

May 11, 1954

G. E. MCGUIRE

2,677,922

FINISHING AND POLISHING EQUIPMENT

Filed Aug. 10, 1950

6 Sheets-Sheet 2

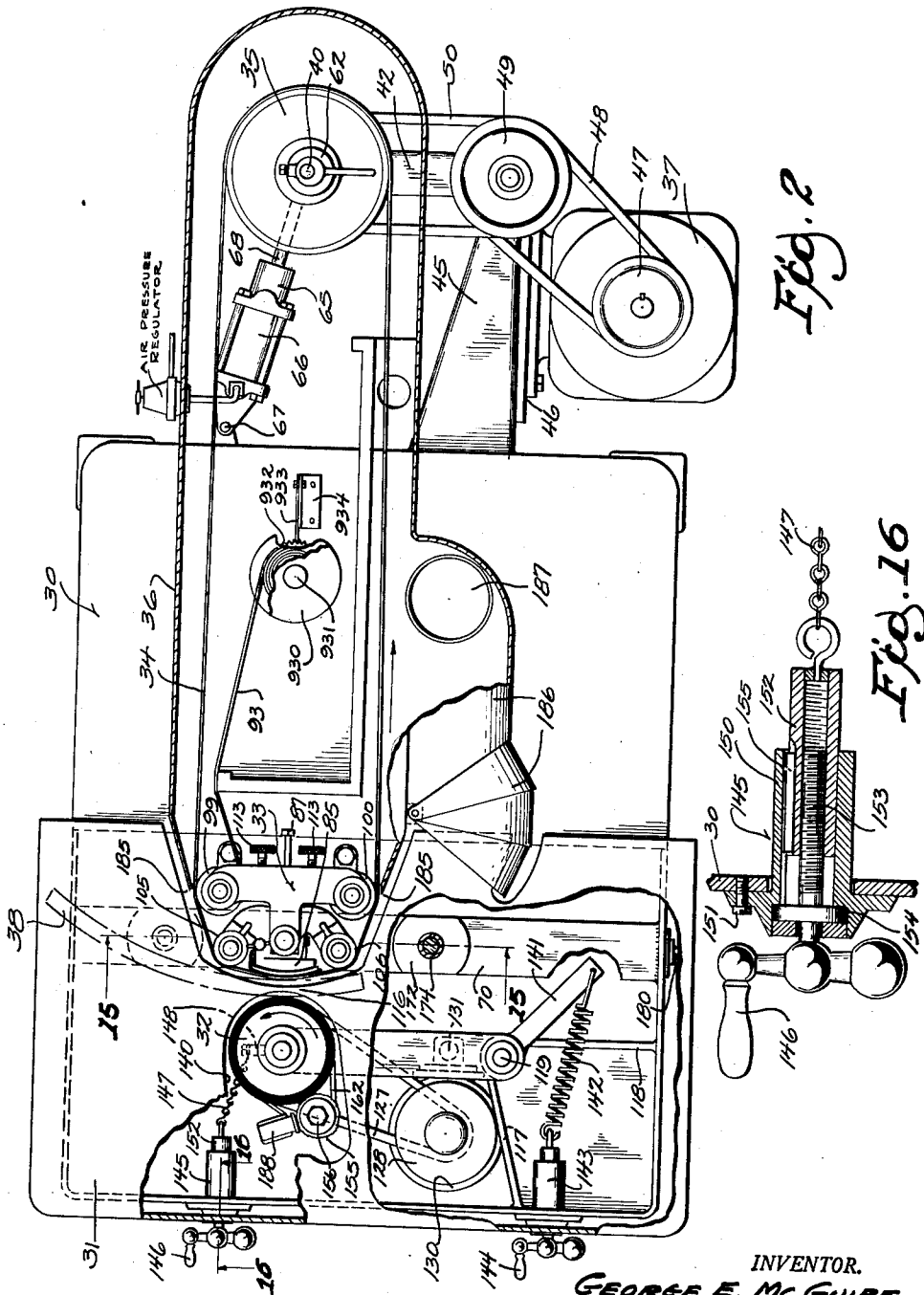


Fig. 2

Fig. 16

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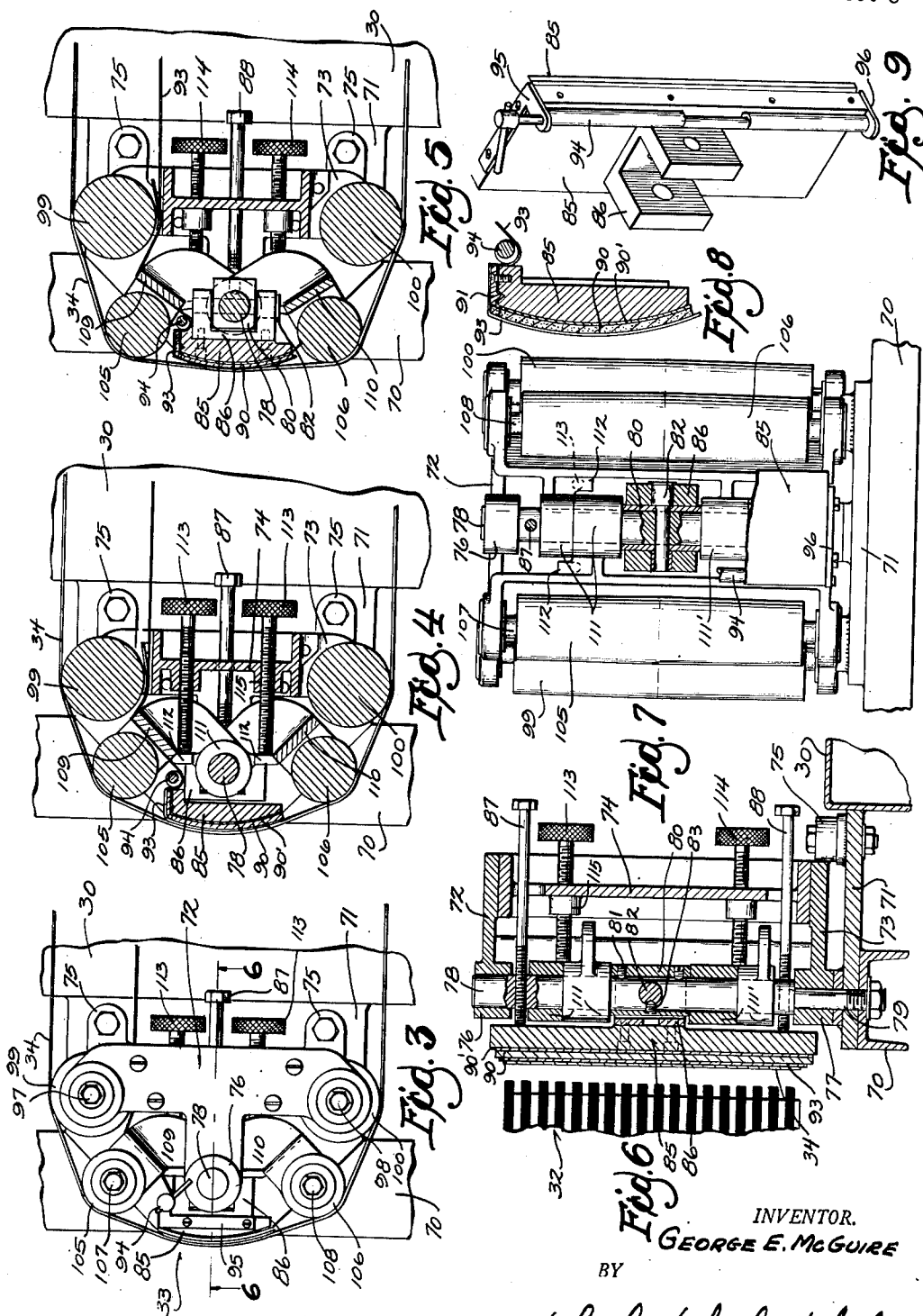
