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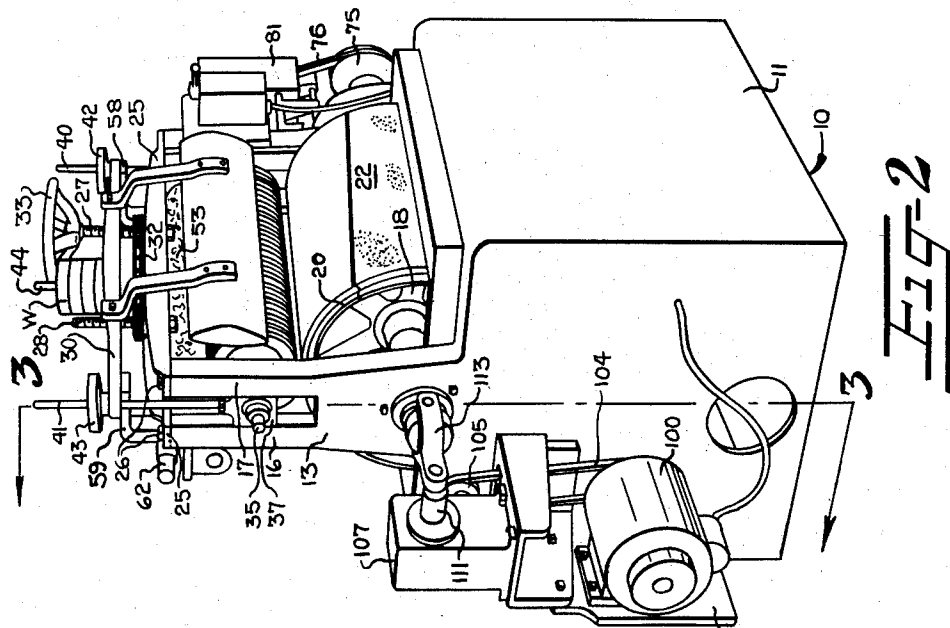
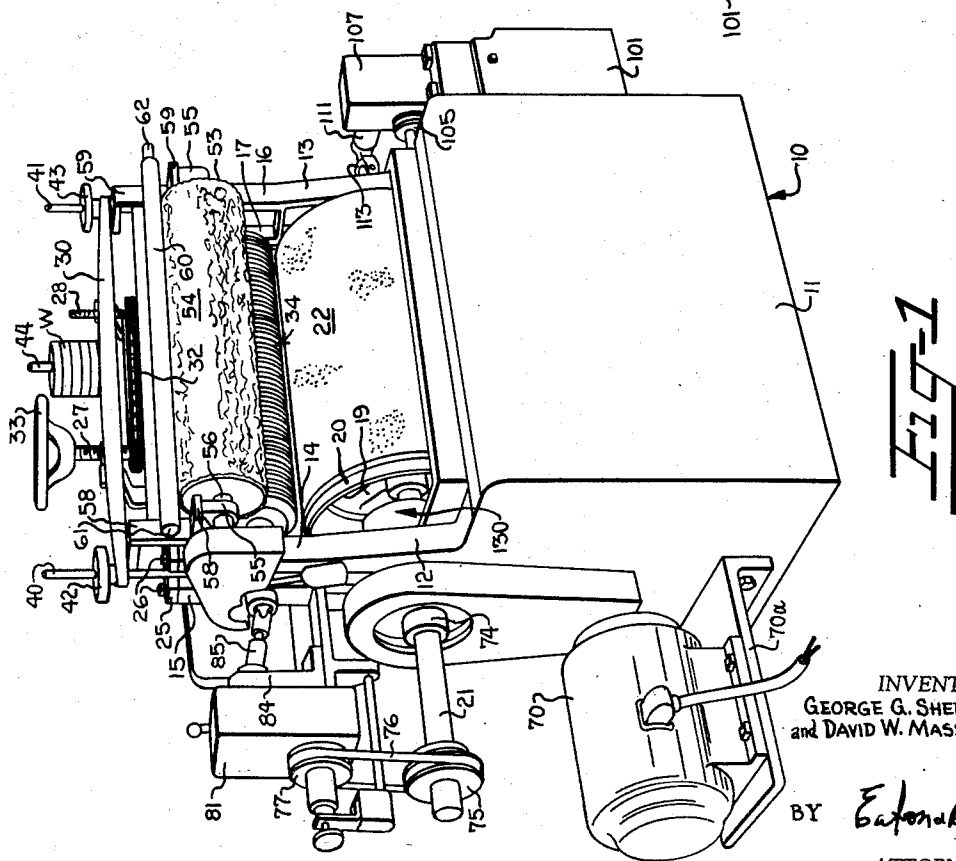
G. G. SHERRILL ET AL

