

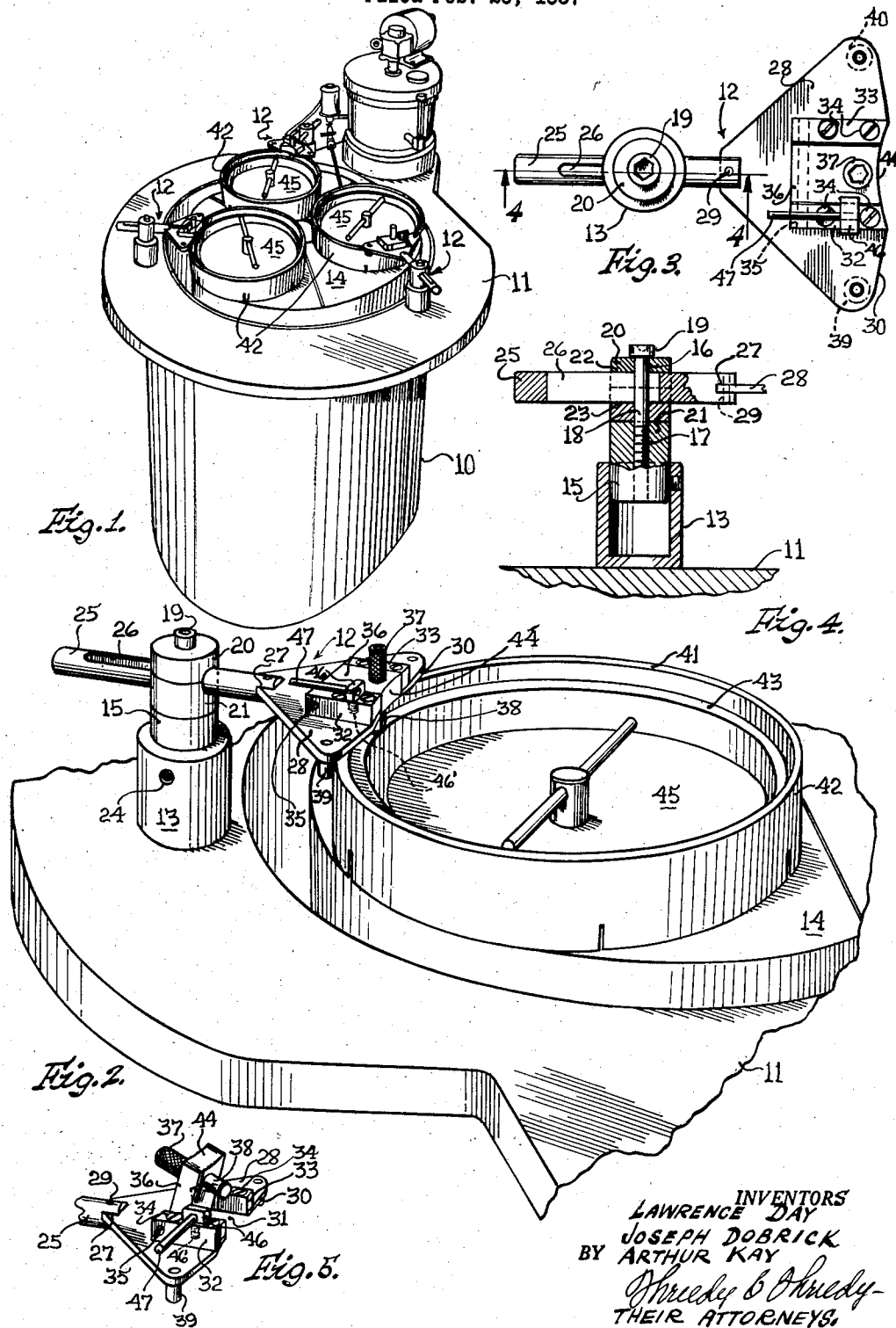
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CONDITIONING RING HOLDING APPARATUS FOR LAPPING MACHINES

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**CONDITIONING RING HOLDING APPARATUS
FOR LAPPING MACHINES**

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Our invention relates to new and useful improvements in conditioning ring holding apparatus for lapping machines and has for its principal object the provision in an apparatus of this character of an arrangement of parts for releasably holding a conditioning ring on a rotating lap surface of a lapping machine.