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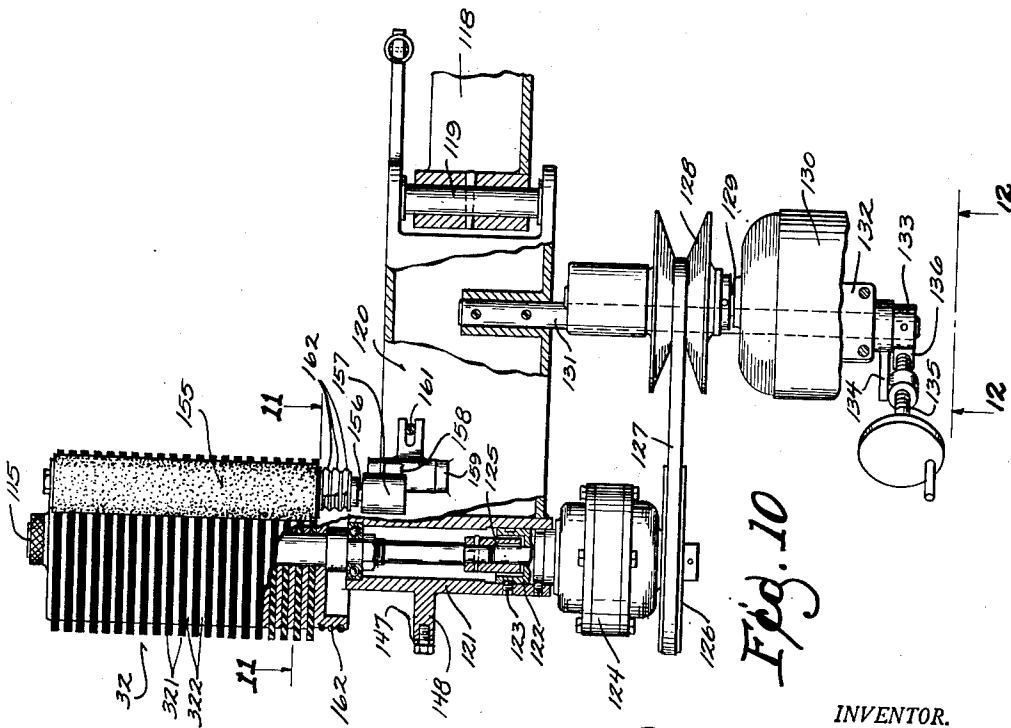
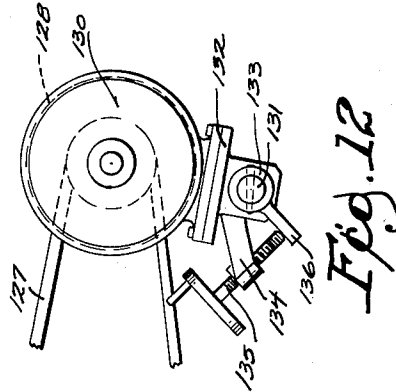
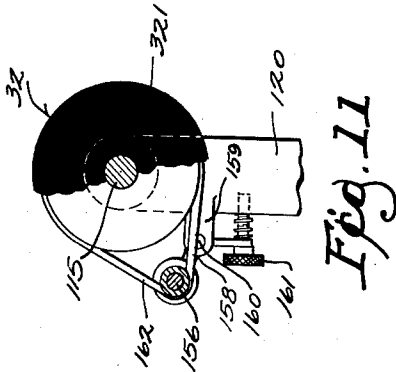
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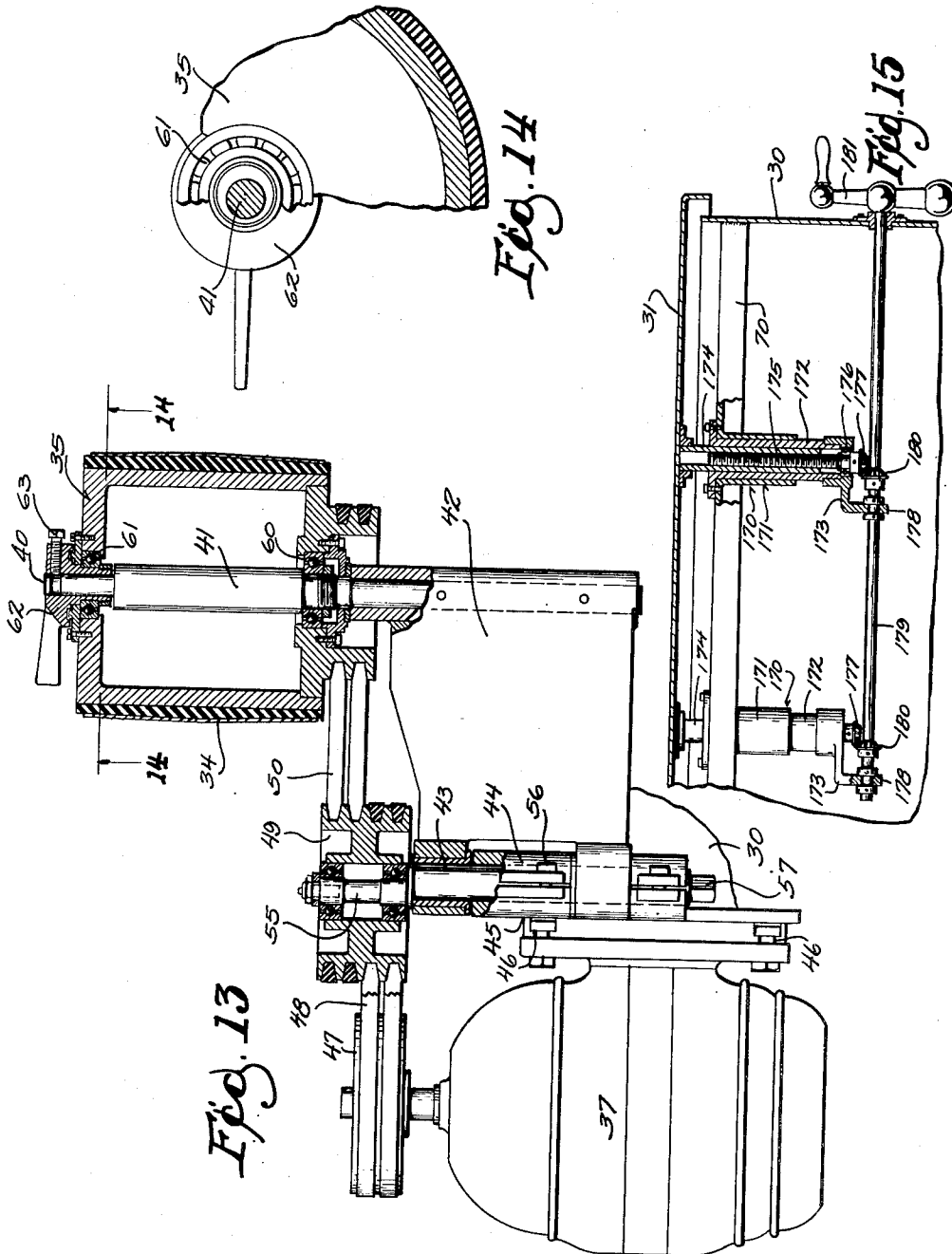
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FINISHING AND POLISHING EQUIPMENT