2,699,016

ABRADING MACHINE

Filed Nov. 23, 1953

3 Sheets-Sheet 1



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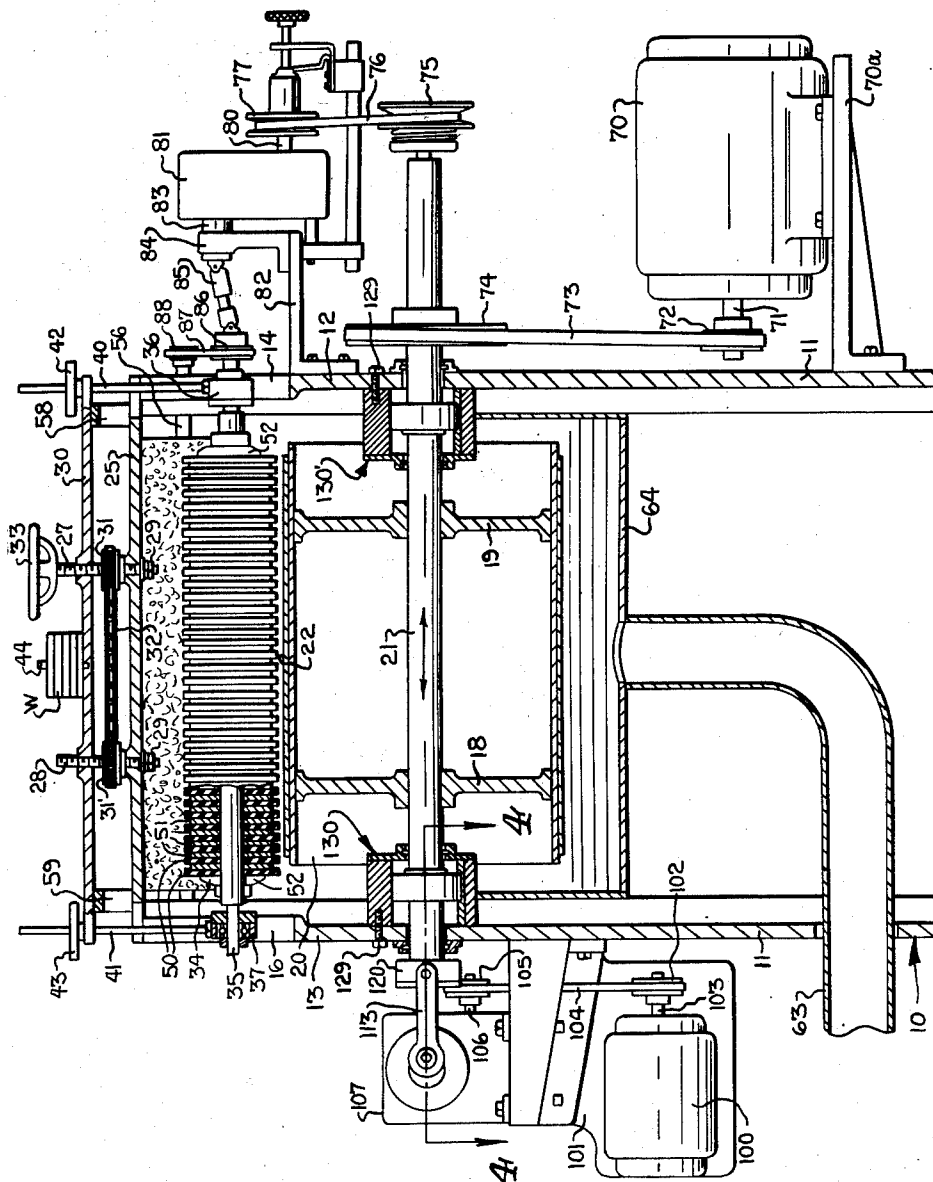
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3 Sheets-Sheet 2