Another important object of our invention is the provision in an apparatus of this character of a method of vertically adjusting the holding apparatus with respect to the lap surface of the machine to enable the user to compensate for the wear of such conditioning rings.

A further object of our invention is the provision in an apparatus of this character of a method to prevent forward and backward agitation of the conditioning rings with respect to the rotatable movement of the lap surface of the lapping machine.

Yet another and equally important object of our invention is the provision in an apparatus of this character of a means for pivoting the holding apparatus about a vertical axis so as to laterally adjust, position and retain the conditioning rings relative to the lap surface of the machine.

Still another object of our invention is in the provision of an apparatus of this character having a latch for releasing the holding apparatus from the rings so that such rings may be readily removed or re-positioned.

Another object of our invention is the provision in an apparatus of this character of a conditioning ring holder that is recessed with respect to the inner circumference of the ring so as to permit the insertion into the ring of a work pressure plate without necessitating removal of the ring from the holding apparatus.

Other objects will appear hereinafter.

The invention consists in the novel combination and arrangement of parts to be hereinafter described and claimed.

The invention will be best understood by reference to the accompanying drawings showing the preferred form of construction, and in which:

Fig. 1 is a perspective view of a lapping machine with our improved holding apparatus associated therewith;

Fig. 2 is a fragmentary perspective view of our conditioning ring holding apparatus;

Fig. 3 is a top plan view of our holding apparatus;

Fig. 4 is a fragmentary detailed sectional view taken on line 4—4 of Fig. 3;

Fig. 5 is a fragmentary sectional view of our holding apparatus in open position.

Our invention relates to a holding apparatus for conditioning rings which are commonly associated with lapping machines. The purpose and function of such conditioning rings is to recondition and/or maintain the surface of the lap in a substantially flat condition. These rings also provide a means for holding work upon the rotating lap surface of the machine. To function properly these rings must be held in a relatively fixed position with respect to the rotating lap surface and yet

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be allowed to rotate freely about their own vertical axes in such fixed position relative to the lap surface.

To accomplish the holding and positioning of the conditioning rings on the lap surface of the lapping machine, we have provided on a machine of this character having a base 10 which terminates into a laterally extending skirt 11, a plurality of holding devices 12. Each of these devices 12 includes a hollow sleeve 13 mounted on the skirt 11 adjacent the edge of the lap surface 14 of the machine. Slidably contained in such sleeve 13 is a member 15. This member 15 consists of a plurality of parts each being of equal size so as to be slidably mounted in the sleeve 13. Each part of the member 15 has a centrally located aperture 16, with the aperture of the lowermost part 17 internally threaded (see Fig. 4). Adapted to pass through the aperture 16 and to have threaded engagement with the threaded aperture of the part 17, is a bolt 18. This bolt 18 holds the parts of the member 15 together. The bolt 18 has an enlarged head 19 provided with a socket opening for an Allen wrench for threading the bolt into the aperture 17. The uppermost parts 20 and 21 of the member 15 have formed in their confronting surfaces diagrammatically opposed grooves 22 and 23, respectively. These grooves 22 and 23 extend transversely of the aperture 16 formed in the parts of the member 15, as shown in Fig. 4.

The arrangement is such that when the parts 20 and 21 are connected together by the bolt 18, the confronting grooves 22 and 23 form a circular passage extending transversely of the length of the member 15 (Figs. 2—4).

The sleeve 13 is provided with a set screw 24 engageable with the member 15 so as to lock the member 15 in a vertical relation with respect to the sleeve 13. As such, the member 15 is vertically adjustable with respect to the sleeve 13 as well as to the skirt 11 of the machine.

Slidably journaled into the passage formed by the grooves 22 and 23, is a rod 25. This rod 25 has a slot 26 formed therein. The bolt 18 is adapted to pass through the slot 26 of the rod 25 when it connects the parts of the member 15 together (Fig. 4). As such, the rod 25 may be moved laterally of the bolt 18 and the member 15 a distance equal to the length of the slot 26. Thus, the rod 25 is adjustable horizontally with respect to the sleeve 13 and the member 15 in a parallel relation with respect to the skirt 11.

