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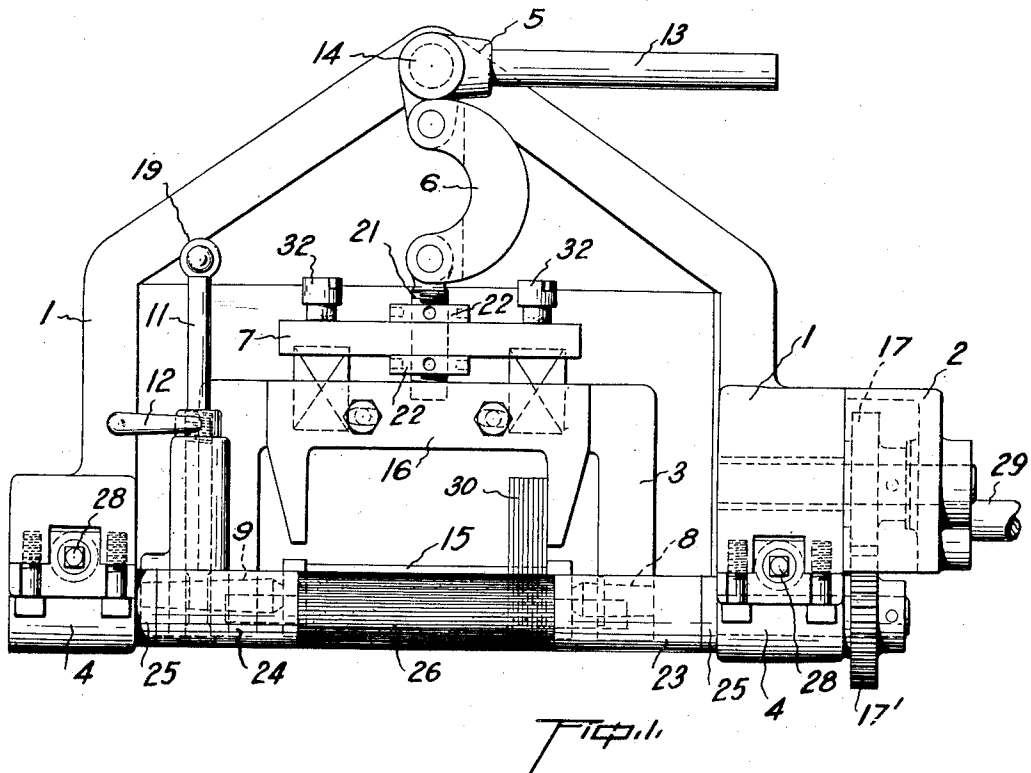
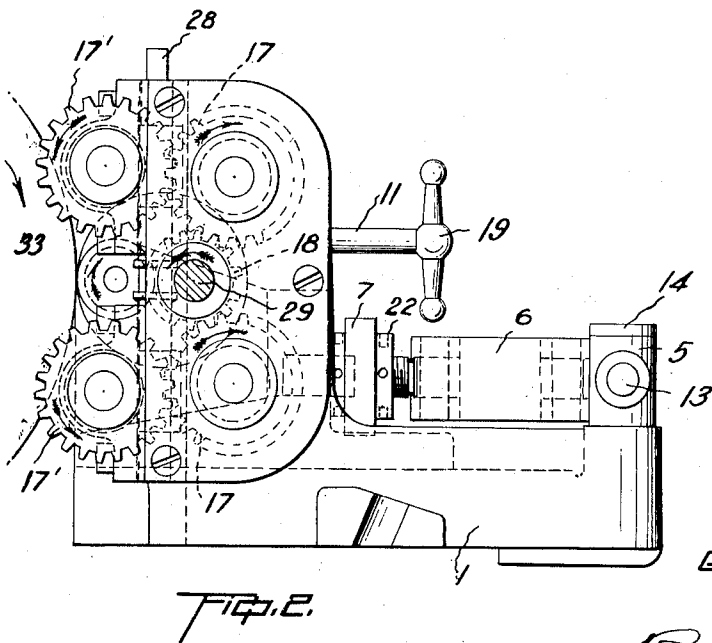
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PISTON RING GRINDING APPARATUS

