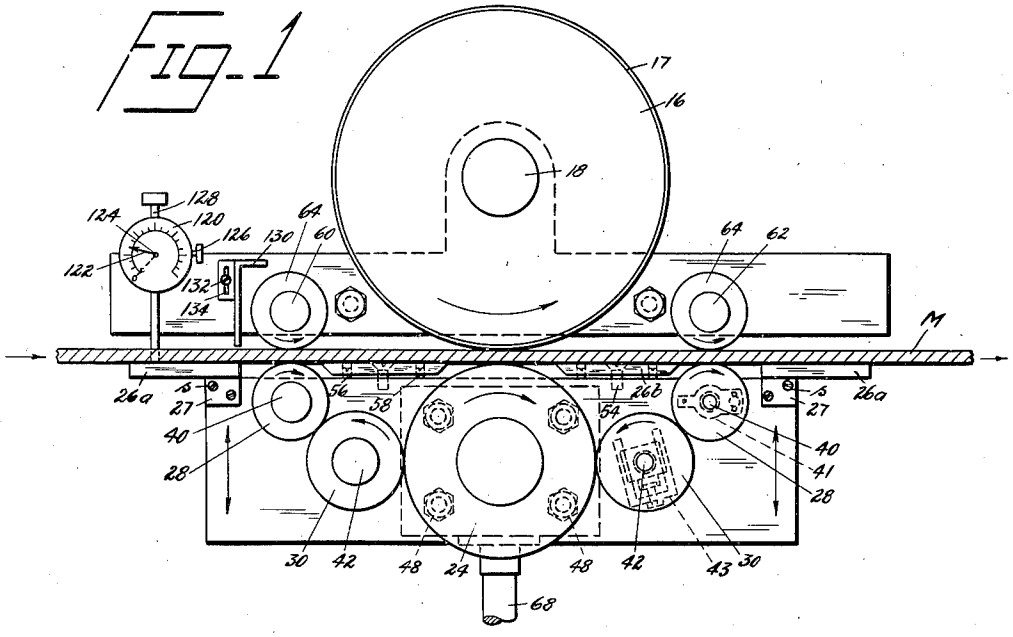
March 8, 1949. G. M. CURTIN 2,463,750

GRINDING APPARATUS

Filed April 12, 1946 3 Sheets-Sheet 1

Fig. 1



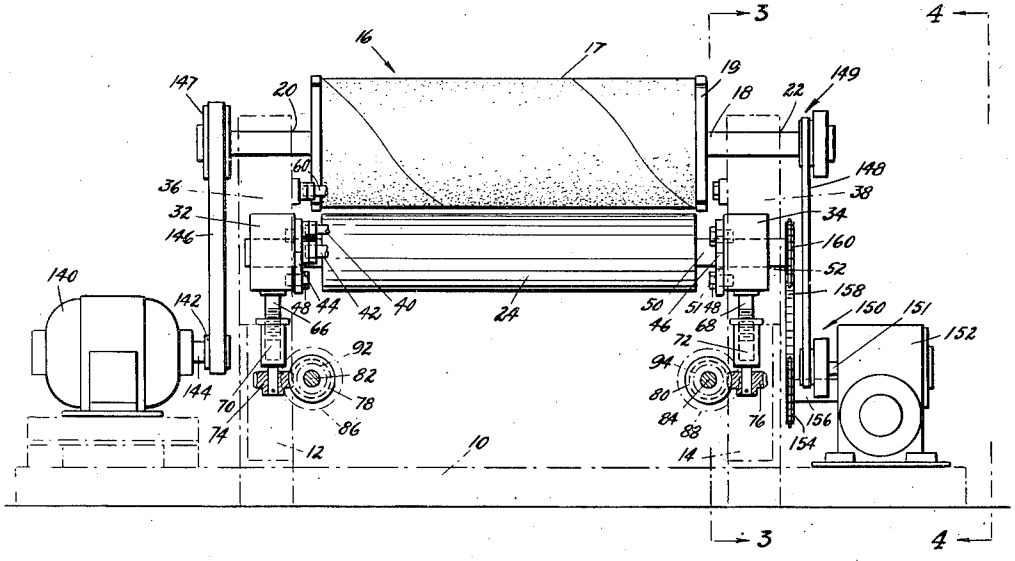


