Jan. 2, 1951 A. E. HAMILTON 2,536,444

GRINDING AND POLISHING APPARATUS

Filed March 8, 1949 4 Sheets-Sheet 1

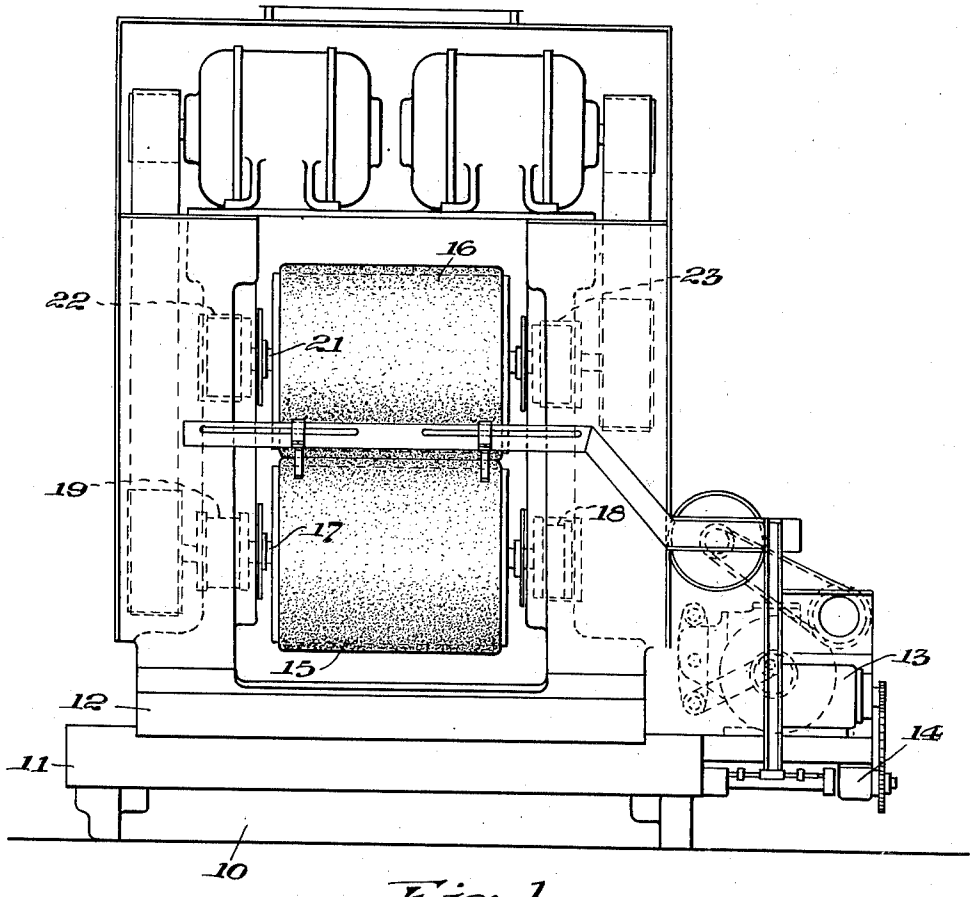


Fig. 1.

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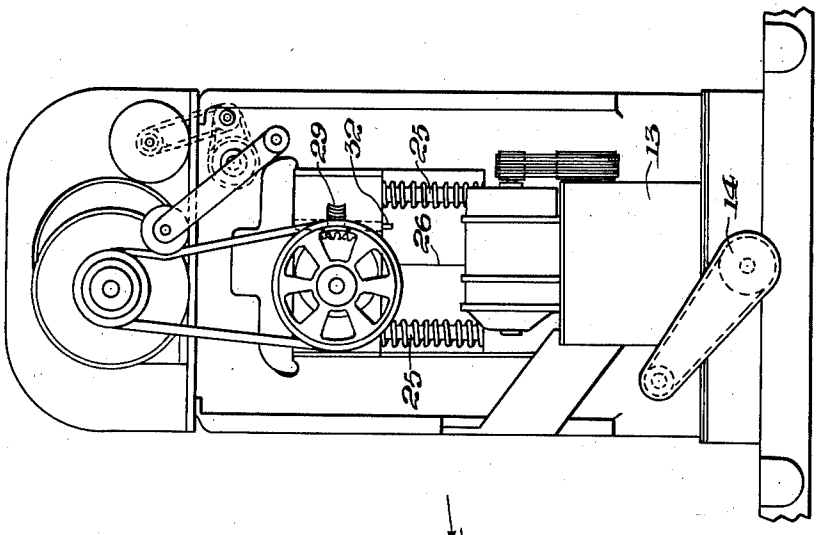


Fig. 3.