Filed Aug. 10, 1928

2 Sheets-Sheet 1



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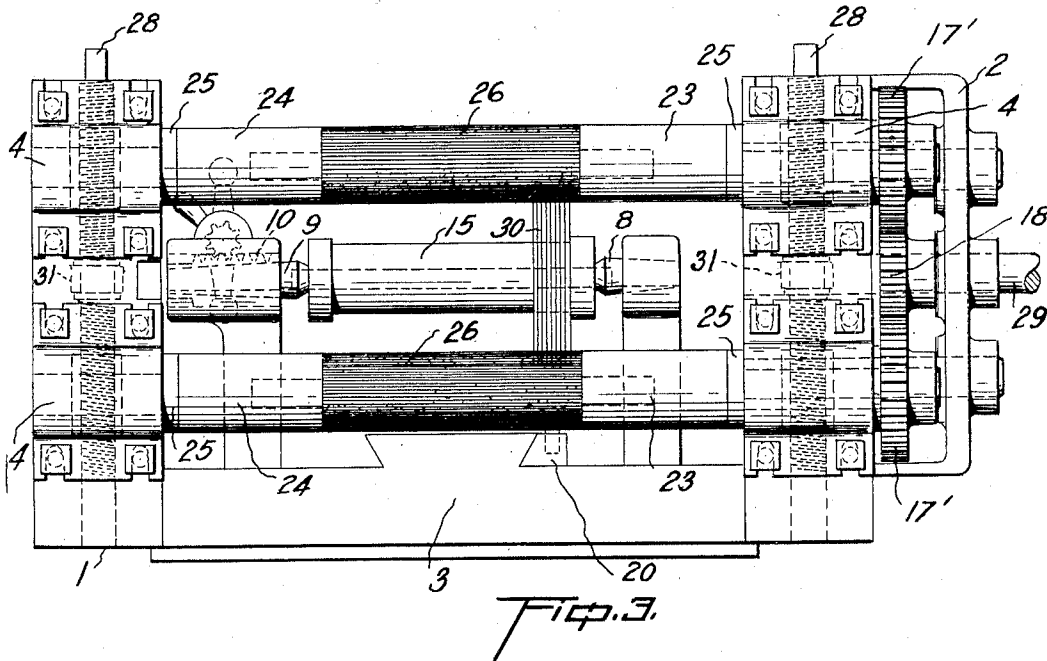
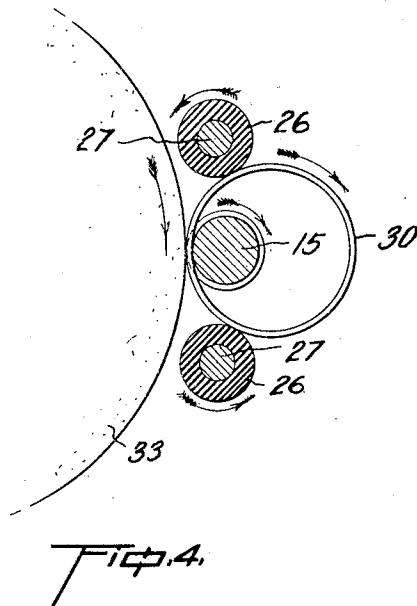
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PISTON RING GRINDING APPARATUS

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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PISTON-RING-GRINDING APPARATUS

Application filed August 10, 1928. Serial No. 298,677.

The primary object of my invention, which relates to the grinding of concentric piston rings for internal combustion and other types of engines, pumps, air compressors and other devices wherein piston rings are used to insure tight joints with encircling cylinder walls is to provide means whereby, in comparison with the best of other known methods, the production rate for such work may be greatly increased without widening of limits as to circular distortion or peripheral accuracy and concentricity or uniformity of ring thickness with correspondingly uniform distribution of resiliency as expressed by pressure against cylinder walls.

Another object of my invention is to provide means whereby eccentric or out-of-round piston ring castings may be trued up quickly and accurately by grinding under conditions such as tend not only to obviate distortion of the rings while being ground but to eliminate subsequent distortion due to the release of internal stresses set up by the grinding process.