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3 Sheets-Sheet 3

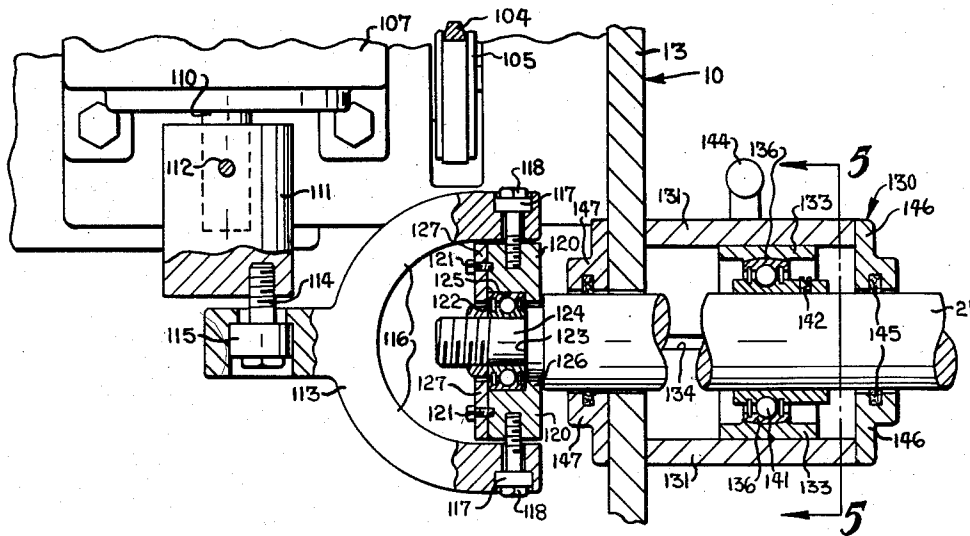


Fig-4

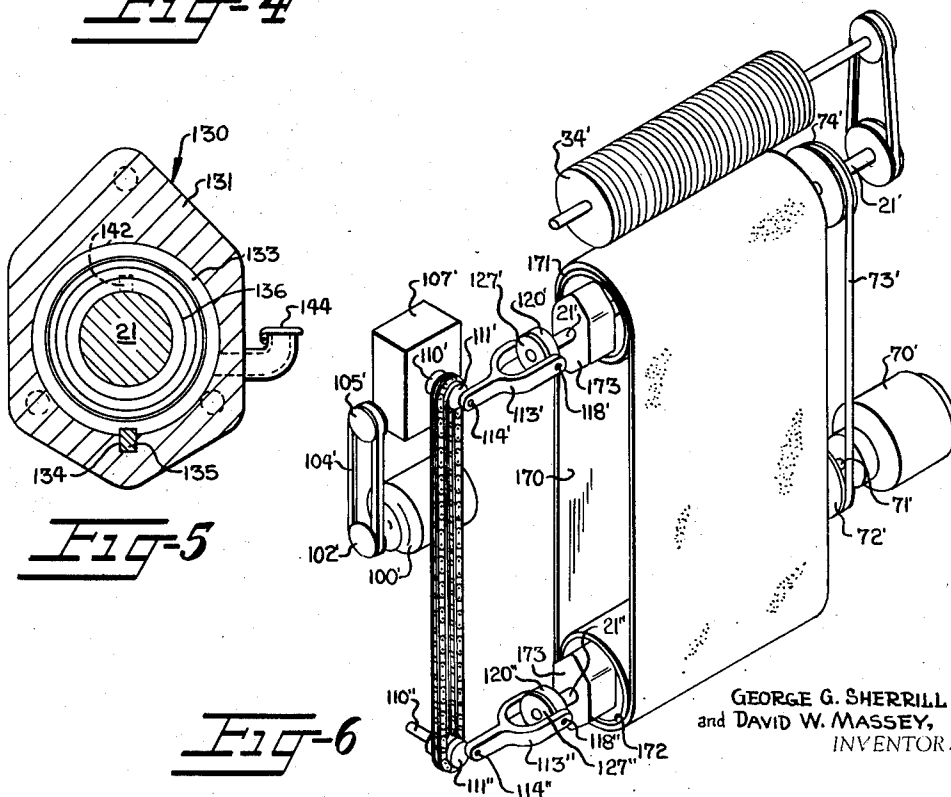


Fig-5

Fig-6

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1

2,699,016

ABRADING MACHINE

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Application November 23, 1953, Serial No. 393,722

5 Claims. (Cl. 51—39)

This invention relates to abrading machines for sanding wood, metal, composition materials and the like, and more particularly to an abrading machine having a rotatable abrading surface associated with a rotatable pinch or feed roll for holding a workpiece in engagement therewith and wherein means are provided for imparting reciprocatory movement to said abrading surface relative to the pinch roll. The invention is particularly adapted for sanding pieces of wood used in making furniture and will therefore generally be referred to as a sanding machine although it is to be understood that the invention is also applicable to various types of abrading machines.

