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FORMING ATTACHMENT FOR ROLL GRINDERS

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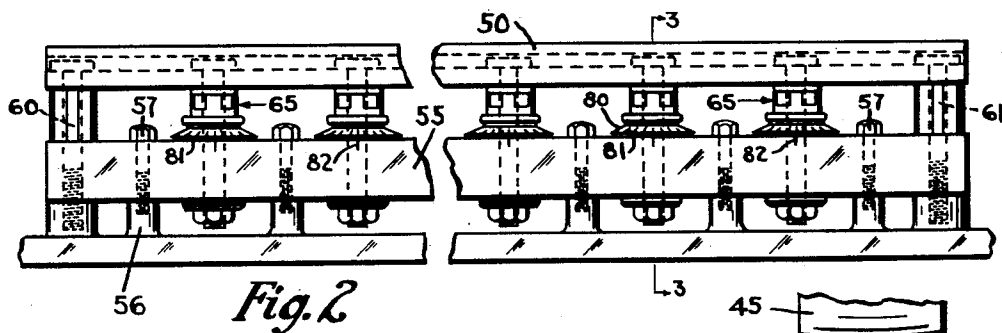


Fig. 2

Fig. 3

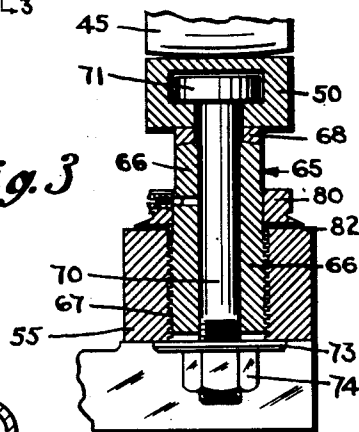
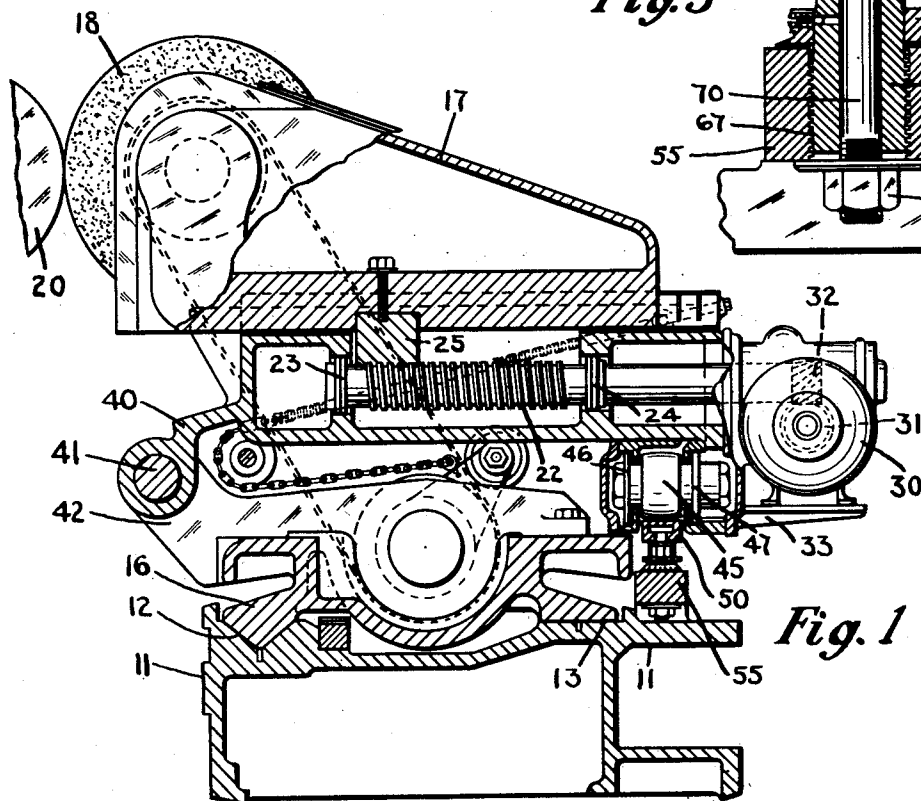


Fig. 1

Witnesses

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UNITED STATES PATENT OFFICE

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FORMING ATTACHMENT FOR ROLL GRINDERS

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This invention relates to grinding machines and more particularly to a forming attachment for roll grinding machines.