One end of the rod 25 is bifurcated as at 27. Mounted in the bifurcation is a substantially triangularly shaped plate 28. This plate 28 is connected in the bifurcation 27 by a pin 29.

The base edge 30 of the triangular shaped plate 28 is notched as at 31. Adjacent either side of the notch 31 and to the top of the plate 28 are mounted blocks 32 and 33. These blocks 32 and 33 are fastened to the plate 28 by means of screws 34. At the innermost end of the blocks 32—33 and journaled therein and extending therebetween is a pivot pin 35.

Pivotaly carried by the pivot pin 35 between the blocks 32 and 33 is a latch lever 36. This lever 36 is of equal thickness and length, as are the blocks 32 and 33, as shown in Figs. 2 and 3. Carried by the lever 36 and extending upwardly therefrom, is a knurled finger-piece 37 to facilitate manually pivoting the lever 36 about the pin 36. Extending downwardly from the underside of such lever 36 is a roller bearing 38. The plate 28 at its opposite free corners provides like roller bearings 39 and 40. These latter roller bearings 39 and 40 are guide rollers and as such are offset with respect to the roller bearing 38 of the latch lever 36. The guide rollers 39 and 40 will cradle the outer curved top edge 41 of the conditioning ring 42 therebetween. The roller bearing 38 will engage the inner top edge of the ring 42, as seen

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in Fig. 2. In such construction, the downwardly disposed rollers 38, 39 and 40 will form a triangularly shaped guide and holding arrangement having engagement with the inner and outer top edge of the conditioning ring 42.

To accommodate the roller 38, the inner surface adjacent the top edge of the ring 42 is provided with a recessed raceway forming a shoulder 43, the depth of the raceway being equal to the length of the roller 38 and the width of the shoulder 43 being equal to the width of the roller 38, so that when such roller is disposed into the raceway there is a flush interior surface to the ring 42. The edge 30 of the triangularly shaped plate 28 tapers rearwardly from the forward edge of the notch 31, and the lever 36 has its forward edge 44 curved to correspond to the curvature of the ring 42 (Fig. 3) so that no parts of such holding device protrude inwardly of the innermost vertical edge of the ring 42 for reasons hereinafter made apparent.

In the lapping operation, the work is placed within the ring 42 and a pressure plate 45 is placed thereon. To readily permit insertion or removal of such pressure plate 45 from within the ring 42, it is advisable to have an unobstructed vertical wall of the ring 42. The holding device, as hereinbefore explained, must not protrude into the interior opening of the conditioning ring 42.

The block 32 is provided with a threaded aperture in its top surface. A latch arm 46 having a threaded pin 46' is adapted to be threaded into the aperture of the block 32. This arm 46 is provided with a handle 47 to facilitate rotating said arm 46 relative to the block 32. The arm 46 is of sufficient size so that it will override the top surface of the lever 36 when it is pivoted into a horizontal plane as seen in Fig. 2. When the arm 46 is so pivoted, it is threaded into tight engagement with the block 32.

When it is desired to pivot the lever 36 upwardly, the arm 46 is turned so that it will unthread itself from the aperture of the block 32 and lie in a vertical plane with respect to the block 32, so that the lever 36 is free to pivot about the pin 35 (Fig. 5). In such pivoted position the ring 42 may be readily removed from the lap surface of the machine.

The hereinafter explained arrangement of parts permits pivotal adjustment of the rod 25 with respect to the axis of the sleeve 13, lateral adjustment through the slot 26 with respect to the member 15, and vertical adjustment between the member 15 and the sleeve 13. As such, the conditioning ring 42 which is to be held thereby can be relocated or retained in a desired position on the surface of the lap 14 when such lap 14 is rotated through a horizontal plane.

Through the holding device as described herein, the ring 42 is restrictively held on the rotating surface of the lap 14 while at the same time, through the frictional contact with such rotating lap 14, the ring 42 is permitted to rotate about its own vertical axis and relative to the rotation of the lap 14. Such rotation of the ring 42 relative to the rotation of the lap 14 will resurface and recondition such lap 14 while in its normal use. It will also by reason of its adjustable features prevent wear on a localized portion of such lap surface.