It is an object of this invention to provide means for abrading wood, metal and the like wherein the abrading surface is so mounted as to have movement in two directions relative to the material being treated, and to this end there is provided a sanding or abrading roll adapted to simultaneously rotate and reciprocate relative to a pinch roll mounted in association therewith whereby the dual action of the sanding roll will more effectively abrade or polish material passed between the pinch roll and the sanding roll than has heretofore been possible.

It is another object of this invention to provide improved means for abrading irregular surfaces formed from any desired material such as steel or wood, said improved means comprising a pinch or feed roll formed from a plurality of circular resilient disks mounted on a shaft and spaced from each other by a plurality of spacing disks formed from any suitable material and said rubber disks being of substantially greater diameter than the spacing disks to provide an article engaging surface for directing an article through the machine during a sanding or polishing operation.

The pinch roll thus formed is mounted in spaced relation to a rotatable sanding roll and is movable relative to the sanding roll to accommodate articles of various configurations and means are provided for driving said pinch roll and said sanding roll in variable timed relation to each other, and means are also provided for imparting oscillating or reciprocatory longitudinal movement to said sanding roll relative to said pinch roll.

It is the primary object of this invention to provide means for reciprocating the sanding roll of a structure of the type described while at the same time imparting rotation to said roll whereby streaks and irregularities will not be formed in the article being sanded due to movement of the sanding roll in two directions during the sanding operation.

Some of the objects of the invention having been stated, other objects will appear as the description proceeds, when taken in connection with the accompanying drawings in which—

Figure 1 is an isometric view of the improved abrading machine looking at the front and one side thereof;

Figure 2 is an isometric view of the machine looking at the rear and opposite side from that shown in Figure 1;

Figure 3 is an enlarged vertical sectional view taken along the line 3—3 in Figure 2 with parts in elevation;

Figure 4 is an enlarged sectional plan view taken along the line 4—4 in Figure 3 and showing the reciprocating assembly in detail;

Figure 5 is a vertical sectional view taken along the line 5—5 in Figure 4;

Figure 6 is an isometric somewhat schematic view

2

showing a modified form of sander wherein a sanding belt is used in lieu of a sanding roll.

Referring more specifically to the drawings, the numeral 10 broadly designates the frame of an abrading machine which includes a substantially rectangular base portion 11 and vertical frame members 12 and 13 which extend upwardly in spaced parallel relation from the opposite sides of the base 11 and are preferably formed integral therewith. The upper end portions of the frame members 12 and 13 are bifurcated to form upwardly extending spaced parallel arms 14, 15 and 16, 17 respectively.

The top of the rectangular base 11 has an opening therein for the reception of the lower half of a sanding drum or roll 20, the other half of the drum 20 being disposed above the top of the base 11 and between the frame members 12 and 13, and said drum 20 being provided with a suitable abrasive surface 22, the ends of the abrasive surface extending through a suitable slot in the periphery of the drum and being secured on the inner surface of the drum in a conventional manner. Spiders 18 and 19 span the inner diameter of the drum 20 and are secured at their medial portions to a shaft 21 journaled adjacent its opposite ends in respective upright frame members 12 and 13 adjacent their junctures with the base portion 11.

Opposite bifurcated ends of a transverse frame member 25 are fixed to the arms 14, 15 and 16, 17 of the frame members 12 and 13 as by bolts 26. The frame member 25 is threadably penetrated adjacent opposite ends thereof by bolts 27 and 28 which extend upwardly therefrom and also threadably penetrate a transversely extending vertically movable supporting arm 30 spaced above said transverse frame member 25. The lower end portions of the bolts 27, 28 are secured to the under surface of the frame member 25 as by nuts 29, and the upper end of the bolt 27 is provided with a handle wheel 33 for imparting rotation to sprocket wheels 31 and 31' fixed to the medial portion of respective bolts 27, 28 between the frame member 25 and the supporting arm 30. A sprocket chain 32 extends between the sprocket wheels 31, 31' for imparting rotation of the bolt 27 to the bolt 28 whereby the supporting arm 30 may be moved upwardly or downwardly relative to the transverse frame member 25 as desired.