In the grinding of rolls for rolling mills and the like, it is necessary to shape the periphery of the rolls according to the requirements of the machine. In certain types of work, it is necessary to grind or produce a concave, a convex, a plain cylindrical surface, or an undulated surface on the periphery of the roll. Various attempts have been made to produce a mechanism whereby the roll might be formed to meet the requirements.

Heretofore various mechanisms have been devised for forming rolls to produce the desired curvature on their peripheries. None of these previous mechanisms, however, have been constructed and arranged to permit accurate flexing of the forming bar throughout its entire extent so that it may be adjusted to produce either a concave, a convex, a plain cylindrical or an undulated surface on the periphery of the roll. These previous mechanisms have depended on the cut-and-try method of operation, that is, the operator flexes the forming bar to the desired shape by using a dial indicator or the like, or flexes the bar and then grinds and measures the crown or curvature on the periphery of the roll and then makes a re-adjustment of the forming bar so as to grind the work to a predetermined shape.

It is an object of this invention to provide a simplified construction in which the grinding wheel and work may be moved relatively toward and from each other during the grinding operation to produce either a convex, concave or true cylindrical surface of the rolls.

It is another object of this invention to minimize this difficulty and to provide a simplified construction whereby the forming bar may be readily flexed throughout its entire length by a micrometer adjusting device to accurately produce a predetermined shape on the bar.

It is a further object to provide a mechanism in which the grinding wheel slide is mounted on a pivotal frame so that it may be readily rocked toward and from the work as it reciprocates so that the curvature of the

forming bar will be transmitted to produce the desired contour on the periphery of the roll. Other objects will be readily apparent from the following disclosure.

One embodiment of the invention has been illustrated in which like numerals indicate like parts:

Fig. 1 is a fragmentary cross-sectional view through the machine having parts broken away to illustrate the mounting of the grinding wheel and the forming bar;

Fig. 2 is a fragmentary view of the forming bar with the micrometer adjusting devices; and

Fig. 3 is an enlarged sectional view taken approximately on the line 3—3 of Fig. 2 showing the micrometer adjustment for the forming bar.

In accordance with the invention a grinding machine is provided having a base on which is mounted the roll to be ground. A grinding wheel is mounted on the usual wheel slide in opposition to the work and is arranged to reciprocate longitudinally relative to the work. The wheel slide is mounted upon an intermediate member which may be moved automatically during reciprocation of the wheel slide to impart a relative movement between the grinding wheel and work axes to produce the desired contour on the periphery of the roll. This member may be mounted in any suitable manner, but in the preferred construction, it is pivotally mounted on the reciprocating carriage and is arranged to be rocked so that the grinding wheel is moved toward and from the work the desired amount during the reciprocation of the grinding wheel carriage. This mechanism is supplemented by a forming bar which is preferably so constructed and arranged that it may be readily flexed to produce the desired curvature on the periphery of the roll. The forming bar is provided with a plurality of spaced micrometer adjusting devices so that the bar may be readily and accurately flexed the desired amount throughout its entire length.

As illustrated in the drawings, a grinding machine has been illustrated comprising a base 11 having a V-way 12 and a flat-way 13 supporting the reciprocable grinding wheel

carriage 16. The carriage 16 supports the grinding wheel slide 17 and a rotatable grinding wheel 18 for reciprocation in operative contact with the roll 20.

