Dec. 12, 1933. H. ERNST 1,938,759

GRINDING MACHINE

Filed Aug. 28, 1930

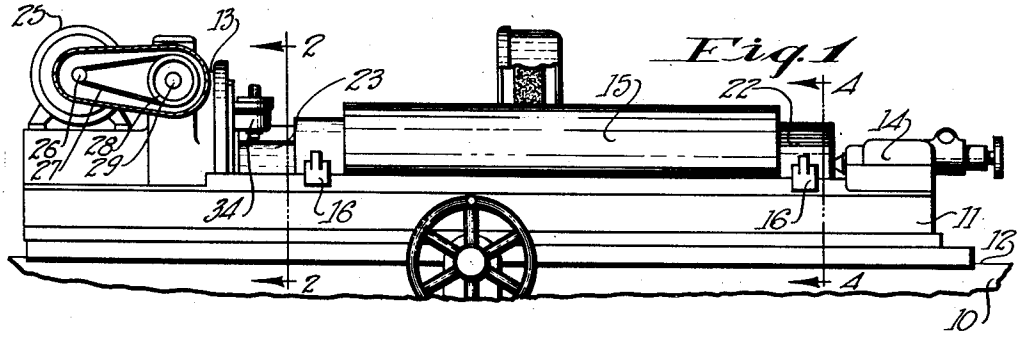


Fig. 1

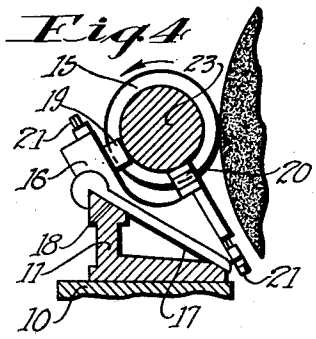


Fig. 4

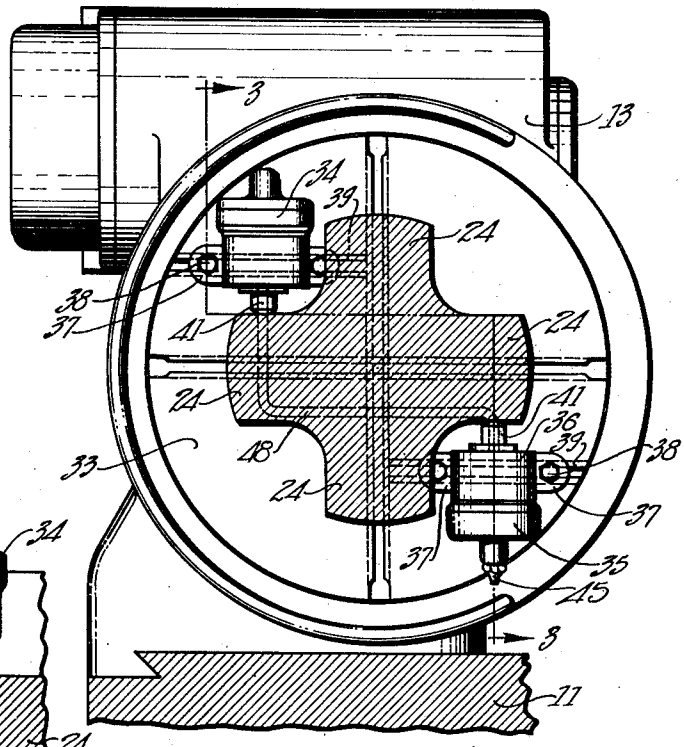


Fig. 2

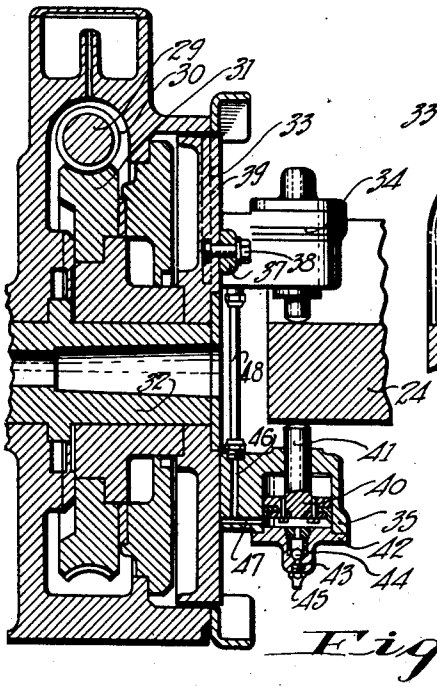


Fig. 3

Inventor
HANS ERNST

By H. K. Parsons

Attorney

Patented Dec. 12, 1933 1,938,759

UNITED STATES PATENT OFFICE

1,938,759

GRINDING MACHINE

Hans Ernst, Cincinnati, Ohio, assignor to Cincinnati Grinders Incorporated, Cincinnati, Ohio, a corporation of Ohio

Application August 28, 1930. Serial No. 478,422

7 Claims. (Cl. 51—236)

This invention relates to improvements in grinding machines and especially to improvements in what is known as center type cylindrical grinders.

Heretofore cylindrical grinders have been utilized for the performance of grinding operations but considerable difficulty has been experienced in the grinding or finishing of exceedingly large and heavy work pieces, such as rolls employed in rolling mills, paper mills or the like. This difficulty resulted chiefly from the mechanism heretofore used for rotating said rolls which mechanism caused out of round or egg shaped rolls to be produced.

It is, therefore, one of the principal objects of this invention to provide a driving connection between the work or roll and the spindle of the machine whereby the said roll will be positively driven at a uniform rate and about a definite, unvarying axis to insure the cylindrical production of the work.

Another object of this invention is the provision of an equalized drive for rotating cylindrical work which automatically equalizes or balances the torque on the driving members thereby insuring the positive rotation of the roll and preventing lateral sway or displacement thereof.