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

Having thus described our invention, what we claim as new and desire to protect by Letters Patent is:

1. A device for holding and retaining a work-holding surface-conditioning ring upon a rotating lap surface of

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a lapping machine including a surface conditioning ring provided with an interior circumferential shoulder, said device comprising a ring-holding means, and said means including three triangularly disposed depending roller bearings engageable with one edge portion of said ring, means for positioning said roller bearings relative to said ring and in spaced confronting relation to the lap surface of the machine, means for supporting said positioning means and said roller bearings relative to said ring, means for vertically adjusting said supporting means relative to the lap surface of the machine, means carried by said positioning means and operatively connected to said supporting means for laterally adjusting said positioning means relative to said ring, means for pivoting one of said roller bearings out of engagement with said interior circumferential shoulder to permit removal of said ring from the lap surface, and means for latching said roller bearings in ring-holding and retaining position.

2. A device for holding and retaining a work-holding surface-conditioning ring upon a rotating lap surface of a lapping machine including a surface conditioning ring provided with an interior circumferential shoulder, said device comprising a ring-holding means, said means including three triangularly disposed depending roller bearings engageable with one edge portion of said ring, means for positioning said roller bearings relative to said ring and in spaced confronting relation to the lap surface of the machine, means for supporting said positioning means and said roller bearings relative to said ring, means for vertically adjusting said supporting means relative to the lap surface of the machine, means carried by said positioning means and operatively connected to said supporting means for laterally adjusting said positioning means relative to said ring, means for pivoting one of said roller bearings out of engagement with said interior circumferential shoulder to permit removal of said ring from the lap surface, means for latching said roller bearings in ring-holding and retaining position, and means for releasing said latching means to permit pivotal movement of said one of said roller bearings from ring-holding and retaining position.

3. A device for holding and retaining a work-holding surface-conditioning ring upon a rotating lap surface of a lapping machine including a surface conditioning ring provided with an interior circumferential shoulder, said device comprising a ring-holding means, said means including three triangularly disposed depending roller bearings engageable with one edge portion of said ring, means for positioning said roller bearings relative to said ring and in spaced confronting relation to the lap surface of the machine, a member for supporting the positioning means and said roller bearings relative to said ring, a sleeve carried by the machine adjacent the peripheral edge of the lap surface for slidably retaining said supporting member, means for vertically adjusting said supporting member relative to the lap surface of the machine, means carried by said positioning means and operatively connected to said supporting member for laterally adjusting said positioning means relative to said ring, means for pivoting one of said roller bearings out of engagement with said interior circumferential shoulder to permit removal of said ring from the lap surface, and means for latching said roller bearings in ring-holding and retaining position.

4. A device for holding and retaining a work-holding surface-conditioning ring upon a rotating lap surface of a lapping machine including a surface conditioning ring provided with an interior circumferential shoulder, said device comprising a ring-holding means, said means including three triangularly disposed depending roller bearings engageable with one edge portion of said ring, means for positioning said roller bearings relative to said ring and in spaced confronting relation to the lap surface of the machine, a member for supporting said positioning

means and said roller bearings relative to said ring, a sleeve carried by the machine adjacent the peripheral edge of the lap surface for slidably retaining said supporting member, means for vertically adjusting said supporting member relative to the lap surface of the machine, means carried by said positioning means and operatively connected to said supporting member for laterally adjusting said positioning means relative to said ring, means for pivoting one of said roller bearings out of engagement with said interior circumferential shoulder to permit removal of said ring from the lap surface, means for latching said roller bearings in ring-holding and retaining position, means for releasing said latching means to permit pivotal movement of said one of said roller bearings from ring-holding and retaining position.