The supporting arm 30 supports a feed roll or pinch roll 34 in variable spaced relation above the sanding roll 20, said feed roll 34 being mounted on a shaft 35 suitably journaled adjacent its opposite ends in bearing blocks 36 and 37 disposed within the slots formed between the respective upper arms 14, 15 and 16, 17 of the vertical frame members 12 and 13, and said bearing blocks 36, 37 being supported by vertical suspension members 40 and 41 respectively which extend upwardly between the bifurcated end portions of the frame member 25 and loosely penetrate opposite ends of the supporting arm 30.

Stops 42 and 43 are fixed to the upper portions of the suspension members 40, 41 and are adapted to bear against the upper surface of the supporting arm 30 to support the feed roll 34 journaled in the bearing blocks 36 and 37. The members 40 and 41 extend upwardly beyond the stops 42 and 43 to provide suitable space for weights W, which may be suitably stored on top of the supporting arm 30 as by a stud or bolt 44 secured to the medial portion thereof.

It is evident that this arrangement permits the feed roll 34 to float and to be forced upwardly relative to the sanding roll 20 to permit the passage of irregularly-shaped articles there-between during a sanding operation. The amount of weight required to force the feed roll 34 upwardly may be varied by manipulation of the weights W in the manner heretofore described.

The feed roll or pinch roll 34 may be of any suitable construction but is preferably formed from a plurality of work engaging resilient disks 50 held in spaced relation to each other by alternate relatively small spacer disks 51, said resilient disks 50 and spacer disks 51 being suitably mounted on the shaft 35 and confined thereon by end plates 52.

A clearer roll 53 having a rough fabric covering 54 on

the periphery thereof is suspended, as by substantially Z-shaped brackets 58 and 59, from the support arm 30 in touching engagement with the feed or pinch roll 34, said clearer roll 53 being vertically movable with said feed roll and adapted to constantly clean the same. The clearer roll 53 is mounted on a rotatable shaft 56 journaled adjacent its opposite ends in bearing blocks 55 fixed to the lowermost surfaces of the brackets 58 and 59.

The brackets 58, 59 also support a longitudinally slotted suction pipe 60 disposed in touching engagement with the clearer roll 53. One end of the suction pipe 60 is closed as at 61 and the other end of the pipe has a reduced open end portion 62 to which suitable suction means, not shown, may be attached. An additional suction pipe 63 (Figure 3) is connected to a U-shaped trough 64 disposed immediately below the sanding roll 20 and to suitable suction means not shown for carrying away waste material from the sanding operation.

It should be noted that the support arm 30 carries the entire feed roll assembly which comprises the feed or pinch roll 34, the clearer roll 53 and the suction pipe 60, all of which are vertically movable together relative to the sanding roll 20 by manipulation of the handle 33. It should also be noted that the suspension members 40, 41 which loosely penetrate the support arm 30 permit only the feed roll 34 to move upwardly relative to the support arm 30 in response to a predetermined amount of upwardly directed pressure being exerted thereon by an irregularly-shaped or smooth article passed between the feed roll 34 and the sanding surface 22 mounted on the sanding roll 20, the clearer roll 53 and suction pipe 60 being fixed relative to the support arm 30 by the angular brackets 58, 59.

The sanding roll 20 and the feed roll 34 are rotated by a motor 70 mounted on a suitable bracket 70a and connected to a suitable source of electrical energy, not shown. The motor 70 has a shaft 71 extending therefrom on which a pulley 72 is fixed, and an endless belt 73 extends about the pulley 72 and also about a pulley 74 fixed on the shaft 21 adjacent the outer surface of the vertical frame member 12. A variable speed pulley 75 is fixed to the shaft 21 adjacent the pulley 74 and is engaged by an endless belt 76 which also engages another variable speed pulley 77 fixed on a shaft 80 extending from one side of a gear box 81 secured to the outer surface of the vertical frame member 12 in substantial axial alignment with the feed roll 34 as by a bracket 82.

The opposite side of the gear box 81 has another shaft 83 extending therefrom, the medial portion of which is journaled in a bearing block 84 supported by the bracket 82. One end of a universal joint 85 is pivotally connected to the end of the shaft 83 remote from the gear box 81, and the other end of the universal joint 85 is connected to the feed roll shaft 35 adjacent the outer surfaces of the arms 14, 15. A pulley 86 is fixed to the shaft 35 adjacent the universal joint 85 and an endless belt 87 extends about the pulley 86 and also about a pulley 88 fixed on the clearer roll shaft 56 adjacent the outer surface of the bearing block 54.