Fig. 2

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GRINDING APPARATUS

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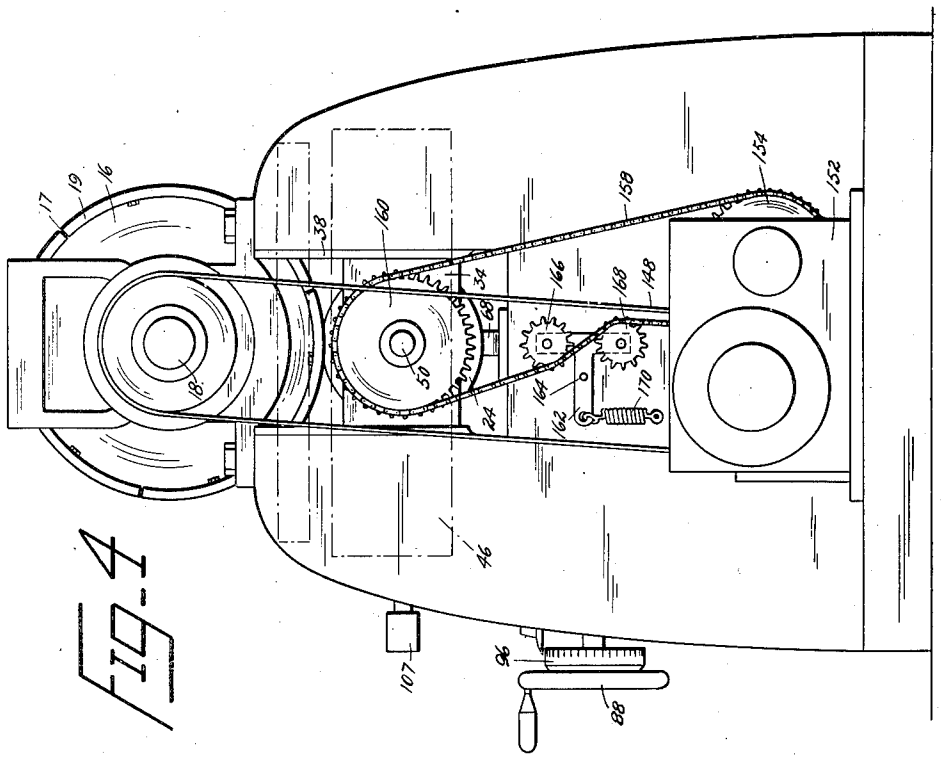