A further object of my invention is to provide a device readily attachable to and operable by grinding machines of different makes designed for grinding parts other than piston rings, any convenient source of power being susceptible of utilization for driving the moving parts of my device, which is particularly adapted for association with any grinding instrumentality of a character suited to the kind and grade of work to be done in finish grinding the periphery of concentric piston rings.

An additional object of my invention is to provide means whereby more fully to realize the advantages of adjustability in yieldably supporting the work, in controlling the pressure of frictional driving contact that keeps the work moving, in regulating the pressure with which the work may be held without distortion against the grinding instrumentality, and in determining effective grinding limit as expressed by thickness of the work when finished.

My invention is embodied or expressed in an adjustably mounted work holder moved to and from the dressing or grinding instrumentality by manual or other actuation

of a toggle lever for developing pressure for holding movable pieces of work firmly but without distorting them, combined with yieldable means for driving these movable pieces of work through frictional contact, means for preventing the work from moving lengthwise of the supporting mandrel while the face of the revolving dressing or grinding wheel moves transversely across the work mounted on a supporting mandrel of smaller external diameter than the internal diameter of the circular pieces of work being ground, means for limiting the amount of grinding so as to control the thickness of the work when finished also being a distinguishing feature of my invention, as indicated by the following description and accompanying illustrations, of which

Figure 1 is a plan or top view,

Fig. 2 an end elevation;

Fig. 3 an elevation looking towards the ring-driving friction rolls from the grinding wheel, while

Fig. 4 is a conventional cross sectional view showing the operative relationships existing between the various elements of the device when running in production.

The same reference numbers apply to the following parts of all drawings:

1.—Frame or base on which the piston-ring-mandrel carriage 3 with appurtenant parts is slidably mounted for actuation through manipulation of toggle handle 13.

2.—Gear-shaft-supporting guard or shield covering friction roll drive gears 17 and 18.

3.—Sliding carriage for fixed and movable centers 8 and 9 by which piston-ring arbor or mandrel 15 is supported.

4.—Adjustably mounted friction-roller-support brackets tapped to receive vertically disposed right-and-left threaded adjusting screws 28 that serve, when turned, to force the friction rolls apart to release the ground piston rings or draw the rolls together to increase their bearing pressure on the rings being ground.

5.—Toggle-joint knuckle.

6.—Toggle-joint link.

7.—Pressure plate for transferring toggle pressure to the arbor or mandrel 15 which

holds the rings against the friction rolls that drive them and the emery, carborundum, or other abrasive wheel that grinds them.

8.—Stationary or fixed center on which one end of ring mandrel 15 is supported.

9.—Movable or adjustable center on which other end of ring mandrel is supported.

10.—Movable or adjustable center holder with rack and pinion means of adjustment.

11.—Center-adjusting pinion shaft with integral teeth that mesh with teeth of rack of movable center holder.

12.—Locking lever for ring-mandrel center-adjusting shaft.

13.—Handle mounted in knuckle 5 for operating toggle joint.

14.—Toggle joint knuckle pivot pin.

15.—Mandrel or arbor by which piston rings are held in contact with resilient friction-drive rolls and grinding wheel under toggle pressure due to manipulation of handle 13.

16.—Adjustably mounted ring holder plate serving as a sidewise guide for rings mounted on mandrel 15.

17.—Gears for driving the friction rolls 26 that in turn drive the piston rings 30 being ground.

18.—Driver gear meshing with the stationary pair of driven gears 17 which in turn mesh with the movable pair of gears 17', on the ends of the upper and lower friction-roll drivers 23.

19.—Handle for operating center-adjusting pinion shaft 11 when mounting loaded ring mandrel between centers 8 and 9.

20.—Removable gib by which carriage 3 is slidably held to base frame 1.

21.—Toggle joint eye bolt for carriage actuating mechanism connected with pressure plate 7.

22.—Pressure plate positioning or adjusting nuts on eye bolt 21.

23.—Friction roll drivers actuated by gears 17'.

24.—Friction roll supports journaled in movable support brackets 4 brought together or spread apart by turning right-and-left threaded adjusting screws 28.

25.—Bronze spacing washers for friction rolls and driving gears.

26.—Friction rolls for driving rings.

27.—Friction-roll supporting shaft.