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6 Sheets-Sheet 5



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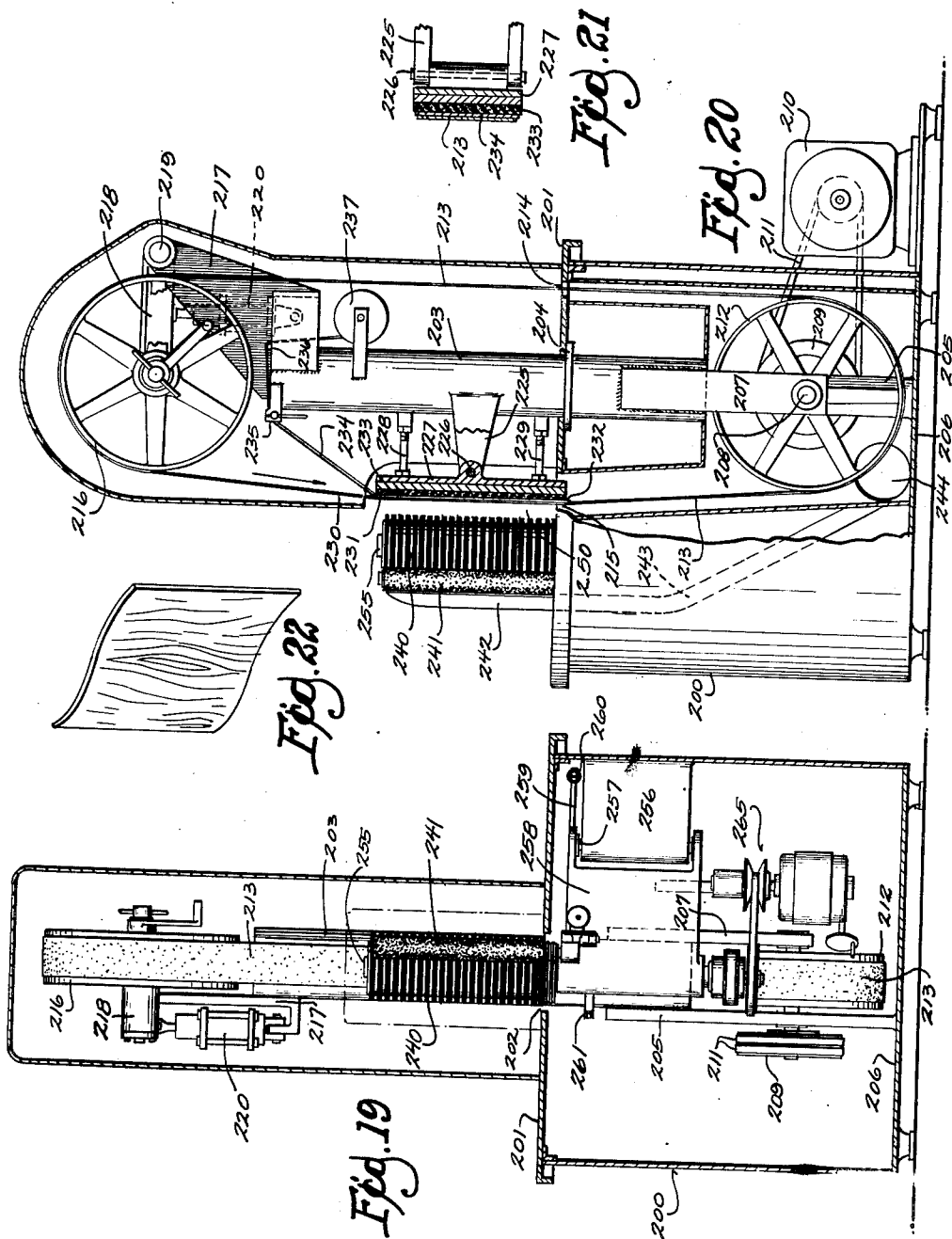
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FINISHING AND POLISHING EQUIPMENT

Filed Aug. 10, 1950

6 Sheets-Sheet 6



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2,677,922

FINISHING AND POLISHING EQUIPMENT

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Application August 10, 1950, Serial No. 178,577

16 Claims. (Cl. 51—139)

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My invention relates to improvements in finishing and polishing equipment and in certain respects is concerned with improvements upon the finishing and polishing machine shown and described in United States Letters Patent No. 2,322,459 issued June 22, 1943 to Carl J. Lippold.

The invention relates to the abrasive finishing and polishing of contoured work pieces such as chair backs, and the machine for accomplishing this includes a constantly moving belt-like abrasive element against which the work piece is pressed and fed by a feed roll. The improvements in my machine relate to:

A novel working "head" over which the abrasive belt is directed at a work station; a novel feed roll positioned and rotated to project the work piece in a path of movement against the abrasive belt in a direction contrary to the direction of movement of the belt itself; a novel mounting for a feed roll and for the cleaning of the roll to assure positive predetermined speed of work feed during a working operation; adjustable contour of the path of movement of an abrasive belt through a working zone to accommodate work pieces of differing contour; novel friction reducing means for a back-up shoe for an abrasive belt at a work station; novel means for cleaning a feed roll of an abrading or polishing machine; and means for mounting the power driving and driven elements of a machine of the character described herein so that the abrasive belt may be adjustably and controllably driven with respect to the working head, and the feed roll may be adjustably operated to effectively feed a work piece contra to the direction of operation of the belt.

Further improvements will be apparent from the description below.

In the drawings:

Fig. 1 is a side elevation of my finishing and polishing machine.

Fig. 2 is a plan view of the machine shown in Fig. 1, portions of the hood over the abrasive belt and its operating mechanism and portions of the work table being broken away to show the operating mechanism therebeneath.

Fig. 3 is a plan view of the working head of the abrasive belt guiding means shown in Fig. 2, the scale of the view in Fig. 3 being somewhat enlarged.