Fig. 4

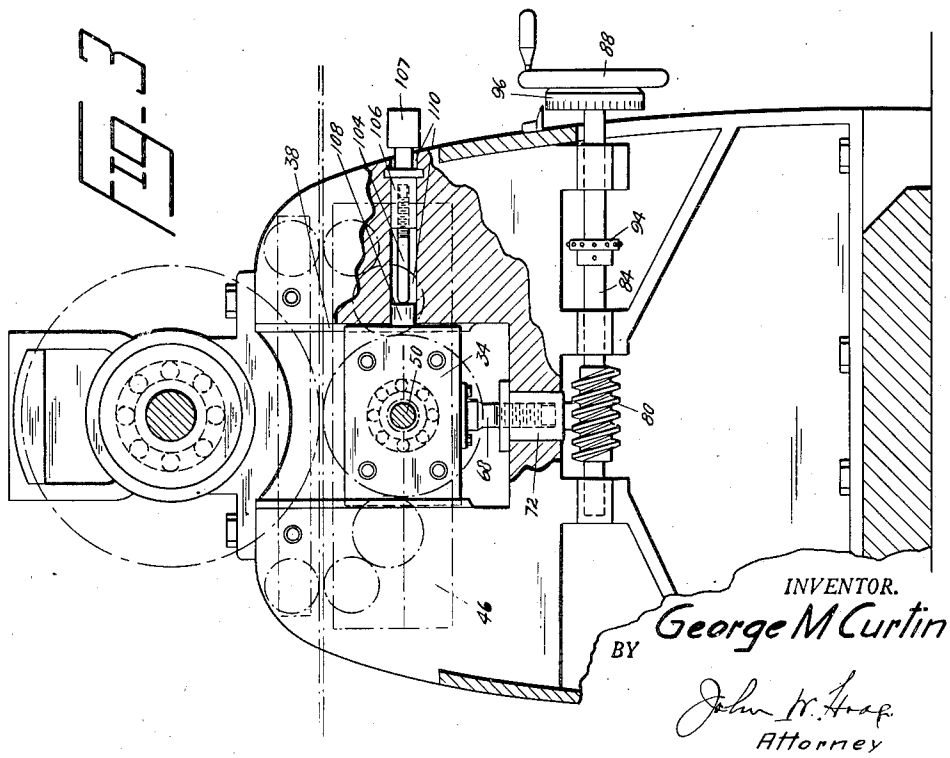


Fig. 3

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GRINDING APPARATUS

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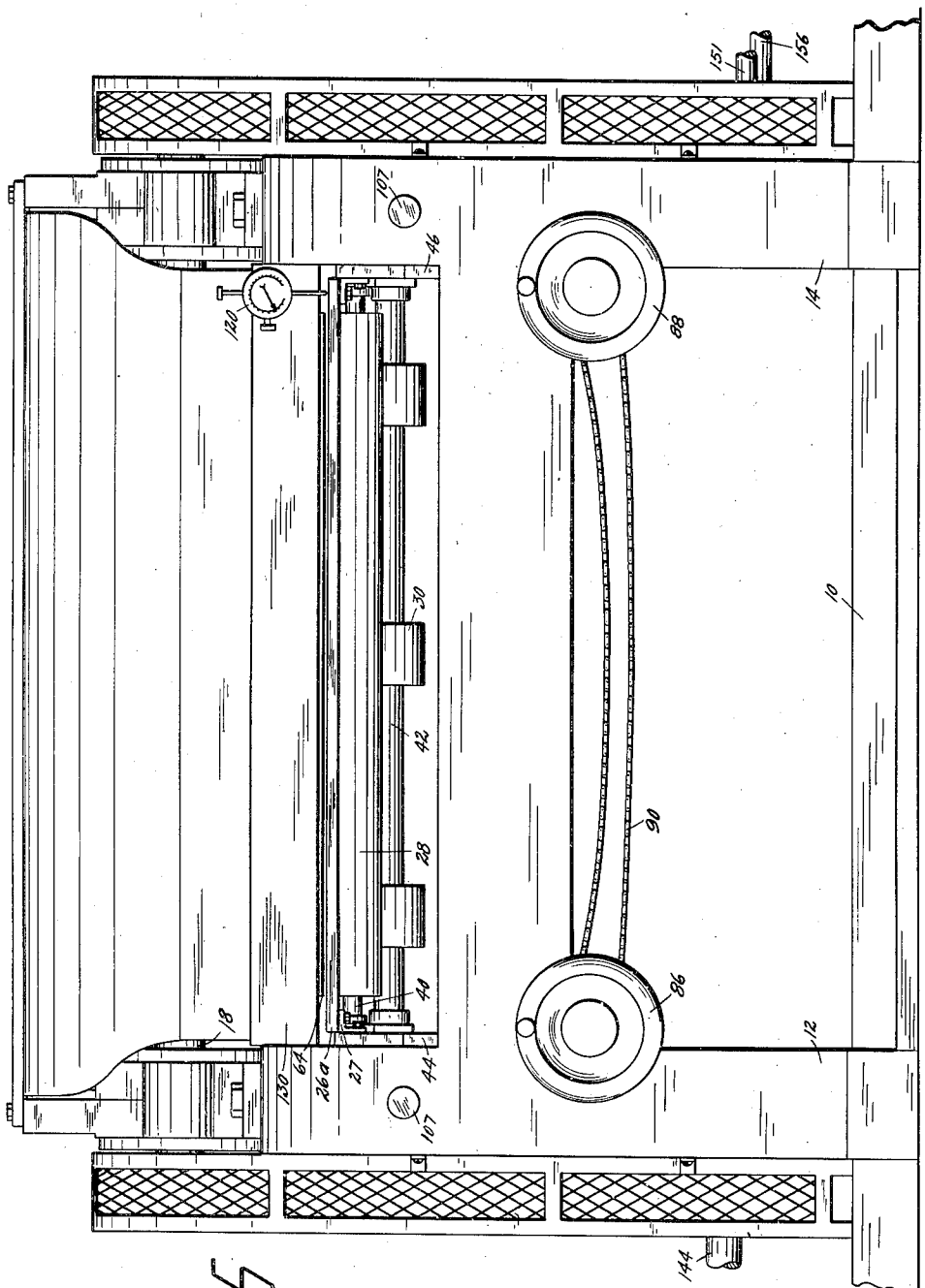