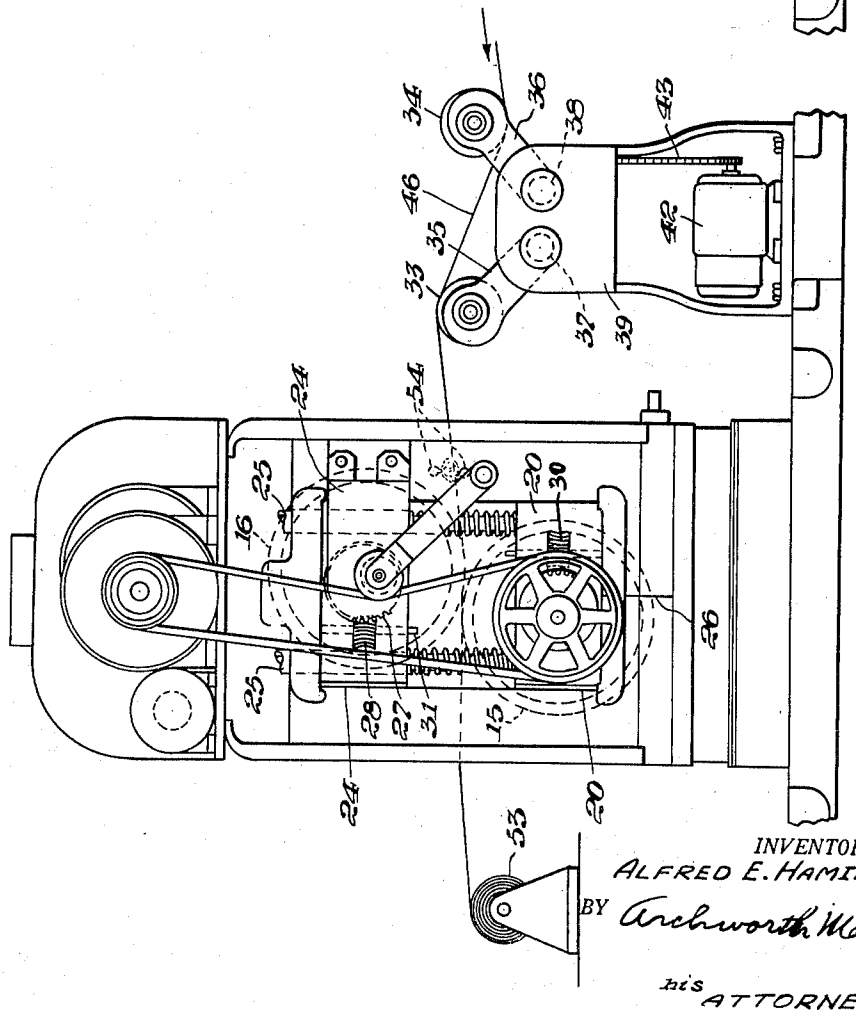


Fig. 2.

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Filed March 8, 1949 4 Sheets-Sheet 3

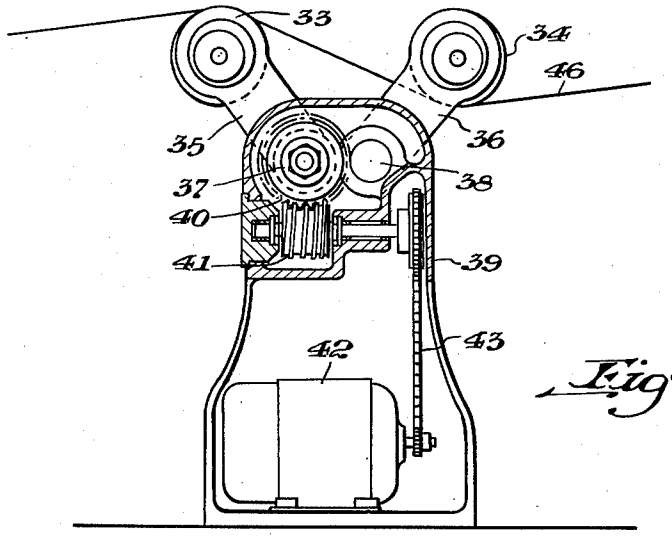


Fig. 4.