28.—Friction-roll support bracket adjusting screw with right and left threads for simultaneous movement of upper and lower pairs of brackets and rolls towards or away from piston rings 30 on mandrel 15.

29.—Drive shaft on which is mounted pinion 18 driving set or fixed upper and lower gears 17 meshing with movable or shiftable gears 17' by which friction rolls 26 are driven.

30.—Piston rings or other cylindrical work having walls to be dressed or finished to uniform thickness.

31.—Positioning or retaining dog for holding adjusting screw 28.

32.—Shouldered and threaded slotted-head guide pins for supporting pressure plate 7.

33.—Dressing or grinding wheel.

Operation

When my invention is embodied in a fixture of the character herein described and illustratively disclosed, the device is bolted to the table of a grinding machine, with the axis of the work-supporting mandrel 15 horizontally parallel to the axis of the grinding wheel 33, which rotates in a plane at right angles to the mandrel 15, the work mounted thereon being moved transversely in conventional manner across the face of the revolving wheel when grinding.

With toggle in non-pressing position, the piston rings or other circular pieces to be dressed or ground are placed on the mandrel 15 in sufficient number to occupy the space between the two projecting guide arms of the holder 16, which is adjustably attached to the carriage 3 so that it can be set in accordance with the endwise positioning of the mandrel on its supporting centers 8 and 9, of which 8 is fixed and 9 is adjustable, the latter being actuated by handle 19 attached to pinion shaft 11, a locking hand lever 12 serving to prevent change of adjustment after proper setting.

It will be noted, particularly on reference to Fig. 4, that the work supporting mandrel 15 is of smaller diameter than the work, which might be a single piece instead of many rings, and has therewith, theoretically at least, nothing more than straight line contact with the trued inner periphery of the circular piece or pieces of work.

Above and below the mandrel 15 are two parallel rubber friction driving rolls 26 supported by end pieces 23 and 24 journaled in two pairs of brackets 4 which are drawn towards each other and bring the friction rolls 26 into contact with the work 30 or forced away from each other, throwing the friction rolls out of contact with the work by means of two right-and-left threaded adjusting screws 28 which serve to regulate the contact-pressure between the yieldable material of the driving rolls 26 and work 30.

The friction-drive rolls 26, which make straight line contact with the work at points that of necessity lie within a perfect circle parallel to one embracing the point of contact between the inner periphery of the work and the mandrel supporting it, are sufficiently resilient to take care of initial thickness and surface inequalities without greatly reducing the driving efficiency of the rolls or causing distortion due to corresponding variations in contact pressure up to the time when the work is dressed to uniform thickness and the driving pressure becomes equally uniform.

On the so-called driving ends 23 of the friction rolls 26 are gears 17' that mesh with a similar pair of gears 17 driven by a pinion 18 on drive shaft 29, but any other equally effective means of driving adjustably mounted friction rolls for the purpose herein described could be employed without departing from the spirit or scope of my invention, the essence of which is expressed through the structure disclosed by the accompanying drawings, but not thereby specifically limited to the application represented.

Any suitable source of power may be utilized in driving shaft 29 and the train of gears that serve to turn the friction drive rolls which hold the rings firmly against the work-holding mandrel, as diagrammatically illustrated by Fig. 4, while driving them, rotation of the work being independent of rotation of the dressing or grinding wheel whose rate of travel with reference to the speed at which the work turns may be varied to suit whatever requirements may be imposed by the character of the material, speed of production, grade of finish desired, etc.

Upon turning the adjusting screws 28 to bring the friction drive rolls 26 into driving contact with the rings 30, the latter are brought more firmly into contact with the mandrel 15, to which the toggle pressure is communicated through the link 6 and pressure plate 7 to the carriage 3 having integral supports for the fixed and movable centers 8 and 9 on which the work-carrying mandrel 15 is mounted. Movement of the carriage 3 towards the grinding wheel 33 under the actuating influence of the toggle brings the rings into contact with the grinding wheel, where they may be held under variable manual pressure while being moved transversely across the face of the wheel until the limit of carriage movement and therefore of grinding, as determined by setting of toggle eye-bolt adjusting nuts 22, is reached and rings are concentric or of uniform thickness and peripheral smoothness. The pressure plate 7 may readily be shifted to accommodate rings of different cross sectional thickness by changing the position of the adjusting nuts 22 on toggle eye bolt 21 passing through the pressure plate, which slides on the slotted head guide pins 32.