FIG. 5

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GRINDING APPARATUS

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Application April 12, 1946, Serial No. 661,797

4 Claims. (Cl. 51—78)

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This invention relates to apparatus for grinding material, and particularly strip material, very accurately to a desired thickness. The device is particularly adapted for the grinding of non-flexible strip material, such for example as strips of mica, plastic and the like.

It is an object of the invention to provide a simple, practical and efficient apparatus of the above mentioned kind.

Another object of the invention is to provide an apparatus for grinding strips of rigid material which must be fed to and through the machine in a straight line.

Another object of the invention is to provide simplified means for adjusting and setting a device of the above mentioned kind.

Another object of the invention is to provide grinding apparatus by which the thickness of the product may be controlled to measurements on the order of ten thousandths of an inch.

Another object of the invention is to provide grinding apparatus adapted to reject material which is too thick for the setting of the machine.

Another object of the invention is to provide grinding apparatus which may be readily set in advance to grind to the desired thickness, and without the repeated trial gauging operations characteristic of the prior art.

Another object of the invention is to provide grinding apparatus in which all the material supporting, pressing, and advancing means may be raised and lowered as a unit.

Another object of the invention is to provide a grinding apparatus in which the direction of rotation of the grinding roll may be reversed without reversing the direction of rotation of the pressure roll, thus making it possible to grind material with either a climb or a plunge cut.

Another object of the invention is to provide grinding apparatus capable of grinding a taper, so that one surface of the strip after being ground will be inclined relative to the other, and the product will increase in thickness from one lateral margin to the other.

Other objects of the invention will be in part obvious or in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements, arrangements of parts, and in the several steps and relation and order of each of said steps to

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one or more of the others thereof, all as will be pointed out in the following description, and the scope of the application of which will be indicated in the following claims.

The invention will best be understood if the following description is read in connection with the drawings, in which,

Figure 1 is a diagrammatic side view of the grinding roll and pressure roll assemblies of the embodiment of the invention shown in Figure 2;

Figure 2 is a front elevational view of the device with the casing removed;

Figure 3 is a vertical sectional view taken on the line 3—3 of Figure 2 looking in the direction of the arrows;

Figure 4 is a side view looking in the direction of the arrows 4—4, Figure 2; and

Figure 5 is a front elevation of the complete device without the motor and speed reducer.

The machine comprises the base 10 and the side frame members 12 and 14. The grinding roll 16 is supported in the frame near the top of the frame by means of its trunnions 18 which are received in bearings 20 and 22 in the frame members 12 and 14 respectively. The grinding surface may be a sheet of sandpaper 17, detachably mounted as by any suitable clamp means 19 shown extending over the ends of the grinding roll 16.

Beneath the grinding roll an assembly, comprising a pressure roll 24 which may be faced with rubber or the like, material support members 26^a and 26^b, lower feed rolls 28 and drive rolls 30 for driving the feed rolls from the pressure roll, is supported on slide members 32 and 34 which are mounted in vertical slideways 36 and 38 provided respectively in the opposite frame support members 12 and 14.

The lower feed rolls 28 and the drive rolls 30 are supported on their trunnions 40 and 42 respectively in bearings provided by end plates 44 and 46 respectively which in turn are secured to the slide members 32 and 34 respectively, as by screws 48, and therefore are carried by, and moved in unison with, the said slide members 32 and 34.