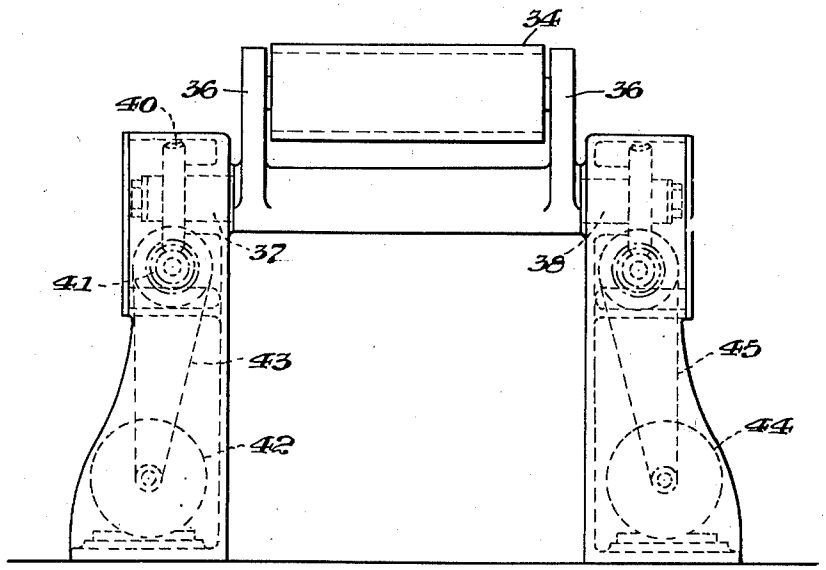


Fig. 5.

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GRINDING AND POLISHING APPARATUS

Filed March 8, 1949 4 Sheets-Sheet 4

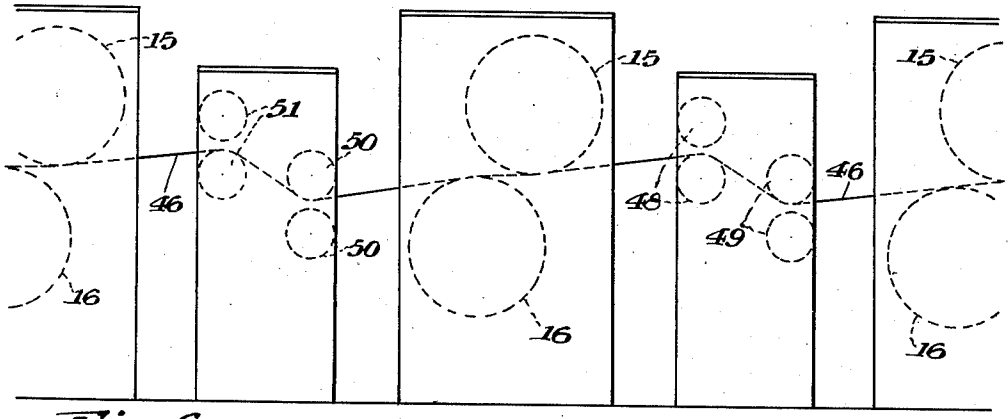


Fig. 6.

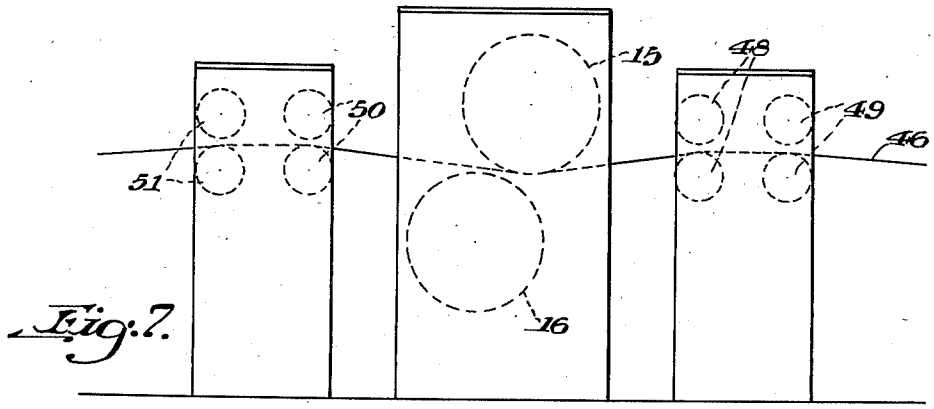


Fig. 7.