5. A device for holding and retaining a work-holding surface-conditioning ring upon a rotating lap surface of a lapping machine including a surface conditioning ring provided with an interior circumferential shoulder, said device comprising a ring-holding means, said means including three triangularly disposed depending roller bearings with certain of said roller bearings engageable with the outer peripheral edge of said ring and the remaining roller bearings engaging said interior circumferential shoulder so as to rotatably retain said ring relative to the rotating lap surface, means for positioning said roller bearings relative to said ring and in spaced confronting relation to the lap surface of the machine, means for supporting said positioning means and said roller bearings relative to said ring, means for vertically adjusting said supporting means relative to the lap surface of the machine, means carried by said positioning means and operatively connected to said supporting means for laterally adjusting said positioning means relative to said ring, means for pivoting one of said roller bearings out of engagement with said interior circumferential shoulder to permit removal of said ring from the lap surface.

6. A device for holding and retaining a work-holding surface-conditioning ring upon a rotating lap surface of a lapping machine including a surface conditioning ring provided with an interior circumferential shoulder, said device comprising a ring-holding means, said means including three triangularly disposed depending roller bearings engageable with one edge portion of said ring, means for positioning said roller bearings relative to said ring and in spaced confronting relation to the lap surface of the machine, said positioning means including a horizontally disposed plate carried at one end of a positioning rod, said rod having a slidable connection to a vertical support carried by the machine adjacent the peripheral edge of the rotating lap surface, means for rotating said support about its vertical axis for positioning said positioning means and said roller bearings relative to the lap surface of the machine, means for laterally adjusting said rod with respect to said support for positioning said roller bearings relative to the lap surface of the machine, means for vertically adjusting said support and said positioning means relative to the lap surface of the machine, means for pivoting one of said roller bearings out of engagement with said interior circumferential shoulder to permit removal of said ring from the lap surface, means for latching said roller bearings in ring-holding and retaining position, and means for releasing said latching means to permit pivotal movement of said one of said roller bearings from ring-holding and retaining position.

7. A device for holding and retaining a workholding surface-conditioning ring upon a rotating lap surface of a lapping machine including a surface conditioning ring provided with an interior circumferential shoulder, said

device comprising a ring-holding means, said means including three triangularly disposed depending roller bearings with certain of said roller bearings engageable with the outer peripheral edge of said ring and the remaining roller bearings engaging said interior circumferential shoulder so as to rotatably retain said ring relative to the rotating lap surface, means for positioning said roller bearings relative to said ring and in spaced confronting relation to the lap surface of the machine, said positioning means including a horizontally disposed plate carried at one end of a positioning rod, said rod having a slidable connection to a vertical support carried by the machine adjacent the peripheral edge of the rotating lap surface, means for rotating said support about its vertical axis for positioning said positioning means and said roller bearings relative to the lap surface of the machine, means for laterally adjusting said rod with respect to said support for positioning said roller bearings relative to the lap surface of the machine, means for vertically adjusting said support and said positioning means relative to the lap surface of the machine, means for pivoting one of said roller bearings out of engagement with said interior circumferential shoulder to permit removal of said ring from the lap surface, and means for latching said roller bearings in ring-holding and retaining position.

8. A device for holding and retaining a workholding surface-conditioning ring upon a rotating lap surface of a lapping machine including a surface conditioning ring provided with an interior circumferential shoulder, said device comprising a ring-holding means, said means including three triangularly disposed depending roller bearings with certain of said roller bearings engageable with the outer peripheral edge of said ring and one of said roller bearings engaging said interior circumferential shoulder so as to rotatably retain said ring relative to the rotating lap surface, means for positioning said roller bearings relative to said ring and in spaced confronting relation with respect to the lap surface of the machine, said positioning means including a horizontally disposed plate carried at one end of a positioning rod, said rod having a slidable connection to a vertical support carried by the machine adjacent the peripheral edge of the rotating lap surface, said support including a sleeve carried by the machine adjacent the peripheral edge of the rotating lap surface, a member rotatably and vertically movable in said sleeve, said member having a passage formed therein extending transversely of its length, said positioning rod contained in the passage of said member and slidably adjustable therethrough to position said roller bearings relative to the lap surface of the machine, means for rotatably adjusting said member relative to said sleeve, means for vertically adjusting said member relative to said sleeve, means for laterally adjusting said rod with respect to said member for positioning said roller bearings relative to the lap surface of the machine, means for pivoting one of said roller bearings out of engagement with said interior circumferential shoulder to permit removal of said ring from the lap surface, and means for latching said one of said roller bearings in ring-holding and retaining position.

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