Preferably adjustable swivel bearings 41 and 43, which may be of a known kind as illustrated, fixed on the end plates 44 and 46, are provided for the trunnions 40 and 42 respectively, to permit slight angular adjustments in the position

of the lower feed rolls, 28, and driving rolls 30 and thus insure operative contact between the driving rolls 30 and the pressure roll 24, and with the lower feed rolls 28, respectively.

The presser roll 24 is provided with trunnions 50 which extend through holes 51 in the end plates into bearings 52 in the slide members 32 and 34 respectively.

The material support members, as shown, comprise the front and rear members 26a, and the intermediate members 26b, the latter being spaced apart and disposed on opposite sides of the presser roll 24 with their top surfaces on a level with the top of the pressure roll, and the members 26a being spaced outwardly from the members 26b and disposed on the opposite side of the lower feed rolls 28 respectively, from said members 26b, in the same horizontal plane as members 26b.

The members 26a are shown mounted on end plates 44 and 46, with their depending flanges 27 secured to the end plates respectively, as by screws. The members 26b are supported from the end plates by means permiting the height of said members, and the angle of the surface of said members, to be adjusted, and so that the whole members or either the leading or the rear edge of said members 26b may be raised or lowered with respect to the other edge as may be required to properly align said members with respect to each other, the members 26a, and the lower feed rolls 28. As illustrated herein the members 26b are secured to the top of the end plates 44 and 46 respectively by long screws 54 positioned intermediate shorter screws 56 and 58, it being apparent that one edge of members 26b may be elevated with respect to the other by loosening one set of screws 56 and 58, and taking up on the other set of screws 56 or 58.

It will thus be apparent that the pressure roll 24 and its assembly, including the lower feed rolls 28, the feed roll drive rolls 30, and the material supporting members 26a and 26b, may be raised or lowered with respect to grinding roll 16 to provide the desired space between the pressure roll and the grinding roll for the strip of material M to be ground to the desired thickness.

Positioned above the path of the material, on shafts 60 and 62 which extend between the frame members 12 and 14 are the upper feed rolls 64, which are vertically aligned with the lower feed rolls 28, and form with the feed rolls 28 respectively pairs of feed rolls, adapted to engage the strip of material M both in advance of, and behind the grinding roll, each pair of feed rolls serving to engage the strip of material and to advance it. As will be more fully explained the direction of rotation of the feed rolls may be reversed to cause the material M to be driven in either direction through the device.

The slide members 32 and 34 are supported on shafts 66 and 68, the lower ends of which are threaded and are received respectively in the shoulder bushings 70 and 72, which are fixed for rotation to the worm wheels 74 and 76, which in turn are actuated by the worms 78 and 80, on the hand wheel shafts 82 and 84 respectively, operated by hand wheels 86 and 88.

One of the worm gears is right hand and the other is left hand and they may be interconnected for operation in unison by the chain 90 (Figure 5) which may be made to engage sprocket wheels 92 and 94 respectively on hand wheel shafts 82 and 84, so that both shafts may be connected through chain 90 and operated simultaneously upon operation of either hand wheel thus causing the slides 32 and 34 and their associated end plates 44 and 46 respectively to be elevated and lowered together and to the same amount.

The hand wheels have calibrated hubs 96 which preferably are calibrated in ten thousandths of an inch so that one revolution of either hand wheel 86 or 88 raises the corresponding slide member 32 or 34 .005 of an inch.

By the means described the whole pressure roll assembly may be moved toward or away from the grinding roll 16 extremely gradually, making it possible to grind many materials including rigid strip materials, such for example as mica, to much more exact thicknesses than has heretofore been possible.

Furthermore, by positioning one of the slides 32 or 34 at a different height from the other, through operation of one or both of the hand wheels while chain 90 is removed from the sprocket wheels 92 and 94 on the hand wheel shafts 82 and 84, with the result that shafts 82 and 84 operate separately, a taper grind may be given to the strip M. Thus the strip may be ground so that it increases in thickness from one lateral margin to the other.