The provision of the universal joint 85 permits limited vertical movement of the entire feed roll assembly relative to the sanding roll 20.

It is thus seen that the sanding roll 20, the feed roll 34 and the clearer roll 56 are all interconnected and adapted to be rotated in variable timed relation by the motor 70.

In order to more effectively abrade or sand and polish a given piece of material such as wood or steel, means are provided for furnishing reciprocatory or oscillatory movement to the sanding roll 20 relative to the feed or pinch roll 34 simultaneously with the revolving of the sanding roll 20. The advantages of imparting two-way movement to the sanding roll relative to the feed roll or material being processed are apparent in that streaks are eliminated in the material being processed and more efficient sanding and polishing may be accomplished in the same or less time than has heretofore been possible in sanding machines wherein the sanding roll merely rotates relative to the material being processed.

Reciprocatory lateral movement is imparted to the sanding roll 20 relative to the feed or pinch roll 34 by a motor 100 connected to a source of electrical energy, not shown, and mounted on a bracket 101 suitably secured to the side of the rectangular base portion 11 remote from the motor 70. A pulley 102 is fixed on a

shaft 103 of the motor 100 and an endless belt 104 extends about the pulley 102 and also about a pulley 105 fixed on a shaft 106 of a gear box 107. A shaft 110 (Figure 4) extends from the gear box 107, preferably in right angular relation to the axis of the sanding roll shaft 21 and an eccentric or hub 111 is fixed on the shaft 110 as by a set screw 112.

Shafts 106 and 110 are drivingly connected within the gear box 107. One end of a yoke 113 is eccentrically connected to the hub 111 as by a screw 114 which loosely penetrates a bearing 115 rotatably mounted in said one end of the yoke 113 and threadably engages the hub 111 adjacent one edge thereof. The other end of the yoke 113 has arms 116 which are pivotally connected as by screws 118 to a bearing block 120 mounted on a reduced outer portion 124 of the sanding roll shaft 21. The screws 118 loosely penetrate bearings 117 rotatably mounted adjacent the outer ends of the arms 116 and threadably engage the bearing block 120.

The inner surface of the bearing block 120 has an annular groove 125 therein which communicates with the end thereof remote from the sanding roll 20, said groove defining a shoulder 126 integral with the bearing block 120. The outer race of a ball bearing assembly 122 is secured in the annular groove 125 as by a pressed fit and held in engagement with the shoulder 126 by an end plate 127 secured to the outer end of the bearing block 120 as by screws 121. The inner race of the ball bearing assembly 122 is fixed on the reduced portion 124 of the shaft 21 and held in engagement with a shoulder 123 thereon as by a nut 128 threaded on the end of the reduced portion 124 of the shaft 21, it being understood that the shoulders 123 and 126 are radially aligned to form a seat for the ball bearing assembly 122.

The assembly thus described is adapted to furnish reciprocatory movement to the shaft 21 and the sanding roll 20 mounted thereon upon energization of the motor 100, and in order to permit such reciprocatory movement of the shaft 21 simultaneously with rotational movement thereof in response to activation of the motor 70 and the shaft 21 is journaled in piston-type bearing blocks or rotary shaft seals 130 and 130' each comprising a housing 131 and 131' fixed to respective upright frame members 12 and 13 as by bolts 129. The bearing blocks 130 and 130' are identical but opposite hand, and therefore only the bearing block 130 which is shown in detail in Figure 4 will be described in detail.

The bearing block 130 is provided with a bore 132 which extends in axial alignment with the shaft 21 and in which a sleeve or piston 133 is slidably mounted. The inner surface of the housing 131 is provided with an axially extending keyway 134 for the reception of a key 135 keyed to the sleeve 133. The inner peripheral surface of the sleeve 133 has a concave groove 136 extending thereabout to form a seat for the reception of the outer race of a self-aligning ball bearing assembly 141 which has an elongated inner race secured to the shaft 21 as by a set screw 142.

An oil cup 144 is secured to one side of the housing 131 in communication with the interior of the bearing block 130 to permit lubrication for the self-aligning bearing 141, and suitable annular oil rings 145 are provided in suitable annular flanges 146 and 147 suitably secured to opposite ends of the housing 131 for closing the same, it being noted that the shaft 21 extends loosely through the frame member 13 to the outer surface of which the annular flange 147 is suitably secured.