Fig. 4 is a horizontal section of the working head shown in Fig. 3 taken on line 4—4 of Fig. 6.

Fig. 5 is a horizontal section of the working head shown in Fig. 3 taken on line 5—5 of Fig. 6.

Fig. 6 is a section on line 6—6 of Fig. 3 and

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showing fragmentarily a portion of the feed roll which faces the abrasive belt.

Fig. 7 is a front elevation of the guide rolls and their mounting in the working head of my machine. The guide shoe being removed and portions of the shoe supporting mounting being shown in vertical section.

Fig. 8 is a fragmentary view in plan showing the guide shoe and special friction reducing means incorporated with my guide shoe.

Fig. 9 is a perspective of the guide shoe, the view being taken generally from the rear and showing the mounting bracket and the anti-friction web clamp used in conjunction with the shoe.

Fig. 10 is a side elevation of the feed roll, feed roll cleaner, and power connections for the feed roll cleaner and feed roll, portions of the supporting members being broken away to show in vertical section the supporting means and certain of the assembled parts.

Fig. 11 is a section on line 11—11 of Fig. 10.

Fig. 12 is a section on line 12—12 of Fig. 10.

Fig. 13 is a side elevation of main power and pulley drive assembly for the abrasive belt, certain portions of the supporting arms and the pulleys being shown in vertical section to show features of adjustment and power connection.

Fig. 14 is a view taken on line 14—14 of Fig. 13.

Fig. 15 is a vertical section on line 15—15 of Fig. 2.

Fig. 16 is a section on line 16—16 of Fig. 2.

Figs. 17 and 18 are perspective views of particular shapes of work pieces for the finishing of which my machine is adapted.

Fig. 19 is a vertical section through an alternative form of my invention.

Fig. 20 is a side elevation of the machine shown in Fig. 19, the housing being broken away in vertical section to show the operating parts.

Fig. 21 is a section on line 21—21 of Fig. 20.

Fig. 22 is a perspective of a work piece for the finishing of which the machine of Figs. 19 and 20 is particularly adapted.

Like parts are designated by the same reference characters throughout the several views.

As shown in Figs. 1 and 2, my finishing and polishing machine includes certain principal structural portions which I shall preliminarily designate and which will hereinafter be more specifically described. The entire machine is

mounted upon a box-like enclosed frame or base 30. Upon the forward portion of this frame, at approximately table height, I provide the horizontal work table 31. Over the surface of this table a work piece such as one of the work pieces

shown in Fig. 17 or 18 is guided and forced by a feed roll 32. Rearwardly of the feed roll, and to the right as shown in Figs. 1 and 2, is a working head indicated generally at 33. About this working head is driven an abrasive or polishing belt 34 which moves on a power pulley 35 mounted upon a vertical axis under hood 36. At the rear portion of the machine and mounted to the back portion of the frame thereof, is the motor 37 for the operation of the abrasive belt. Beneath the work table 31 are the motor and motor drive connections for the feed roll 32.

For a ready understanding of the operation of my machine, it should be noted that the abrasive belt 34 moves counterclockwise as shown in Fig. 2 and as indicated by the arrow adjacent the working head 33. However, the feed roll 32 rotates in the direction indicated by the arrow in Fig. 2 and because the feed roll 32 has the characteristics below described, the work piece is forced horizontally through the throat 116 between the feed roll and the abrasive belt in the direction contra to the direction of movement of the belt 34. The work piece shown in dotted lines at 38 in Fig. 2 is therefore in a position which it assumes as it leaves the throat at the end of its travel through the throat.

Belt drive

As shown most clearly in Fig. 2 the abrasive belt 34 is supported, guided and powered to move over the various pulleys and a shoe comprising working head 33 which faces forwardly toward feed roll 32. At the rear end of the machine, the power pulley 35 is mounted upon a vertical axis 40 provided by fixed shaft 41 carried by a heavy arm 42. This arm is swingably mounted upon hinge pintle 43 carried by a clamp-like frame member 44 which forms a part of the frame arm 45 extending rearwardly of the box-like frame 30 of the machine. Upon one side of the frame arm 45 I mount a set of ways 46 upon which motor 37 is secured for sliding adjustment according to well known practices. Motor drive pulley 47 driving through multiple-belts 48 is connected to motivate pulley 49, and the pulley 49 is connected by belts 50 to the main drive pulley 35 upon which the abrasive belt 34 is supported, driven and guided.

As shown in Fig. 13 the pulley 49 is mounted upon ball bearings on an eccentric, integral extension 55 of the pintle 43 so that upon release of clamp bolts 56 and the rotation of pintle 43 by the application of a wrench to the squared end 57 thereof shaft 55 may be eccentrically adjusted so as to change the center distance between fixed shaft 41 and the extension 55 of pintle 43. The belts for the main drive pulley 35 may thus be adjusted, or relieved for belt change.

Ball bearings 60 and 61 at either end of the power pulley 35 are self-aligning and provision is made at the top of the power pulley for the wobble adjustment of bearing 61 so that the abrasive belt may be adjusted to ride at the proper level in its movement over the power pulley and over the head 33. This wobble adjustment is accomplished by means of the lever equipped shaft sleeve 62 mounted upon the reduced end of fixed shaft 41, and it will be noted that this sleeve provides an eccentric mounting for the cone of the bearing 61. Any position of rotative adjustment selected for the sleeve 62 upon shaft 41 may be fixed by set screw 63 as will be readily seen from the examination of Fig. 13.

To adjust the tension upon the abrasive belt

34 I provide a pneumatic belt tightener 65 which includes a cylinder 66 mounted upon a pivot mounting at 67 and provided with a ram 68 extending into contact with arm 42 adjacent its support on the fixed shaft 41. Air pressure upon the ram 68 thrusts the arm 42 swingably in a rearward direction to tighten the abrasive belt 34. The release of air from the cylinder 66 permits the ram 68 to retract within the cylinder and effects the loosening or slacking off of the belt 34. An air line and adjustable pressure regulator as shown in Fig. 2 may be used to select the desired tension of belt 34.

At the forward end of the belt 34 is working head 33 which is an important improvement in my finishing and polishing machine. This working head is supported by a heavy channel cross member 70 braced from the box frame 30 by a head plate 71 which overlies the channel and provides a firm foundation for the working head (see Fig. 6). Top and bottom frame members 72 and 73, respectively, of the working head are substantially T-shaped in plan, and a vertical head frame 74 extending between them is of relatively heavy I-beam construction as shown in Fig. 6. A set of ears 75 extending rearwardly from the T-shaped head frame 73 is bolted firmly to head plate 71.

The central, forwardly extending legs 76 and 77 of the T-shaped head frames 72 and 73 are spanned by a shoe mounting shaft 78, the lower end of which is shouldered and reduced in size to provide an anchor bolt 79 to extend through head plate 71 and channel 70 to give additional support and firm anchorage to the working head. A square thrust block 80 comprises a collar positioned at a mid-point on shaft 78 between head frames 72 and 73 where it is positioned by set screws 81. Laterally through the shaft 78 and through this thrust block 80 is a shoe mounting pintle 82 which extends horizontally and is held in place by set screw 83. It is upon this horizontal pintle that the shoe 85 is mounted for slight adjustment as will now be described.