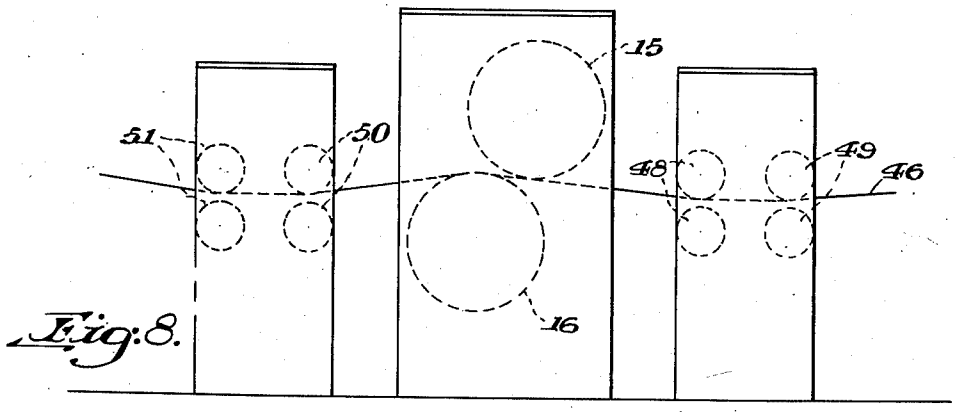


Fig. 8.

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Patented Jan. 2, 1951

2,536,444

UNITED STATES PATENT OFFICE

2,536,444

GRINDING AND POLISHING APPARATUS

Alfred E. Hamilton, Pittsburgh, Pa.

Application March 8, 1949, Serial No. 80,148

7 Claims. (Cl. 51—80)

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My invention relates to grinding and polishing apparatus and a method that are particularly suitable for the surfacing of strip material or sheet material, including stainless steel, plastics, etc., and constitutes additions to and modifications of certain of the apparatus shown in my application Ser. No. 778,554, filed October 8, 1947 (Patent No. 2,481,588).

In the grinding and polishing of strip material, there is in present machines only a fairly small area of contact of the grinding drum with the strip, at the pass line below the drum or at the pass line between upper and lower drums. The width of this contact area (in a direction longitudinally of the strip) can be varied slightly by the use of cushioned drums such as those of the pneumatic or soft rubber type, but the permissible increase in abrasive area at the pass line is not very great, and furthermore, the adjusting of the drums to a condition where their peripheral surfaces are compressed radially somewhat may result in greater grinding effect by the lower drum than by the upper drum. In any case, the limited area of grinding contact at any given instant is not sufficient to remove or grind material from the surface of the strip as rapidly as may be desired, in some instances.

One object of my invention is to provide an arrangement whereby the strip-like work piece can be deflected at the vicinity of the pass line to effect a greater or less partial "wrap around" position on the periphery of the surfacing drum, thus permitting of a greater increase in material removal from the strip over what is possible where the effective width of contact at the pass line may perhaps be less than one inch. Obviously if the strip can be bent on the surface of the abrading drum for a distance of say three inches, much greater quantities of material can be removed.

Another object of my invention is to provide an arrangement whereby the strip may be deflected at the pass line between two surfacing drums into an extent of abrading area on one drum which may be greater or less than the abrading area at the other drum.

Another object of my invention is to provide an arrangement whereby the strip may be manipulated in such manner that it will be abraded by only one of a pair of surfacing drums that are contained within the same roll housing, where it is necessary to perform a surfacing operation on only one face of the strip.

Still another object of my invention is to provide apparatus of the character referred to

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wherein one of the surfacing drums can be shifted relative to the other drum in directions generally tangential to and radially thereof in such manner as to effect deflection of the strip from the normal pass line simply through adjustment of one drum.

In the accompanying drawings, I have shown apparatus wherein abrading devices of the drum or roll type are employed, but it will be understood that certain features of the invention are applicable to structures wherein sanding belts extend around the drums and the work applied to the belt, at the drum, instead of having the abrasive material on the periphery of the drum.