5 The grinding wheel may be fed toward and from the work by any of the old and well known feeding mechanisms but, as illustrated in the drawings, a feed screw 22 is rotatably mounted in bearings 23 and 24. The wheel
10 slide 17 is provided with a half-nut 25 adapted to engage the threaded portion of the feed screw 22 so that rotation of the screw 22 is transmitted through the half-nut to move the slide 17 to produce the desired feeding of the
15 grinding wheel 18. The feed screw 22 may be rotated by any suitable mechanism but as shown in the drawings, a reversible motor 30 is mounted on a bracket 33 and is connected by a spiral gear 31 and a gear 32 on the outer
20 end of the feed screw 22. It will thus be readily seen that any rotation of the motor shaft is transmitted through gears 31 and 32 to rotate the feed screw and thereby feed the grinding wheel toward or from the work.

25 The intermediate supporting member 40 is pivotally mounted on the shaft 41 which is supported in a pair of brackets 42 which are formed integral with or bolted to the reciprocating carriage 16. The shaft 41 is preferably
30 located on the front end of the supporting member 40 at a point directly below the grinding wheel. A roller 45 is mounted in suitable bearings 46 and 47 under the rear end of the intermediate member 40 and is arranged to
35 contact with the surface of a forming bar 50. It will be readily seen from this construction that any reciprocatory movement of the roller 45 in contact with the surface of the flexed forming bar 50 will be transmitted to
40 rock the intermediate member 40 and consequently the grinding wheel 18 toward or from the roll 20 as the carriage 16 reciprocates to produce the desired contour on the roll.

In order that the forming bar may be readily and accurately flexed to give it the desired shape, any suitable mechanism may be utilized, but in the preferred construction,
45 a plurality of micrometer devices are utilized whereby the operator may readily flex the bar the required amount to produce the desired curvature on its operative surface. The forming bar 50 is mounted on the rear
50 of the base 11 and is supported by a bar 55 which is rigidly secured to the projections 56 of the base 11 by cap screws 57. The ends of the forming bar 50 are rigidly bolted to the supporting bar 55 by bolts 60 and 61. Spaced at equi-distant intervals along the
55 forming bar 50 are the micrometer adjusting devices 65 each comprising a sleeve 66 having a threaded portion 67 at its lower end adapted to engage a correspondingly threaded aperture in the bar 55. Interposed between
60 the upper end of the sleeve and the under side of the forming bar 50 is a thrust washer

68 which cooperates with the sleeve to form a support for the bar 50. The bar 50 is held rigidly in contact with the washer 68 and sleeve 66 by means of a clamping bolt 70. The head 71 of the bolt 70 engages a T-slot
70 in the forming bar 50 and the body of the bolt passes through a central aperture in the washer 68 and sleeve 66 and through an aperture in the supporting bar 55. The lower
75 end of the bolt is provided with a threaded portion having a washer 73 and nut 74, arranged to clamp the forming bar 50 rigidly to the supporting bar 55.

When it is desired to form a concave surface on the periphery of the roll, the operator
80 slacks off or loosens the nut 74 and then turns the sleeve 66 to raise the upper surface of the washer 68 and also the forming bar 50 the required amount to produce the proper curvature on its upper surface.
85 The nuts 74 are then tightened to lock the bar 50 in adjusted position. In this position of the bar, any reciprocation of the table will cause a rocking movement of the grinding wheel to produce a concave surface on the
90 periphery of the roll.