Shoe 85 is a relatively narrow plate-like member sufficiently long in a vertical direction to provide a shoe surface for an abrasive belt of the greatest width to be used in my machine. I prefer to make this shoe of aluminum and I curve the front face, which is forwardly directed toward the feed roll 32, upon a relatively short radius taken on a vertical axis. The shoe is straight, however, in its vertical dimension, and is intended, once the machine is set up for a given abrasive or polishing belt operation, to be fixed in position, however, I mount this shoe 85 for adjustable oscillation about a horizontal axis provided by the shoe pintle 82. This pintle extends through the legs of a U-shaped bracket 86 secured at a mid-point in the back of the shoe as seen most clearly in Fig. 9. The legs of the bracket 86 are spaced apart sufficiently to snugly embrace thrust block 80 on shaft 78, and the bracket arms are extended sufficiently rearwardly to permit limited oscillation of the bracket and shoe upon pintle 82. Threaded holes through the upper and lower portions of shoe mounting shaft 78 provide for shoe adjusting screws 87 and 88 which adjustably bear against the back of the top and bottom of the shoe so as to control and fix the position of oscillation of the shoe about the pintle 82.

Upon the face of the shoe 85, I secure a pad consisting of a heavy layer of felt, sponge rubber or other cushioning material 90 which is re-

tained in position by a pad clamp 91 secured to the side of the shoe 85 by cap screws. As shown in Fig. 8 the pad is sewed or otherwise secured to a fabric backing 90'. Only this backing is crimped around the edge of the shoe and held under clamp 91. It will be seen in Fig. 8 that it is only necessary to secure this felt along one margin of the shoe since the pad is "wiped" into position over the face of the shoe by the action of the belt 34 as it moves across the working head.

As will be apparent from the following description the shoe 85 cushioned by a felt or sponge rubber pad is completely effective to avoid the irregularity and "jumpiness" of an abrasive belt moving through the working station of an abrading or polishing machine. Such belts have lap joints and tend to jump when the belt joint passes over a pulley or other surface not made in accord with my invention, and each irregularity causes a blemish or visible defect in the polished or abraded surface of a work piece.

Since I move my belt across a face of the shoe 85 with the felt 90 therebetween considerable friction which would be thus induced is avoided in my new working head by provision of my anti-friction graphited fabric web 93 which is interleaved between the felt and the abrasive belt 34. The graphited material which I have found best suited to this work is a light-weight canvas web, thoroughly impregnated with graphite. Along the same side of the shoe 85 to which the felt is gripped at 91, I mount a graphite web clamp 94 which is carried by brackets 95 and 96, and since the clamp 94 is eccentric in its mounting in said brackets, it is only necessary to partially turn the clamp 94 to securely hold the graphited canvas web in clamped position as shown in Figs. 2 to 5 inclusive. It is upon the surface of the graphited canvas web 93 that the belt 34 of abrasive or polishing material rides as it passes over the forward end of the working head.

To make it easy to replace worn out graphited web material 93 I mount a reel or spool 930 on a spindle 931 secured to the box frame 30 as shown in Fig. 2. This spool has a ratchet wheel 932 fixed thereto. A fixed bracket 933 has a leaf spring 934 riveted thereto to act as a pawl deflectable in one direction so that as the end of the pawl bears upon ratchet 932 a supply of web 93 on the spool may be unrolled and the pawl will act as a brake to prevent an unwanted excess of web from unrolling. I have found that an area of graphited canvas web under an abrasive belt will be effective for the life of an abrasive belt, or approximately 3 or 4 hours of heavy duty work, and when the belt 34 is changed a new area of web 93 is drawn through the opened clamp 94. The worn portion of the web is then clipped off with knife or shears to prevent fouling under the contour roll adjacent the trailing side of the shoe 85.

Secured upon vertical shafts 97 and 98 fixed at either end of the T-frame 12, I provide pulleys 99 and 100 over which the abrasive belt passes and is directed in going to and from the shoe 85. These two pulleys 99 and 100 and the shoe 85, therefor, define the extreme width of the contour of the belt 34 as it passes about my working head. However, it is necessary to make the curvature of the path of the belt 34 adjustably variable to conform to the requirements for finishing and polishing work pieces having certain contours. I, therefore, provide adjustable contour rolls 105 and 106 which are carried on swing-

able vertical contour roll shafts 107 and 108, respectively. These contour roll shafts are carried in turn by anti-friction bearings at the end of swingable brackets 109 and 110 each provided with a pair of bracket bosses 111 and 111' bored for reception upon shoe mounting shaft 78.

Each of the brackets 109 and 110 has two spaced pads 112 against which contour roll adjusting screws 113 and 114 may be brought to bear as they are threadedly adjusted in bosses 115 forming part of vertical head frame 74. Thus although the extreme width of the path of travel of belt 34 about head 33 is determined by the pulleys 99 and 100 and the vertical center of the shoe 85 determines the extreme forward portion of the working face of the belt in the course of its travel, the actual contour of the working face of the belt between the pulleys 99 and 100 is determined by the adjustment of the contour rolls 105 and 106. As described above the shoe and its resilient pad 90 with the graphited canvas cover thereover can yield along its lateral areas and since the belt 34 is under tension controlled by air pressure in cylinder 66, the adjustment of the contour rolls 105, 106 can alter the contour of travel of the belt 34 between the pulleys 99 and 100 and the shoe 85, and can also influence the contour of the path of travel of the belt over the surface of the shoe. The head 33, therefore, offers adjustments of contour in a versatile way under control of the contour roll adjusting screws 113-114. In fact the extreme of movement of the swingable adjustment of the contour rolls on their brackets 109, 109 permits of their retraction sufficiently to take them out of contact with the belt whereby to permit the belt to be guided and contoured only by the pulleys 99 and 100 and by shoe 85.

Adjustment of the shoe 85 about pintle 32 under control of the shoe adjusting screws 37 and 38 makes it possible for the operator to incline the shoe with reference to the face of the feed roll which faces it.

Feed Roll

Forwardly of the shoe 85 and mounted upon a power operated feed roll shaft 115 there is mounted a generally pulley-shaped feed roll 32, the surface of which, in general, is parallel with the shoe 85. The surface material of this feed roll is of great importance in the operation of my machine and the operation of the feed roll at controlled speed appears to be important not only with reference to the speed with which a work piece is to proceed through a polishing or abrading operation, but also with reference to the successful thrust of a work piece through my machine contra to the direction of operation of the belt 34.

Feed roll 32 is built up so that the surface comprises alternate lands 321 of rib-like resilient material and lands 322 of non-resilient material, such as wood or metal, the resilient lands project outwardly, radially beyond the non-resilient lands so that peripherally the feed roll presents against the surface of a work piece only the somewhat annular ribs of resilient material.