The pressure roll assembly bearing support slide blocks 32 and 34 can be locked in any desired position by means of the locking pins 104 (Figure 3) respectively, which threadedly engage in the shoulder bushings 106 having knobs 107 respectively by which they may be rotated, the inner ends of the pins 104 respectively being movable upon rotation of their respective shoulder bushings into engagement with the metal blocks 108 which are loose within the bores 110 within which the shoulder bushings are received. When either locking pin is moved inwardly it presses against its associate metal block which in turn forces the raised slide block against the opposite side of its slideway, and thus frictionally locks the block in its slideway.

A gauge (Figure 1) is provided for initially adjusting the vertical distance between the grinding roll 16 and the pressure roll assembly, to grind the work strip to the desired thickness. The gauge comprises a calibrated dial 120 having the pointer 122 which is mounted on a shaft 124 controlled by the thumb screw 126. A gauge rod 128 is connected to the pointer shaft 124, as by a ratchet and pinion connection, not shown, so that vertical movement of the gauge rod swings the pointer. The pointer is first set at zero and the gauge rod is then used to gauge the setting given the apparatus by operation of the hand wheels, and thus a check is obtained as to the thickness which will result from the setting, in advance of any work being done, thus greatly simplifying the operation of setting the device and checking the setting. Heretofore gauging has ordinarily been performed only on strips which have been passed through the apparatus, thus making a succession of gauging operations necessary as a preliminary to the final adjustment of the apparatus and before the working run is begun.

In initially adjusting the machine the hand wheels 88 are operated to elevate the pressure roll assembly until the pressure roll 24 and the grinding roll 16 are brought into contact. When sparking between the grinding roll and the pressure roll ceases the gauge roll 128 is moved down against the upper surface of the work support

member 26a and the pointer 122 is set at zero. The hand wheels 88 are now operated to lower the pressure roll assembly an amount equal to the thickness to which the strip of material M is to be ground, and this setting is checked by now again moving the gauge rod 128 down into contact with the top surface of the support plate 26a thus moving pointer 122 and causing it to indicate the thickness for which the apparatus is set.

A guard member 130 is provided which is positioned in advance of the front pair of feed rolls, and means are provided to adjust it vertically so that it acts also as a selecting device to reject any strips of material which are too thick for the setting of the machine and might therefore cause jamming and damage to the rolls. Accordingly the guard member is secured to the frame by the adjusting screw 132 extending through vertical slot 134, and the lower end of the guard is adjusted to be approximately the same height above the work support plate member 26a as the bottom of the top feed rolls 64.

The drive is from the motor 140 through pulley 142 on the motor shaft 144, belt 146, and the trunnions 18 of the grinding roll 16 through pulleys 147 and 149, through belt 148 and pulley 150 on speed reducer shaft 151, down to the speed reducer 152, and from the speed reducer to the pressure roll 24 through gear 154 on shaft 156, chain 158, and sprocket 160 on the trunnions 50 of the pressure roll. The pressure roll 24 drives the driving rolls 30 which in turn drive the lower feed rolls 28, which, together with the upper feed rolls 64, and the pressure roll, feed the material through the machine.

It will be noted that pulley members 149 and 150 each comprise two pulleys of different diameter. By changing the belt 148 between the pulleys of pulley members 149 and 150 the speed of drive be modified through the speed reducer means 152, which may be of standard form and so is not described in detail.

Since the direction of rotation of the grinding roll 16 may be reversed with respect to the direction of rotation of the pressure roll assembly either a climb cut or a plunge cut may be obtained, if desired, depending upon the direction of rotation of grinding roll 16.

To compensate for adjustment of the pressure roll assembly in a vertical plane, means are provided for tightening chain 158 and thus keeping it firmly engaged at all times on sprockets 154 and 160. As illustrated a T-shaped bracket 162 is pivotally mounted on the machine frame by pivot 164, and on a vertically extending arm of the bracket the sprockets 166 and 168 are rotatably mounted and spaced apart one above the other in engagement with chain 158 on opposite sides. The other or horizontally extending arm of the bracket is connected to the machine frame by the spring 170 which tends to pivot the bracket to take up any slack in the chain 158.