Other objects and advantages of the present invention should be readily apparent by reference to the following specification considered in conjunction with the accompanying drawing and it is to be understood that any modifications may be made in the structural details there shown within the scope of the appended claims without departing from or exceeding the spirit of the invention.

In the drawing:

Figure 1 is a fragmentary elevational view of a grinding machine embodying the improvements of this invention.

Figure 2 is a sectional view taken on line 2—2 of Figure 1.

Figure 3 is a sectional view taken on line 3—3 of Figure 2.

Figure 4 is a sectional view on line 4—4 of Figure 1.

Throughout the several views of the drawing similar reference characters are employed to denote the same or similar parts.

As was noted above, cylindrical grinders as a whole are not new and the grinding machine per se forms no part of this invention. Such a machine may comprise a bed 10 having mounted thereon a work supporting table 11 longitudinally actuable relative to the bed on ways 12. The table 11 supports at one end a headstock 13 and at the other end a tailstock 14 between which the work is positioned. The work 15, here shown as a relatively large roll as employed in rolling mills or the like, is supported for rotation on journal supports 16. The journal supports 16 have an underface 17 engaging a similarly formed face 18 on the table 11 and have contact shoes 19 and 20 at their upper end for actual contact with the surface of the work 15. As shown in Figure 4, the shoes 19 and 20 are adjustable as by adjusting screws 21 for varying the size of work that may be supported between them.

The work piece or roll 15 is provided on opposite ends with journals 22 and supported by journal supports 16 and the roll is formed on one end adjacent one of the journals with a wabble drive 23. This wabble drive end 23 is formed with arms 24 extending on opposite sides thereof.