The keys 135 and 135' prevent relative rotational movement between the sleeves 133, 133' and the shaft 21, and the self-aligning bearing 141 permits both the shaft 21 and the sleeves 133, 133' to reciprocate within the bearing blocks 130, 130' in response to movement of the eccentrically mounted yoke 113, the bearing blocks 130, 131' being of sufficient length to permit a full stroke.

Referring now to Figure 6, there will be observed a modified form of the invention wherein an abrasive or sanding belt 170 is used in place of the sanding roll 20. The sanding belt 170 is associated with a structure substantially the same as that heretofore described and extends between two rolls 171 and 172, each of which is of substantially smaller diameter than the sanding roll 20 utilized in the form of the invention previously described. The rolls 171 and 172 are mounted on shafts 21' and 21'', opposite ends of which are mounted in

bearing blocks 173. The bearing blocks 173 are identical in construction with the bearing block 130 heretofore described and a further description thereof is deemed unnecessary. Likewise, the corresponding ends of the shafts 21' and 21'' have yokes 113' and 113'' connected thereto in a manner identical with that in which the yoke 113 is connected to the end of the shaft 21 said yokes also being eccentrically connected at their opposite ends to hub or eccentric members 111' and 111''. The hubs 111', 111'' are mounted on shafts 110' and 110'', respectively, the shaft 110' extending from a gear box 107' to which power is conveyed by an electric motor 100' by means of pulleys 102' and 105' interconnected by a V-belt 104'. The shaft 110'' is an idler shaft and sprocket wheels 174, 175 are fixed on the hubs 111', 111'' and are engaged by a sprocket chain 175 to cause both hubs 111' and 111'' to rotate in unison.

This modified form of the invention is adapted to be disposed within a rectangular base frame 11' in a manner similar to that heretofore described for the first form of the invention, and it is to be understood that a feed roll 34' together with the entire feed roll assembly heretofore described in connection with the first form of the invention, but not shown in connection with the modified form, is also associated with the sanding belt 170.

The shaft 21' and the feed roll 34' are rotated by power transmitted from a motor 70' through belts 73' and 76'.

It is thus seen that improved means are provided in both forms of the invention for imparting two-way movement to the sanding surface relative to the feed roll of a sanding machine in order to more effectively finish the surface of a given piece of material fed through the machine.

It is also apparent that the provision of the feed roll 34 permits irregularly-shaped pieces of material to be sanded and processed by furnishing a positive and secure grip upon the same at all times as such material is fed through the machine.

In the drawings and specification there has been set forth a preferred embodiment of the invention and although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation, the scope of the invention being set forth in the appended claims.

We claim:

1. An abrading and polishing machine comprising a frame, a shaft journaled in said frame, a rotatable abrasive surface fixed on said shaft, a rotatably mounted resilient pinch roll for guiding articles of various sizes and shapes into contact with said abrasive surface, means for driving said abrasive surface and said pinch roll, means for varying the speed of said pinch roll relative to said abrasive surface, means for reciprocating the shaft having the abrasive surface fixed thereon longitudinally of its axis relative to the pinch roll, said last named means comprising said shaft having a threaded reduced end portion, a bearing mounted on said end portion, said bearing having an annular peripheral groove in the inner surface thereof, a ball bearing assembly mounted in said groove and on said reduced end portion of the shaft and confined against longitudinal movement relative to said shaft, a yoke pivotally connected to said bearing, and driving means for reciprocating said yoke, said bearing and said shaft.

2. An abrading and polishing machine comprising a frame, a shaft journaled in said frame, a rotatable abrasive surface fixed on said shaft, a rotatably mounted resilient pinch roll for guiding articles of various sizes and shapes into contact with said abrasive surface, means for driving said abrasive surface and said pinch roll, means for varying the speed of said pinch roll relative to said abrasive surface, means for reciprocating the shaft having the abrasive surface fixed thereon longitudinally of its axis relative to the pinch roll, said last named means comprising said shaft having a threaded reduced end portion, a bearing mounted on said end portion, said bearing having an annular peripheral groove in the inner surface thereof defining a shoulder, a ball bearing assembly mounted in said groove and on said reduced end portion of the shaft, an end plate secured to the end of said bearing for holding the outer race of the ball bearing assembly in engagement with said shoulder and a nut mounted on said reduced portion to fix the bearing against the shaft for preventing longitudinal

movement of the bearing relative to the shaft, a yoke pivotally connected to said bearing, and driving means for reciprocating said yoke, said bearing and said shaft.