Figure 1 is a front view of a roll stand with which my invention may be employed; Fig. 2 is an end view thereof; Fig. 3 is a view showing the opposite end of the roll stand; Fig. 4 is a vertical sectional view on an enlarged scale of the apparatus for deflecting the strip at locations between a plurality of roll stands or at the entrance or exit sides of roll stands; Fig. 5 is a face view of the structure of Fig. 4; Figs. 6, 7 and 8 are schematic views showing various ways in which a strip may be deflected from the normal pass line between two drums in order to secure desired extent of contact area between the strip and the drums or to secure grinding engagement of the strip with only one drum.

A large part of the mechanism shown in Figs. 1, 2 and 3 is similar to or the same as that shown and described in my said application, and therefore it need not be described in detail in the present case. Also a plurality of roll stands and pairs of abrasive drums will usually be employed in the system, but only one roll stand is here shown. This stand is mounted upon a stationary base 10, an intermediate reciprocable base 11 and an upper vibratory base plate 12, the bases 11 and 12 being reciprocating and vibrated laterally of the path of strip travel by mechanism at 13 and 14, as described in detail in my said application, in order to effect shifting of the surfacing drums 15 and 16 on the strip, for better uniformity of grinding, all as explained in my said application. The invention as hereinafter described however will be equally applicable to roll stands that are mounted stationarily.

The shaft 17 of the drum 15 is supported in bearings 18 and 19 that are each mounted in vertically-divided bearing blocks 20 while the shaft 21 of the drum 16 is eccentrically journaled in bearings 22 and 23 that are mounted in vertically-divided bearing blocks 24. The bearing blocks 20 and 24 are adjustable vertically relative to one

another by screw threaded rods 25 to symmetrically adjust the rolls relative to the pass line. The housing members are also split along vertical lines as at 26 (Figs. 2 and 3) to permit separation thereof, for removal of the drums and their bearings. Those details are explained fully in my co-pending application.

The present structure differs from that of said application in that the drum shaft 21 is eccentrically mounted in its bearings, and the bearings are adjustable about their axes in order to shift the top roll horizontally and radially relative to the bottom roll 15. Each of the bearings 22 and 23 has a gear wheel 27 formed thereon as shown more clearly in Fig. 2, that meshes with a worm or spline gear 28. The worms 28 and 29 at the opposite ends of the shafts are rotated by placing wrenches on the lower ends of worm shafts 31 and 32 respectively. These shafts will, of course, both be turned the same distance at each adjustment of the drum 16 and will, of course, change the position of the drum in both horizontal and vertical directions, relative to the drum 15. For example, the upper drum can be adjusted to various positions with respect to the lower drum as indicated schematically in Figs. 6, 7 and 8. The lower drum can be adjusted in like manner, as indicated at 30 in Fig. 2.

There will be times when it will be necessary only to shift the drum 15 or the drum 16 to vary the area of grinding engagement between the strip and the drums, but for greater deflections of the strip and greater area of grinding engagement, pass line guide rolls 33 and 34 will be employed. Usually, these will be positioned between roll stands, but they can be also used in conjunction with a single roll stand.

The rolls 33 and 34 are journaled in rocker arms 35 and 36 respectively which are rigidly mounted on rock shafts 37 and 38, journaled in a housing or casing 39. The shaft 37 has a worm gear 40 rigidly secured thereto and meshing with a worm 41 that is driven by a motor 42 through a drive chain 43. Similarly, the shaft 38 is rocked by a motor 44 that drives a sprocket chain 45. The motors 42 and 44 are of the reversible type, controlled by push buttons so that either the roll 33 or the roll 34 can be adjusted up or down as occasion may require.

When it is desired to effect greater area of contact between the strip 46 and the lower surfacing drum of a roll stand which is in advance of that shown in Fig. 2, the motor 44 will be operated in a direction to move the roller 34 downwardly to thus effect a partial wrapping of the strip on the preceding lower drum. Similarly, if a wider contact is desired at the upper drum, the motor 42 will be operated in a direction to slightly raise the guide roller 33 and deflect the strip so that it will engage a greater area circumferentially of the drum 16. Again, the screws 25 can be adjusted so as to separate the drums 15—16, thereby making it possible for the guide rollers 33—34 to be adjusted in such manner that only the upper or lower faces of the strip will be surfaced in that it can be held against only one of the drums.

Referring now to the schematic view of Fig. 6, the drums 15 and 16 and pairs of deflecting rolls at 48 and 49 and 50 and 51 are relatively positioned in such manner that both sides of a strip are being ground. These pairs of deflector rolls can be adjusted in any suitable manner by hand screws or by motors.