In the past a driving connection has been utilized for rotating the roll 15 through the wabble drive end 23 but the power was applied to but a single point thereof due to its particular construction. This resulted in a tendency of the work to pivot first about one of the journal shoes 19 or 20 and then about the other resulting in a work piece having an out of round or egg shaped cross section. Referring to Figure 4 and assuming the work to be rotating in the direction of the arrow thereon, it will be seen that with the point of application of power to the roll anywhere within the upper portion of the roll there is a tendency to pivot the roll about the journal shoes and draw the roll away from the grinding wheel. Similarly, with the point of application of power to the roll in the lower portion thereof the tendency is to crowd the roll against the grinding wheel thereby producing a roll of oval or egg shape cross section since opposite sides or segments are alternately pushed into the grinding wheel and actuated away from the grinding wheel.

By this invention the application of power for effecting the rotation of the roll is applied at opposite points and the said power is automatically equalized, thereby insuring a constant rotation of the work on the journal without the tendency of first crowding the work into the wheel and then moving it away. This equalized drive comprises a motor 25 supported by the housing of headstock 13 and having a driving pulley 26 on its shaft. A transmission belt or chain 27 extends from the pulley 26 to a pulley 28 fast on the end of worm shaft 29. The said shaft 29 is journaled in the walls of the headstock housing and is pro-

vided intermediate its ends with a worm 30 meshing with and driving a worm wheel 31 secured to spindle 32. The spindle 32 in turn has secured to its outer end a face plate 33 to which is secured the driving members or dogs 34 and 35.

The dogs 34 and 35 are mounted at diametrically opposite points on the face plate 33 and each dog being a duplicate of the other it is deemed sufficient if but one of them be described in detail. Accordingly, dog 35 has a housing 36 from which ears 37 extend being adjustably secured to the face plate 33 by bolts or the like 38 extending through the said ears 37 and received in T-slots 39 formed in the said face plate 33. The dog housing 36 is bored to form a cylinder in which piston 40 is mounted for reciprocation therethrough from which pin 41 extends. A cap 42 is secured to the open end of housing 35 having a filling opening 43 formed therein and controlled by a check valve 44. An automatic filling plug 45 is also secured in the reduced end of the cap 42.

The housing 36 is further provided with conduits 46 and 47 at right angles to one another and communicating with the interior of the cylinder 35. A pipe or conduit 48 extends between the dogs or cylinders 34 and 35 for conveying a substantially noncompressible medium, such as oil, grease or the like.

A supply of the said oil, grease or the like is introduced into cylinder 35 through the filling part or fitting 45 and finds its way through conduits 47, 46 and 48 to the cylinder 34 for applying equal pressures on the outside of pistons 40 contained within the said housings or cylinders 34 and 35.

As shown in Figure 2, the plungers or pins 41 are adapted to engage opposite surfaces of arms 24 at points diametrically opposed to one another. These points should be preferably equally distant from the center of spindle 32 and work 15.

The operation of the device is as follows:

Assuming a work piece to be mounted on the journal supports 16 with the wabble drive portion 23 thereof toward the headstock and the pins 41 projecting toward the faces of the arms 24. The motor 25 is now energized which will cause a rotation of face plate 33 and driving dogs 34 and 35. Should one of the pins 41 extend further from its housing than the other it will of course, engage its arm 24 first but no movement of the work will take place because the pin engaging the arm will be pushed back into its housing. This inward movement of the pin will carry with it its attached piston forcing from the cylinder or dog housing the medium on the other side of the piston which extruded medium passes through conduit 48 into the other dog housing or cylinder forcing outwardly thereof the piston and driving pin toward the arm of wabble drive end 23. The movement of the pistons and driving pins through their respective cylinders or housings continues until both driving pins engage with their respective arms. From this it will be seen that an equal pressure is applied at substantially diametrically opposite points for rotating the work and should the tendency occur to apply a greater force on one of the dogs than on the other the piston at this point will be forced into its housing forcing therefrom the hydraulic medium therein and forcing outwardly the other piston and driving pin. From this it will follow that there is no tendency of the work to pivot about journal shoes 19 and 20 thereby insuring a constant uniform rotation of the work about a predetermined axis resulting in the work being ground absolutely concentric with its axis.