I have found that in a feed roll six inches in diameter and nine inches long in its vertical dimension a practical feed roll for feeding wooden work pieces, such as those shown in Figs. 17 and 18, includes alternate resilient lands $\frac{1}{8}$ inch wide and interspersed spacers 322 $\frac{1}{4}$ inch wide.

Thus far in the experimental and commercial

use of my machine I have found that natural rubber provides the best feed roll rib surface with which to feed wood, plastic, and other materials of which furniture and like items are made. But within contemplation of my invention, it will be apparent that other substances of a resilient nature such as synthetic rubber may be used to provide the resilient lands or ribs required for the feeding of work pieces of differing characteristics.

The ribs of my new feed roll are laterally as well as radially yieldable to conform to the irregularities of surface areas of work pieces. Thus there is opportunity for the ribs to yield and to shape themselves against the work piece surface with a better feeding action.

As indicated above the feed roll mounted upon its shaft 115 opposite shoe 35 and the shaft 115, is adjustably swingably carried by mechanism now to be described, so that the working throat indicated as 116 between the feed roll and the shoe 35 may be adjustably opened and closed in accord with the requirement for space through which a work piece such as the work piece shown at dotted lines in Fig. 2 may be fed.

Beneath the table 31 and attached to the box-like frame 30 are a pair of feed roll frame supports 117 and 118 which converge as shown in Fig. 2 to provide a stable mounting for feed roll assembly pintle 119. Upon this pintle is mounted swingably a heavy feed roll assembly arm 120 shown most clearly in Figs. 2 and 10. At the outer end of the arm, the opposite end from the pintle 119, is mounted the vertical shaft 115 which is carried in a ball bearing in a tubular support 121 so that the feed roll mounted on the upper end of the shaft extends upwardly from the arm 120. Below the arm 120 and carried by a sleeve 122 held in tube 121 by set screws 123 is a speed reducer 124. A pin and slot connection at 125 provides for ready assembly and connection of the output shaft of the speed reducer with shaft 115 upon which feed roll 32 is mounted. A pulley 126 provides the input connection for the speed reducer 124, and this pulley is connected by V-belt 127 with a pulley 128.

The pulley 128 is mounted directly on the motor shaft 129 of motor 130 which provides the motivation of feed roll 32. The pulley 128 is of controllable working diameter with respect to V-belt 127 for speed change in a manner well known in the V-belt art and is popularly known as an Ideal pulley.

Motor 130 is supported from arm 120 by motor support shaft 131 on the lower end of which is a motor mounting pad 132 supported for free rotation on the shaft 131 by collar 133 which constitutes a non-rotatable thrust collar at the end of the shaft. (See Fig. 10.) The motor mounting pad has an arm 134 extended from it radially of the axis of shaft 131 and a screw threaded speed adjusting manual control 135 is so positioned that the end of its screw bears against a foot 136 forming an integral part of the collar 133. Thus the motor may adjustably be swung bodily about the axis of shaft 131 to "tighten" or "loosen" the belt 127, the real result of such adjustment being a change of speed of input pulley 126 and change of speed of rotation of the feed roll 32.

As will now be apparent, the feed roll is carried on the swingable end of arm 120 and it may move toward and away from the shoe 35 in a slot 140 in table 31. Since the feed roll is biased toward the workhead 33 in accord with my in-

vention, I provide a bias arm 141 extending horizontally from the upper portion of the arm 120 and at an angle thereto as shown in Fig. 2. To the outstretched end of this biasing arm 141 I attach biasing spring 142 which is under tension adjustably determined by manual bias control device 143 with its handle 144. This device is identical in construction with manual stop control 145 with its handle 146, detailed construction of which is seen in Fig. 16. This stop control 145 has chain connection 147 to a boss 148 on the tubular support 121 so that the swing of arm 120 and the feed roll 32 is limited, at least sufficiently to prevent contact of feed roll 32 with belt 34. The operator also may use this stop control to determine the depth of "cut" when an abrading or sanding belt is being used.

Construction of the manual control devices 143 and 145 will be apparent from an examination of Fig. 16 where it will be seen that a flanged tubular housing 150 is secured by machine screws 151 to the front of box frame 30 into which the tubular portion of the device extends. A reciprocable, non-rotatable nut 152 is threaded internally to receive control screw 153 forming part of the handle 146, the screw being flanged at 154 to prevent reciprocation of the screw in the tube 152. Any form of key 155 may be used to prevent rotation of nut 152. Thus upon rotation of handle 146 the nut is reciprocated and the member fastened to it, as for instance chain 147, is pulled or relieved to the extent dictated by the relative threaded adjustment of nut 152 and screw 153.

It will be noted that because of the angular disposition of bias arm 141 with reference to the point of anchorage of spring 142 the bias of feed roll 32 toward the working head is substantially constant throughout the working range of swinging movement of the arm 120 and bias arm 141 about the pintle 119. Even though the spring is more greatly extended the pressure remains approximately the same since the moment arm is shortened in the more extreme position of bias arm 141.

Maintenance of proper frictional contact of the drive roll 32 against a work piece 38 is important in order to assure driving force to move the work piece contra to the direction of movement of belt 34. The rubber-like resilient ribs of the feed roll 32 must, therefore, be clean and I have found ordinary cleaning devices unequal to the requirements especially in view of the fact that the atmosphere adjacent the roll 32 and the working head is laden with dust resulting from the abrading or polishing work. My invention, therefore, includes a cleaner mechanism the principal working element for which is a cleaner roll 155 mounted upon a cleaner roll shaft 156 carried rotatably in a closed ball bearing assembly 157. This assembly is in turn carried by a swingable cleaner arm 158, the shape of which is shown most clearly in Fig. 11. A cleaner bracket 159 extending out from arm 120 supports a pin 160 about which the cleaner arm may swing, and a thumb screw at 161 with a spring bearing against the cleaner arm determines the position of the cleaner roll with reference to the feed roll. Multiple belts 162 apply rotative force for the rotation of the cleaner roll which spins quite rapidly as will be apparent from the relative size of the "pulley" on the cleaner roll as contrasted with the pulley on the feed roll (see Fig. 10).

The surface of the cleaner roll is a pile fabric and a rug-like material is best suited to the work.

I have found that the bristly pile of rug fabric will keep the ribs clean and no feed failure results from slippage between the ribs and the work piece while the cleaner roll 155 is in operation.

Work table adjustment

The belt 34 is usually much wider than the work pieces being fed through the throat 116, and the constant concentration of work upon the lower portions of the belt would soon destroy it either by wear or by stretching that portion of the belt. I therefore, mount the work table 31 upon screw jacks 170 as shown clearly in Fig. 15. Of course some work pieces, in the hands of a skilled operator can be fed through the throat without help from the table and may be directed into the throat at any lever thereabove, but heavy pieces are usually fed with one edge against the table.

