of the disc **16** by the roller stops **76**.

During rotation of the lapping disc **16**, a suitable abrasive mixture is fed thereto from the container **30**, and the shoulder **54** of each workpiece **48** is lapped to the extent required. As will be appreciated, because the workpiece **48** is supported from above by the fixture **56**, only the high spots on the shoulder are lapped. Moreover, the ring member **58** is fabricated of a material having substantially the same abrasion resistance as the material of the workpiece; therefore, the ring member wears at the same rate as the workpiece shoulder is lapped. Also, the ring member **58** overlaps the inner periphery of the inner annular lapping zone **44** and the outer periphery of the outer annular lapping zone **46**, thus providing a four-point support for the workpiece on the lapping surface and increasing the supporting contact area with the lapping surface. With the foregoing arrangement, the workpiece is stabilized during lapping, and the shoulder is lapped flat and parallel to the top surface **50** of the workpiece. In addition, the ring member **58** serves to dress the lapping surface and eliminates the need for a separate conventional truing ring.

While there has been shown and described a preferred embodiment of the present invention, it will be understood by those skilled in the art that various rearrangements and modifications may be made therein without departing from the spirit and scope of the invention.

What is claimed is:

1. For use in stabilizing a workpiece having an exterior annular radial shoulder positioned for lapping on the horizontal lapping surface of a rotating lapping disc, a fixture comprising a ring portion having a bottom surface engaging the lapping surface, and mounting means for adjustably securing the workpiece in said fixture with the shoulder of the workpiece positioned in the plane of the bottom surface of said ring portion.

2. For use with a lapping machine including a horizontal lapping disc having an upwardly facing annular channel and presenting a horizontal lapping surface, a fixture for stabilizing a workpiece which extends axially into the annular channel and which has an intermediate exterior annular radial shoulder positioned for lapping on the lapping surface, said fixture comprising a ring portion having a bottom surface engaging the lapping surface, a body portion carried by said ring portion, and mounting means for adjustably securing the workpiece to said body portion with the shouder of the workpiece positioned in the plane of the bottom surface of said ring portion.

3. The fixture of claim **2** wherein said body portion is comprised of a first horizontal plate secured to said ring portion across the top thereof.

4. The fixture of claim **3** wherein said mounting means is comprised of a second horizontal plate parallel to said first plate and adjustably distanced therebelow within the confines of said ring portion, and means for securing the work piece to the underside of said second plate.

5. The fixture of claim **4** characterized by the provision of set screws in one of said plates for engaging the other of said plates to adjust the distance therebetween, and means for fastening said first and second plates together in adjusted position.

6. The fixture of claim **4** wherein said securing means is comprised of a third horizontal plate parallel to said second plate and spaced therebelow, and means for fastening said second and third plates together with the workpiece therebetween.

7. The fixture of claim **6** characterized by the provision of set screws in said first plate for engaging said second plate to adjust the distance therebetween, and means for fastening said first and second plates together in adjusted position.

8. The fixture of claim **7** including a pad member interposed between said third plate and the workpiece.

9. The fixture of claim **8** wherein said ring portion is fabricated of a material having substantially the same abrasion resistance as the material of the workpiece.

10. A lapping fixture for a workpiece having a top surface and a bottom surface and an intermediate exterior annular radial shoulder parallel to the top surface, comprising a ring member, a first horizontal plate secured to said ring member across the top thereof, a second horizontal plate parallel to said first plate and spaced therebelow within the confines of said ring member, a third horizontal plate parallel to said second plate and spaced therebelow, means for fastening said second and third plates together with the workpiece therebetween, set screws in said first plate for engaging said second plate to adjust the distance therebetween whereby the shoulder of the workpiece may be positioned in the plane of the bottom of said ring member, and means for fastening said first and second plates together in adjusted position.

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