What is claimed is:

1. In a device of the class described the combination of a face plate adjacent the end of a work piece, adjustable dogs carried by the face plate for engaging the work at a plurality of equally spaced driving points, said dogs each comprising a cylindrical housing, a driving pin extending therefrom, a hydraulic medium between the cylinders for transmitting the pressure from each cylinder to the remaining cylinders for equalizing the pressure in said driving dog cylinders and thereby equalizing the effective urge of each driving pin, and a spring loaded valve for retaining the medium in said cylinders yet whereby the medium therein may be replaced.

2. In a grinding machine for grinding large rolls having finished journal bearings and a wabble drive end adjacent one of the bearings the combination of a bed, journal supports carried thereby for receiving the journals of the roll for supporting the roll for rotation about a predetermined axis, a work supporting table reciprocably mounted on the bed, a head stock and a tail stock on the table between which the work is disposed, a driven face plate carried by the head stock adjacent the wabble drive end, said wabble drive end comprises arms extending at angles to one another, a pair of driving dogs projecting from the face plate for engaging the arms at equally radially spaced points from the center of the roll, and means for equalizing the torque on each driving dog.

3. In a grinding machine for grinding large rolls having finished journal bearings and a wabble drive end adjacent one of the bearings the combination of a bed, journal supports carried thereby for receiving the journals of the roll for supporting the roll for rotation about a predetermined axis, a driven face plate adjacent the wabble drive end, said wabble drive end comprises arms extending at angles to one another, a pair of driving dogs extending from the face plate for engaging the arms at equally radially spaced points from the center of the roll, and means for equalizing the torque on each driving dog, said means comprising a substantially non-compressible hydraulic medium for equalizing the total driving torque on the driving dogs.

4. In a grinding machine for grinding large rolls having a wabble drive end the combination with means for supporting said roll for rotation about a definite axis, of means for effecting its rotation comprising a driven face plate, a pair of driving dogs, means securing the driving dogs to the face plate for adjustment relative thereto radially of the axis of rotation of the roll, a driving pin extending from each dog engaging the wabble drive end of the roll at points equally spaced from the axis of the roll, and means for balancing and equalizing the torque on the driving dogs and pins.

5. In a grinding machine for grinding large rolls having a wabble drive end the combination with means for supporting said roll for rotation, of means for effecting its rotation comprising a driven face plate, a pair of driving dogs radially spaced thereon for movement therewith, each driving dog comprising a cylinder adjustably secured to the face plate, a piston within each cylinder, a driving pin carried by each piston and engaging the roll at points equally spaced from the axis of the roll, and means connecting the cylinders for transmitting the torque acting

against one of said dogs to the other thereby equalizing the torque on each dog and effecting a rotation of the roll about a predetermined, unvarying axis.

6. In a grinding machine for grinding large rolls having a wabble drive end the combination with means for supporting said roll for rotation, of means for effecting its rotation comprising a driven face plate, a pair of driving dogs radially spaced thereon for movement therewith, each driving dog comprising a cylinder adjustably secured to the face plate, a piston within each cylinder, a driving pin carried by each piston and engaging the roll at points equally spaced from the axis of the roll, a conduit connecting the cylinders, and a substantially non-compressible hydraulic medium in the cylinders and conduit for transmitting the torque from one driving pin and its piston to the other.

7. In a grinding machine for grinding large rolls having a wabble drive end the combination with means for supporting said roll for rotation, of means for effecting its rotation comprising a driven face plate, a pair of driving dogs radially spaced thereon for movement therewith, each driving dog comprising a cylinder adjustably secured to the face plate, a piston within each cylinder, a driving pin carried by each piston and engaging the roll at points equally spaced from the axis of the roll, a conduit connecting the cylinders, a substantially non-compressible hydraulic medium in the cylinders and conduit for transmitting the torque from one driving pin and its piston to the other, and means for introducing the hydraulic medium into the cylinders and connecting conduit.

HANS ERNST.