In Fig. 7, I show the deflector rolls so positioned that only the upper surface of the strip

46 is being ground. While in Fig. 8, I show an arrangement wherein the lower surface of the strip is being ground more rapidly or with greater force than the upper surface thereof. Obviously various variations in this matter of deflecting the strip can be employed to secure greater or lesser grinding force on the upper side of the strip relative to the lower side thereof, or to selectively grind either the upper or lower surface of the strip with a desired degree of rapidity, depending upon the extent of the deflection and therefore the grinding area.

The strip will be drawn past the drums in any suitable manner, as by the use of motor-driven coilers and uncoilers, such as the coiler indicated at 53 in Fig. 2, or it may be drawn directly from the reducing rolls of continuous rolling mills. Usually water spray devices such as those indicated at 54 will be required in order to prevent overheating of the strip and the drums.

The adjustments of the upper roll bearings as shown in Figs. 2 and 3 is preferably by worm gearing since the worm will hold the gears 27 against creeping from their set positions. Likewise, the worm gearing in Figs. 4 and 5 will effectively hold the guide rolls 33—34 at their adjusted positions.

While the claims refer to "drums," it will be understood that this term contemplates grinding drums or wheels that carry the abrasive or finishing material directly on their peripheries, as well as to rolls or drums around the peripheries of which an abrasive or finishing belt is passed.

I claim as my invention:

1. Grinding apparatus comprising a plurality of pairs of rotatable drums having surfacing material on their peripheries and arranged to form a pass line for strip material and the like, a roll stand for each pair of drums, means for advancing a strip between the pairs of drums successively, a pair of deflecting rollers positioned between the roll stands, means for adjusting one of said rollers to guide the strip to a plane above the normal pass line, and means for independently adjusting the other roller to deflect the strip to a plane below the normal pass line.

2. Grinding apparatus comprising a pair of rotatable drums having surfacing material on their peripheries and cooperating to form a roll pass, for strip-like material that is given traveling movement between the drums, means for adjusting the drums relative to one another in directions perpendicular to the normal pass line, and means for adjusting one of the drums relative to the other, in directions generally radial of and tangentially of the other drum.

3. Grinding apparatus comprising a pair of rotatable drums having surfacing material on their peripheries and adapted to operate upon the upper and lower surfaces of strip material passed between them in a straight line, and means for adjusting the position of one of the drums relative to the other drum in directions generally radial and tangential thereto.

4. Grinding apparatus comprising a pair of rotatable drums having surfacing material on their peripheries and adapted to operate upon the upper and lower surfaces of strip material passed between them in a straight line, and means for adjusting the position of one of the drums relative to the other drum in directions generally radial and tangential thereto, the said adjusting means comprising rotatably adjustable bearings in which a shaft for the adjustable drum is eccentrically mounted.

5. Grinding apparatus comprising a pair of rotatable drums having surfacing material on their peripheries and adapted to operate upon the upper and lower surfaces of strip material passed between them in a straight line, means for adjusting the position of one of the drums relative to the other drum in directions generally radial and tangential thereto, the said adjusting means comprising rotatably adjustable bearings in which a shaft for the adjustable drum is eccentrically mounted, and a worm gear device for rotatably adjusting the bearings.

6. Grinding apparatus comprising a pair of rotatable drums having surfacing material on their peripheries and adapted to operate upon the upper and lower surfaces of strip material passed between them in a straight line, means for adjusting the position of one of the drums relative to the other drum in directions generally radial and tangential thereto, and an adjustable guide roller positioned to affect deflection of a strip from its normal path of travel between the drums, to thereby vary the area of grinding contact between the strip and one of the drums.

7. Grinding apparatus comprising a pair of rotatable drums having surfacing material on their peripheries and normally respectively having surfacing engagement with the upper and

lower surfaces of strip material that is passed between the drums, a pair of guide rollers positioned adjacent to the roll stand and respectively movable into position against the upper and lower surfaces of the strip material, and means for adjusting the guide rollers in directions generally perpendicular to the path of travel of the material, to deflect the material from a straight line path of travel between the drums, the said means comprising a pair of rocker arms for supporting each roller and worm gear devices for rocking said arms to adjusted positions.

ALFRED E. HAMILTON.

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