At two spaced points upon the channel cross member 70 I provide tubular mounting reinforcements 171 each of which is shaped to receive mounting sleeves 172, at the lower end of which is a bracket 173. The interior of the sleeve 172 is shaped to slidably receive a post 174 which is actually an interiorly threaded nut mounted non-rotatably as a sliding element for the support of table 31. The screw 175 of this screw jack construction is carried by the bracket 173 in ball bearings as shown at 176 and the screw is provided at its lower end with a miter gear 177.

Each of the brackets 173 has a depending cross-shaft supporting bearing at 178 for cross-shaft 179 upon which are mounted miter pinions 180. Cross shaft 179 extends through the side wall of the box frame 30 and is provided with a hand crank 181 so that when the cross shaft 179 is rotated thereby the screws 175 within each screw jack assembly may cause the work table 31 to be raised or lowered as desired.

In order to distribute the wear and secure the greatest advantages of the full width of the belt 34 I use the work table adjusting mechanism above described so that, from time to time, the work pieces may be applied against an upper portion of the belt or at a mid-point rather than against the lower portions of the belt which might otherwise be constantly used.

For dust disposal I use the interior of the hood as a part of the dust disposal system. The hood 35 terminating forwardly at 185 (see Fig. 2) partially encloses the working head so that dust laden air adjacent the working head is drawn into the space beneath the hood. However, if dusty air passes beyond the opening through 185, it is disseminated in the direction in which the belt carries it, and I, therefore, provide an air funnel 186 beside the hood 136. It is to this hood construction 186 that I attach a conduit at 187 to withdraw the air from the hood and the box frame. A particular point where dusty material must be withdrawn is the zone about the pile fabric surface of the cleaner roll 155, therefore, at a convenient point in the periphery of this roll I provide a pick-up nozzle 188 and this nozzle is connected with the interior of the box frame 30 so that dust picked off of the pile fabric of the roll 155 is drawn into the box frame 30 and then moved from the box frame through the conduit 187.

Alternative construction

As shown in Figs. 19 and 20 some of the features of my invention have been incorporated in what might be termed a vertical machine. This is best suited to the type of work piece shown in Fig. 22 in which the grain of the surface of the

wood runs in the direction indicated in the drawings. Such a work piece presents special problems because of the large dimensions in which such work pieces often are fabricated, for instance in ply-wood for chair backs or chair seats. The vertical machine shown in these Figs. 19 and 20 is constructed with a box frame 200 having a fixed table-like top 201 apertured somewhat rearwardly of the center portion at 202 for the reception of a vertical column 203 flanged at 204 and secured to the table top in the position shown in Figs. 19 and 20 where it is braced by a bar strut 205 welded to the tube 203 and extending to the bottom 206 of the box frame with which it is welded construction. A second bar strut 207 likewise welded to the lower portion of the tube 203 extends downwardly from the tube sufficiently to provide a bearing support for lower pulley shaft 208. This pulley shaft extends through a bearing in strut 205 and is provided with motor driven pulleys 209 motivated by motor 210 and belts 211. Upon this shaft 208 is the lower pulley 212 for abrasive belt 213, which extends upwardly through the table 201 at spaced points 214 and 215 and is supported over upper belt pulley 216 carried by a heavy bracket 217 welded to the top of tube 203. Pulley 216 is directly supported from the bracket 217 upon upper pulley arm 218 pivoted to bracket 217 at 219. An air cylinder and ram assembly 220 comparable to the air cylinder and ram assembly 65 supports the pulley arm 218 so as to maintain proper tension upon the belt 213.

Mounted on the front face of the column 203 is a bracket 225 carrying horizontal shoe pivot 226 upon which is mounted shoe 227 comparable to shoe 85. Bracing screws 228 and 229 provide for adjustment and fixing of the position of the shoe 227 in oscillatory adjustment of the shoe about the pivot at 226.

In this construction the motor 210 drives the belt 213 with the front flight 230 moving in a downward direction as indicated by the arrow and it passes over the shoe 227 from a leading edge at 231 to the trailing edge 232 of the shoe which is equipped with a felt pad 233 and a graphited canvas anti-friction element 234 comparable to the web 93. This web extends from the lower or trailing end of the shoe 227 at 232 over the shoe surface and upwardly over a clamp 235 comparable to clamp 94 and over suitable pulley 236 to a drum 237 where a supply of this web in coiled condition is stored in readiness for use.

The feed roll 240 of this vertical machine is constructed in laminations and ribs comparable to the feed roll 32, but it has considerable vertical extent sufficient to be juxtaposed to the large shoe 227 shown in Figs. 19 and 20. It has a cleaner 241 comparable to cleaner 155 which is likewise provided with a pick-up nozzle 242 for dust to be passed through a conduit 243 and evacuated through conduit 244.

Thus the vertical machine shown in Figs. 19 and 20 provides a working throat 250 into which a work piece may be inserted so that in one "pass" the belt 213 may polish or abrade the surface of a large work piece with complicated contours, but in this vertical machine the feed roll feeds the work piece transversely of the path of movement of the belt 213.

The mounting of the feed roll 240 upon its vertical shaft 255 is comparable to the mounting of the feed roll 32 in that a bracket 256 extends outwardly from the box frame 200 and a pintle 257 carried by the bracket 256 is used to support

a feed roll arm 258. Bias to hold the feed roll and the feed roll arm 258 in a rearward direction and to press the feed roll against the work piece in the throat 250, is derived from a bias arm 259 and spring 260, comparable to the biasing means at 141, 142 as shown in Fig. 2. Stop connections comparable to those shown at 145-147 and 148 are connected at 261 and a power drive for the feed roll shown in general at 265 in Fig. 19 is comparable to the drive shown in Fig. 10 as will be readily seen upon examination of Fig. 19.

In preparation of my machine for operation a belt 34 of the desired characteristics for polishing, abrading or finishing is applied to the main power pulley 35 and is applied to the power head by placing it over pulleys 99 and 100, and the shoe 85 therebetween. At the same time that the belt is placed over the shoe and its pad 90, the web of graphited fabric 93 is inserted between the belt 34 and the pad. The contour rolls 105 and 106 are then adjusted by the use of the contour roll adjusting screws 113 and 114 so as to urge these rolls outwardly against the belt sufficiently to contour the path of travel of the belt to suit the requirements of the curvature of the particular work piece which is to be worked upon. If the work piece is sharply curved, the contour of the path of travel of the belt 34 over the shoe 85 must be upon a relatively small radius and the contour rolls 105 and 106 will only bear lightly if at all upon the inside of the belt. Under such circumstances the tension upon the belt induced by air pressure in the pneumatic belt tightener 65 will cause the lateral margins of the pad on shoe 85 to be compressed and thus reduce the radius of curvature of the belt at the point where it passes over the shoe. The motor 37 may then be started and the belt 34 will continuously operate in the direction indicated by the arrow.

If the belt tends to creep up or down on the shoe, the main drive pulley 35 may be adjusted on its wobble adjustment but pulleys 99 and 100 and the main drive pulley 35 are crowned, as shown clearly in the drawings so that the belt will tend to ride in proper position over them.

If it is desired that a greater area of the belt 34 at the working head 33 be applied to the work piece, the contour rolls 105 and 106 may be adjusted outwardly against the belt and when the belt is thus contoured the pressure upon the lateral margins of the shoe and its pad is relieved.