Similarly to produce a convex surface on the periphery, the nuts 74 are slacked off and the sleeves 66 turned to lower the upper surface of the bar 50. The nuts 74 are then
95 tightened to draw the bar 50 down and clamp it rigidly in position. In this position of the bar, the grinding wheel will be rocked during reciprocation to produce a convex surface on the periphery of the roll.
100

In the operation of this mechanism, the operator first calculates the curvature or form to be produced on the periphery of the roll and then, by slacking off on all of
105 the nuts 74 makes an adjustment at the center of the bar by turning the center sleeve 66 to flex the bar the desired amount, either concave or convex as desired, and then makes corresponding adjustment on the other micrometer devices to produce the desired curvature on the forming bar 50. After the bar
110 is flexed to the required shape, the machine is then started and as the wheel carriage 16 reciprocates longitudinally on its ways, the roller 45 rolls along the forming bar 50. The shape of the forming bar 50 through the
115 roller 45 rocks the member 40 and consequently the grinding wheel 18 to produce the contour on the periphery of the roll 20.

In order that the bar may be readily flexed
120 to meet the requirements of the machine, it is desirable that some readily accessible means be provided by which the operator may flex the bar the desired amount. A collar 80 having precise graduations 81 on its periphery
125 is mounted on each sleeve 66. A zero point 82 is provided on the upper surface of the supporting bar 55 adjacent each sleeve 66 so that the operator may turn the sleeve to raise or lower the forming bar 50. By reading the
130

graduations on the collar and then turning the sleeve the required number of graduations, the operator may precisely flex the bar the desired amount.

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

1. A forming attachment for grinding machines comprising a flexible forming bar, a support therefor, and a plurality of micrometer adjusting devices therebetween arranged to flex the bar, each having a threaded sleeve forming an adjustable support for said bar, and a bolt having its head engaging a T-slot in said bar and passing through said sleeve to clamp said bar in adjusted position on the support.

2. A forming attachment for grinding machines comprising a flexible forming bar, a support therefor, and a plurality of micrometer adjusting devices therebetween arranged to flex the bar, each having a threaded sleeve to form an adjustable support for said bar, a graduated dial on said sleeve to precisely indicate the position of said bar and means to clamp said bar in adjusted position.

3. A forming attachment for machine tools comprising a flexible forming bar, a support therefor, and a plurality of micrometer adjusting devices therebetween arranged to flex the bar, each having a threaded sleeve to form an adjustable support for said bar, a graduated dial on said sleeve to precisely indicate the position of said bar and a bolt having its head engaging a T-slot in said bar and passing through said sleeve to clamp said bar in adjusted position.

4. A grinding machine comprising a base, a reciprocable grinding wheel carriage movable longitudinally thereon, a wheel slide movable transversely relative to said carriage, a rotatable grinding wheel on said slide, a support interposed between said carriage and slide, pivotal connections between the support and carriage at a point below the axis of the grinding wheel, a roller mounted below the other end of said support, a flexible forming bar on the base which supports the roller, and micrometer adjusting devices on the base which support intermediate portions of the bar and serve to flex the same a predetermined extent.

5. A grinding machine comprising a base, a reciprocable grinding wheel carriage movable longitudinally thereon, a wheel slide movable transversely on said carriage, a rotatable grinding wheel on said slide, a support interposed between said carriage and slide, pivotal connections between the front end of said support and carriage, a roller on the other end of said support, a flexible forming bar on the base arranged parallel with the direction of movement of the carriage and supporting said roller, and means including micrometer adjusting devices on the base

which support the intermediate portions of the bar and serve to flex the same to a predetermined extent.

6. A precision grinding machine comprising a base, a flexible forming bar mounted on said base, a plurality of spaced micrometer adjusting devices securing said bar to the base and arranged to flex the forming bar in a vertical direction to a predetermined curvature throughout its entire length, a carriage mounted on the base to reciprocate longitudinally of the work and substantially parallel to the forming bar, a grinding wheel support, a pivotal mount on one end of the carriage for the wheel support, and means on the other end of said support resting on the forming bar, the wheel support being carried by the forming bar and said pivotal mount, whereby the wheel may be guided along a predetermined path during its reciprocation as determined by the extent to which the micrometer devices have flexed the forming bar.

Signed at Worcester, Massachusetts, this 24th day of March, 1928.

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