Having fully disclosed the essence of my invention, I wish it to be understood that the physical embodiment thereof, as herein presented, is but one expression of its application, structural details obviously being susceptible to great variation without departing from its spirit or scope as indicated by the following claims.

What I claim is:—

1. In a grinding machine having a movable work table transversely reciprocable with reference to a fixedly-mounted grinding wheel rotating in a plane at right angles to

the axis of the mandrel on which the work to be dressed or ground is placed, a base or frame having slidably mounted thereon a carriage provided with fixed and adjustable centers for supporting a work-carrying mandrel movable (with carriage) to and from the grinding wheel, adjustably connected means for moving said carriage and mandrel so as to bring the work carried by the latter into contact with the grinding instrumentality, adjustable means for limiting said movement to control the thickness of the finished work, adjustable means for driving work by frictional contact with two adjustably mounted rolls of yieldable material whose resiliency offsets or compensates for eccentricity and surface inequalities, means for varying the pressure with which the rolls are made to bear on the work and hold it to the work-supporting mandrel while driving it but not great enough to distort the work, adjustable work-guiding means for keeping the work in line with the endwise positioning of the work-holding mandrel, means for locking the adjustable mandrel-supporting center in adjusted position, and means for rotating the adjustably-mounted work-driving friction rolls in association with the means employed for driving the grinding instrumentality and imparting to the work table reciprocating motion parallel with the axis of the grinding wheel.

2. In a machine for dressing or grinding the outer peripheries of a multiplicity of concentric piston rings or similar circular parts, adjustable means for supporting the work so as to drive it by frictional contact with two adjustably mounted rolls of sufficiently yieldable structure to offset the distortion-producing effect of initial out-of-roundness or peripheral surface inequalities of work, means for varying the friction driving pressure between said rolls and rings, means for actuating said adjustably mounted friction-drive rolls in association with means for driving other parts of the machine, the axes of said friction-drive rolls being equidistant from and parallel to the line of contact between the mandrel upon which the rings are placed for grinding and the inner peripheries of the rings, thus providing a three-point type of suspension which is favorable to rapid and accurate grinding, the thickness to which the rings are ground being controlled through use of adjustable mechanism for moving to and from the grinding wheel the sliding carriage on which the work-holding mandrel and its supporting centers are mounted.

3. In a ring grinding machine having a work table transversely reciprocable with reference to a fixedly-set grinding wheel, means for adjustably supporting the work to be dressed or ground on a mandrel so mounted on a sliding carriage as to be movable to-

wards and away from the face of the grinding wheel, means for giving indicated movement to said sliding carriage, locking means for holding work-mandrel adjustment, guiding means for holding work in line with end-wise positioning of work-supporting mandrel, means for varying the contacting pressure with which a pair of friction-drive rolls of yieldable material are made to bear upon the work they both drive and hold in a manner favorable to accurate grinding, means for controlling ring thickness by limiting movement of the work supporting mandrel towards the grinding wheel, and means for driving the friction rolls in conjunction with means for actuating other elements of the machine.

4. In an adjustable fixture adapted for attachment to the movable table of a grinding machine for the purpose of dressing or finishing the outer peripheries of a multiplicity of concentric piston rings or similar circular parts, the combination of adjustable work-supporting members forming part of a carriage slidable to and from the dressing or grinding instrumentality, an adjustable work-guiding member for holding the work to a position corresponding with that of the work-supporting mandrel on which the rings are mounted, adjustable work-driving members of yieldable material, an adjustable pressure-creating and work-support carriage-actuating member for holding the work in contact with the dressing or grinding instrumentality under pressure variable at will, with means for locking the setting or adjustment of work supporting members, means for actuating the work-driving members, means for varying the contacting pressure between the work and the work driving members, means constituting a feature of the grinding machine, for moving the work back and forth transversely across the face of the grinding wheel while in contact therewith, and means for controlling ring thickness by stop-limit setting of work-support-carriage-actuating mechanism, substantially as described herein.

In testimony whereof I affix my signature.
GEORGE W. OLSON.