If the work piece to be worked upon is narrow, the table 31 may be used to adjust the table to the proper height to apply the work piece against the upper, middle or lower portion of the belt 34.

The throat 116 between the feed roll 32 and the working face of belt 34 is then adjusted to suit the particular thickness of work piece 38 which is to be fed therethrough. This adjustment is made manually by means of the handle 146 which may be used to pull upon or release chain 147. At the same time the bias of feed roll 32 toward the working head 33 may be adjusted manually by rotating handle 144 for change of tension of spring 142.

When motor 130 is started feed roll 32 will be rotated at the particular speed selected by the adjustment of the Ideal pulley 128. The direction of rotation of roll 32 is indicated by the arrow of Fig. 2 and the work piece is fed into the throat 116 as determined by the rotation of the direction of the feed roll, this being contra to the direction of travel of the belt 34. Because the ribs of rubber engage the side of the work piece opposite that which is to be abraded or polished

by the belt 34, the work piece is thrust through the throat progressively and finally takes a position shown at 38 in Fig. 2 when it is delivered from the throat 116.

Since the shape of the throat is dictated by the straight vertical surface of the feed roll and the straight surface of the shoe 85, the respective side surfaces of the work piece which has been worked upon by my machine are parallel or substantially parallel according to the adjustment of the shoe 85 under control of the shoe adjusting screws 87 and 88.

The experienced operator of my machine will readily determine the bias of feed roll 32 toward the work and will determine the depth of the "cut" by means of the stop chain 147 if the purpose of the operation is to abrade or sand the work piece.

I claim:

1. A working head for a device of the character described to guide the path of travel of an abrasive belt, said head having a central forwardly facing shoe covered with a resilient pad contoured approximately to said path of travel but sufficiently resilient for distortion under pressure of the abrasive belt, and a contour roll adjustably mounted to said head for adjustable positioning to a fixed location at one side of the shoe in contact with said belt whereby to accurately define said contour, said shoe having a working face provided with an anti-friction web and web supply for feed of said web across the face of the shoe under the belt, and a clamp between the web supply and the shoe to determine feed of increments of said web across said face.

2. In a finishing machine having a throat, a feed roll adapted to be positioned to restrict said throat and comprising a cylindrical surface providing alternate projecting lands of resilient material and grooves between said lands, in combination with a cleaner therefor, said cleaner including a roll having a surface in contact with the feed roll, said surface comprising a cut pile fabric.

3. In a finishing machine having a throat, a feed roll adapted to be positioned to restrict said throat and comprising a cylindrical surface providing alternate projecting lands of resilient material and grooves between said lands, in combination with a cleaner therefor, said cleaner including a roll having a surface in contact with the feed roll, said surface comprising a cut pile fabric, and a vacuum nozzle positioned to clean the pile fabric.

4. The combination with a polishing belt mounted for unidirectional motivated travel over the contoured surfaces of a working head, of a feed roll resiliently mounted to define a throat for the passage of a work piece between the feed roll and the belt, and power means connected to the feed roll whereby the surface of the feed roll adjacent said throat is moved in a direction opposite the direction of travel of the belt said surface comprising spaced projecting ribs of resilient rubber-like material.

5. The combination of claim 4 in further combination with power connections for rotation of the feed roll including means for speed control.

6. In a device of the character described, an abrasive belt mounted for belt movement continuously in one direction about a power drive pulley and a work head, a feed roll mounted for continuous movement in spaced relation to the belt whereby to provide a throat between said belt and said roll for passage of a work piece, means

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for rotating said feed roll in a direction to force the work piece through the throat contra to the direction of belt travel, said roll comprising spaced ribs of resilient rubber-like material, said ribs being aligned in the direction of belt travel and yieldable laterally thereto to grip the work-piece.

7. The device of claim 6 wherein the feed roll is positioned opposite the work head and said throat is therebetween.

8. The device of claim 6 wherein the feed roll is positioned opposite the work head and the work head comprises a shoe positioned to hold the abrasive belt in working relationship to the feed roll.

9. In a machine of the character described, having a working head and a power pulley with a belt extending about said head and said pulley, said working head being tiltable on an axis parallel to the direction of travel of the work, a shaft for said pulley provided with lockable wobble mounting connections whereby the pulley may be positioned in any one of a multiplicity of wobble positions, said wobble connections comprising means for adjustable inclining the axis on which the pulley rotates to correspond to the inclination of the working head.

10. In a machine of the character described having a working head and a power pulley with a working belt thereabout, a shaft for said power pulley having an adjustably fixed axis of rotation and bearing mountings for the pulley upon said shaft, one of said bearings having an eccentric mounting upon said shaft whereby to provide a multiplicity of selective wobble positions for the pulley to align said belt.

11. A work head for a machine of the character described, said work head having a T-shaped frame comprising a leg and wings, the leg of the T-frame being provided with a forwardly directed shoe, each of the wings of the T being provided with a pulley and a shaft secured to the leg of the T-frame rearwardly of the shoe and a pair of contour rolls each provided with a bearing bracket pivotally mounted upon said shaft for swinging adjustment with one of said contour rolls at either side of the shoe.

12. The working head of claim 11 having an adjusting screw extended through the T-frame in position to adjustably about the swinging mounting of said rolls whereby to positively force said roller forwardly.

13. In a device of the character described, the combination with an endless abrasive belt and a working head over which said belt is guided, said head comprising a shoe having a convex surface, of a movable contour guide and a mounting for said guide at one side of the shoe, said mounting comprising positive means for selectively positioning said guide in one position offset forwardly of a tangent drawn to the shoe at its edge margin whereby to lift the belt from said margin of the shoe, whereby said shoe and guide cooperate in defining the path of the belt over said shoe, and in another position in which the guide is offset rearwardly of said tangent whereby said belt is in contact with said margin of the shoe to receive support therefrom to define the path of the belt over the shoe, said shoe being provided with a clamp at its edge margin first encountered by the belt, a web impregnated with graphite releasably secured in said clamp and extending over said shoe, and a spool supply for

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said web whereby upon release of the clamp the web may be drawn from said spool to dispose a fresh portion of the web over the shoe.

14. In a device of the character described the combination with a working head, an abrasive belt guided for movement over said head, a feed roll spaced from said head to feed workpieces against said belt and a table on which said work-piece is supported during such feed, said head comprising a shoe and a mounting on which the shoe is tiltable respecting the surface of the table and the surface of the feed roll whereby to accommodate workpieces of different contour therebetween.

15. The device of claim 14 in which said working head further comprises a guide roller at the side of the shoe and a mounting on which the guide roller is adjustable to a plurality of fixed positions respecting the shoe whereby to bear against the belt and positively determine the angle of approach of the belt to the shoe and thereby selectively adjust the contour of the belt as it passes over the shoe.

16. The device of claim 14 in further combination with a belt pulley remote from the shoe, said pulley being provided with an axle and a mounting on which the axle is tiltable to the same inclination as the shoe.

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