The apparatus described herein has the advantage of flexibility in that, because of the unitary mounting of the pressure roll assembly, opposite ends of the assembly may, if desired, be elevated separately and to different elevations, or both ends of the assembly may be moved in unison and by the operation of a single hand wheel. The unitary mounting of the pressure roll assembly makes practical the employment of gauge means as described herein making it possible to speedily obtain the desired setting of the machine, down to a setting of ten thousandths of an

inch, and before the start of a working operation, thus eliminating the feeding, gauging, and resetting operations characteristic of the operation of prior art grinding machines in preparation for a working operation. The ability of the machine to grind a taper, or to grind with either a climb or a plunge cut, as may be desired, contributes further to the flexibility and versatility of the machine, and the unitary mounting of the pressure roll assembly further cooperates with the guard means and makes it possible for the guard means to automatically reject strips of material which are too thick for the setting of the machine, by maintaining the support members 26a and 26b, the lower feed rolls 28, and the pressure roll 24 with their tops at the same level and equally spaced from the bottom of the upper feed rolls 64 and the bottom of the grinding roll 16.

It will thus be seen that there has been provided by this invention a method and apparatus in which the various objects hereinabove set forth together with many thoroughly practical advantages are successfully achieved. As various possible embodiments might be made of the mechanical features of the above invention and as the art herein described might be varied in various parts, all without departing from the scope of the invention, it is to be understood that all matter hereinbefore set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

What I claim is:

1. Grinding apparatus comprising, a frame, a grinding roll rotatably mounted in said frame, a pressure roll rotatably and slideably mounted in said frame for movement toward or away from the grinding roll, material supporting means movable toward or away from the grinding roll in unison with the pressure roll, means supported by said frame and positioned above, and adjustable vertically with respect to said material supporting means to provide clearance between itself and said material supporting means substantially equal to the clearance between the grinding roll and the pressure roll and thus cooperating with the material supporting means to serve both as guard means and work selector means, and means for advancing a strip of material over said material supporting means.

2. Grinding apparatus comprising, support means, a grinding roll, a pressure roll movable toward or away from the grinding roll, both said rolls being rotatably mounted in said support means, material supporting means movable toward or away from the grinding roll in unison with the pressure roll, and means fixed to said support means including a member movable in a vertical plane toward or away from said work supporting means, and adapted to cooperate with the work supporting means and to be moved from zero position into contact with the work supporting means after the apparatus has been adjusted for a grinding operation to gauge in advance the thickness to which a strip of material will be ground by passing through the apparatus as adjusted.

3. Grinding apparatus comprising, a frame, a grinding roll rotatably mounted in said frame on a fixed axis, upper feed rolls mounted in front and behind said grinding roll in fixed bearings with their bottoms on a level with the bottom of said grinding wheel, a unit adjustable vertically toward and away from said grinding roll comprising lower feed rolls vertically aligned with said up-

per feed rolls respectively, a pressure roll, work support counters in front and behind said pressure roll with their upper surfaces respectively on a level with the top of said pressure roll, means for driving the pressure roll, and rolls intermediate the pressure roll and said lower feed rolls respectively by which the drive of the pressure roll is transmitted to said lower feed rolls causing them to rotate in the same direction as the pressure roll.

4. Apparatus for grinding rigid material such as mica, plastic and the like which comprises, a grinding roll, a pressure roll, opposed upper and lower feed rolls in front and behind said grinding roll and said pressure roll, means for positively driving both of said rolls, means for advancing a strip of material by passing it through said pairs of feed rolls, and means for driving the lower feed rolls from the pressure roll consisting of idler rolls intermediate said pressure roll and said

lower feed rolls respectively, the said upper feed rolls being driven from said lower feed rolls by contact with the material which is being ground.

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Certificate of Correction

Patent No. 2,463,750 March 8, 1949.

GEORGE M. CURTIN

It is hereby certified that errors appear in the printed specification of the above numbered patent requiring correction as follows:

Column 3, line 23, after the word "screws" and before the period insert the letter *s*; line 24, same column, for "permiting" read *permitting*; column 4, line 74, for "gauge roll" read *gauge rod*;

and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 26th day of July, A. D. 1949.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.