3. An abrading and polishing machine comprising a frame, a shaft journaled in said frame, a rotatable abrasive surface fixed on said shaft, a rotatably mounted resilient pinch roll for guiding articles of various sizes and shapes into contact with said abrasive surface, means for driving said abrasive surface and said pinch roll, means for varying the speed of said pinch roll relative to said abrasive surface, means for reciprocating the shaft having the abrasive surface fixed thereon longitudinally of its axis relative to the pinch roll, said last named means comprising said shaft having a threaded reduced end portion, a driven eccentric carried by said frame adjacent said reduced portion of the shaft, a bearing mounted on said end portion, said bearing comprising a housing having an annular peripheral groove in the inner surface thereof defining a shoulder, a ball bearing assembly mounted in said groove and on said reduced end portion of the shaft, an end plate secured to the end of said bearing for holding the outer race of the ball bearing assembly in engagement with said shoulder, a nut mounted on said threaded reduced portion to hold the inner race of the bearing against the shaft, said end plate and said nut serving to prevent longitudinal movement of the bearing relative to the shaft, and a yoke pivotally connected to said bearing housing and to said driven eccentric.

4. An abrading and polishing machine comprising a frame, rotary shaft seals supported by said frame adjacent opposite sides thereof, a shaft journaled adjacent its opposite ends in said rotary shaft seals, a rotatable abrasive surface fixed on said shaft, a rotatable resilient pinch roll, a clearer roll, suction means adjacent said abrasive surface and said clearer roll for cleaning the same, a source of power, a plurality of transmission belts extending from said source of power to said shaft having the abrasive surface fixed thereon and to said pinch roll and said clearer roll for imparting rotational movement to said rolls and said shaft, means for reciprocating the shaft simultaneously with rotation thereof within said rotary shaft seals comprising a driven eccentric carried by said frame adjacent one end of said shaft, a bearing mounted on said one end of the shaft and confined against longitudinal movement relative to said shaft, a yoke pivotally connected to said bearing and to said eccentric to reciprocate said shaft within said rotary shaft seals upon rotation of said eccentric, each of said rotary shaft seals having a housing with a longitudinally extending bore therethrough, sleeves slidably mounted in said bores and keyed in said housings to permit longitudinal movement relative to said housings and relative rotational movement between the sleeves and the shaft, a self-aligning ball bearing assembly mounted in each of said rotary shaft seals, the inner races of said ball bearing assemblies being fixed to the shaft to prevent relative rotational movement therebetween and the outer races of the ball bearing assemblies being mounted in the inner peripheries of the sleeves, means for lubricating the bearings, and annular flanges having oil seals therein secured to opposite ends of the housings for closing the bores.

5. An abrading and polishing machine comprising a frame, rotary shaft seals supported by said frame adjacent opposite sides thereof, a shaft journaled adjacent its opposite ends in said rotary shaft seals, a rotatable abrasive surface fixed on said shaft, a rotatable resilient pinch roll, means for reciprocating the shaft simultaneously with rotation thereof within said rotary shaft seals comprising a driven eccentric carried by said frame adjacent one end of said shaft, said one end of the shaft having a reduced portion, a bearing mounted on said reduced portion, said bearing comprising a housing having an annular peripheral groove in the inner surface thereof defining a shoulder, a ball bearing assembly mounted in said groove and on said reduced end portion of the shaft, an end plate secured to the end of said bearing for holding the outer race of the ball bearing assembly in engagement with said shoulders, a nut mounted on said threaded reduced portion to hold the inner race of the bearing against the shaft, said end plate and said nut serving to prevent longitudinal movement of the bearing relative to the shaft, a yoke pivotally connected to said bearing housing and to said eccentric to reciprocate said shaft within said rotary shaft seals upon rotation

7

of said eccentric, each of said rotary shaft seals having a housing with a longitudinally extending bore there-through, sleeves slidably mounted in said bores and keyed in said housings to permit longitudinal movement relative to said housings and relative rotational movement between the sleeves and the shaft, a self-aligning ball bearing assembly mounted in each of said rotary shaft seals, the inner races of said self-aligning ball bearing assemblies being fixed to the shaft to prevent relative rotational movement therebetween and the outer races of the self-aligning ball bearing assemblies being mounted in the inner peripheries of the sleeves, means for lubricating the moving parts of the rotary shaft seals, and

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10

8

annular flanges having oil seals therein secured to opposite ends of the housings for closing the bores.

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