April 30, 1963 W. C. BURT 3,087,282

SURFACE FINISHING MACHINE

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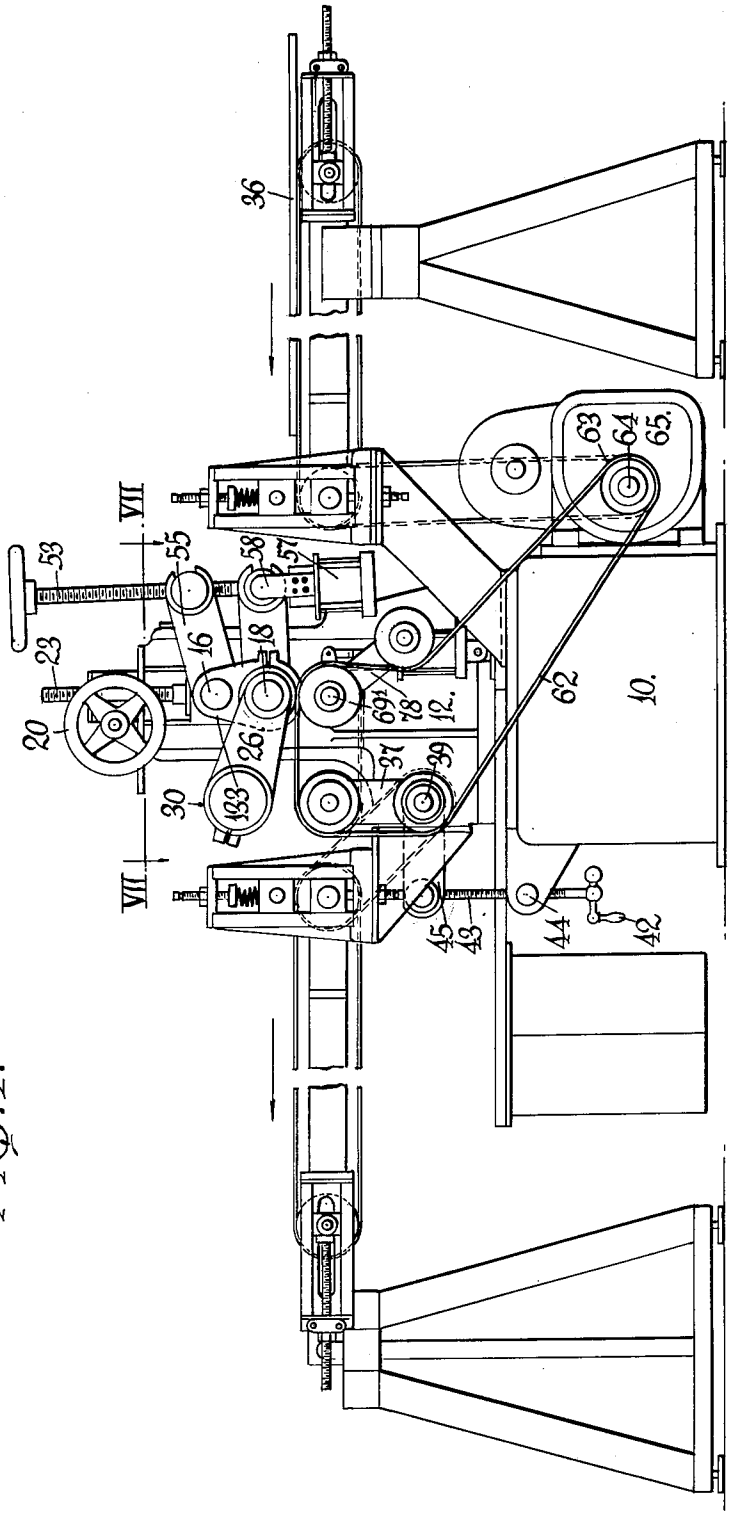


FIG. 1.

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SURFACE FINISHING MACHINE

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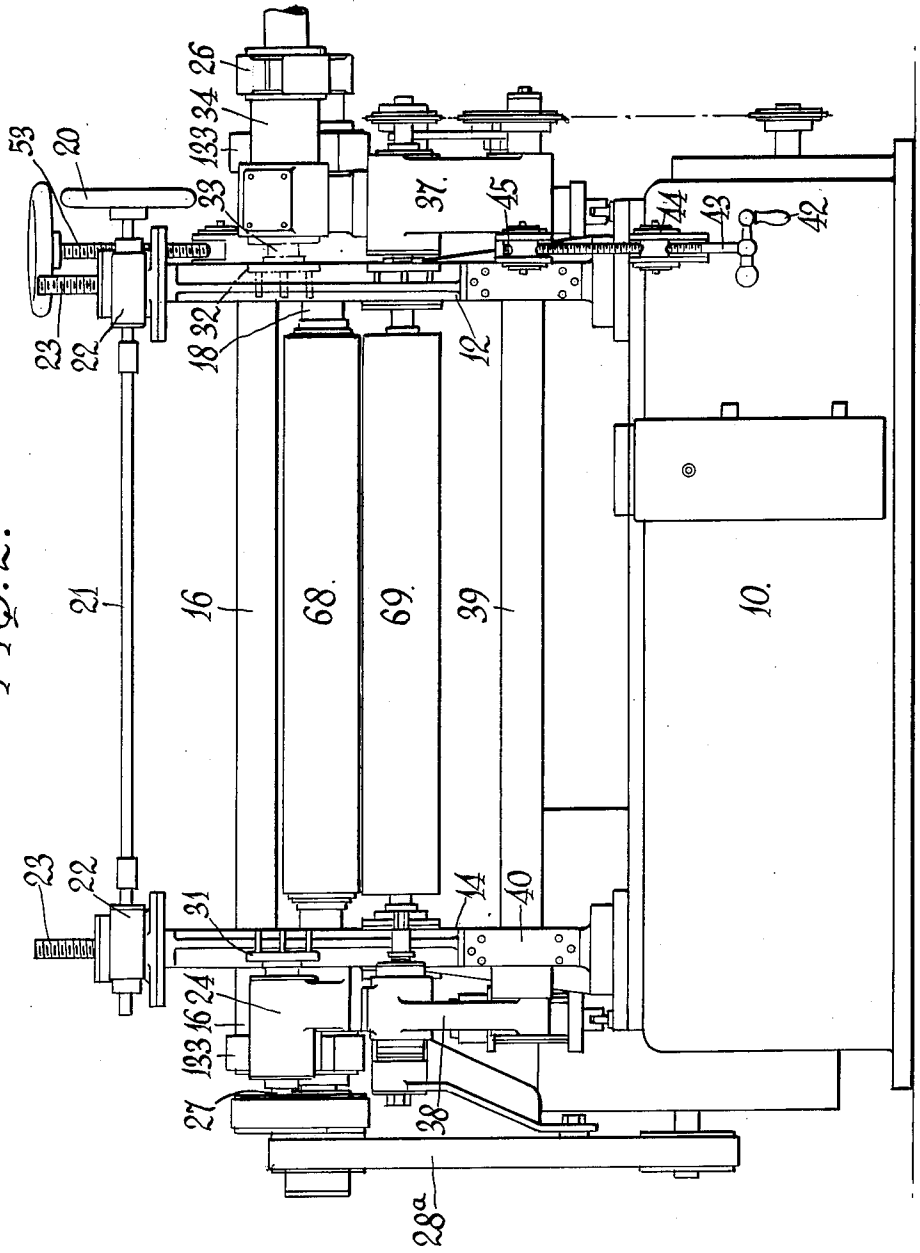


Fig. 2.

INVENTOR
William C. Burt,

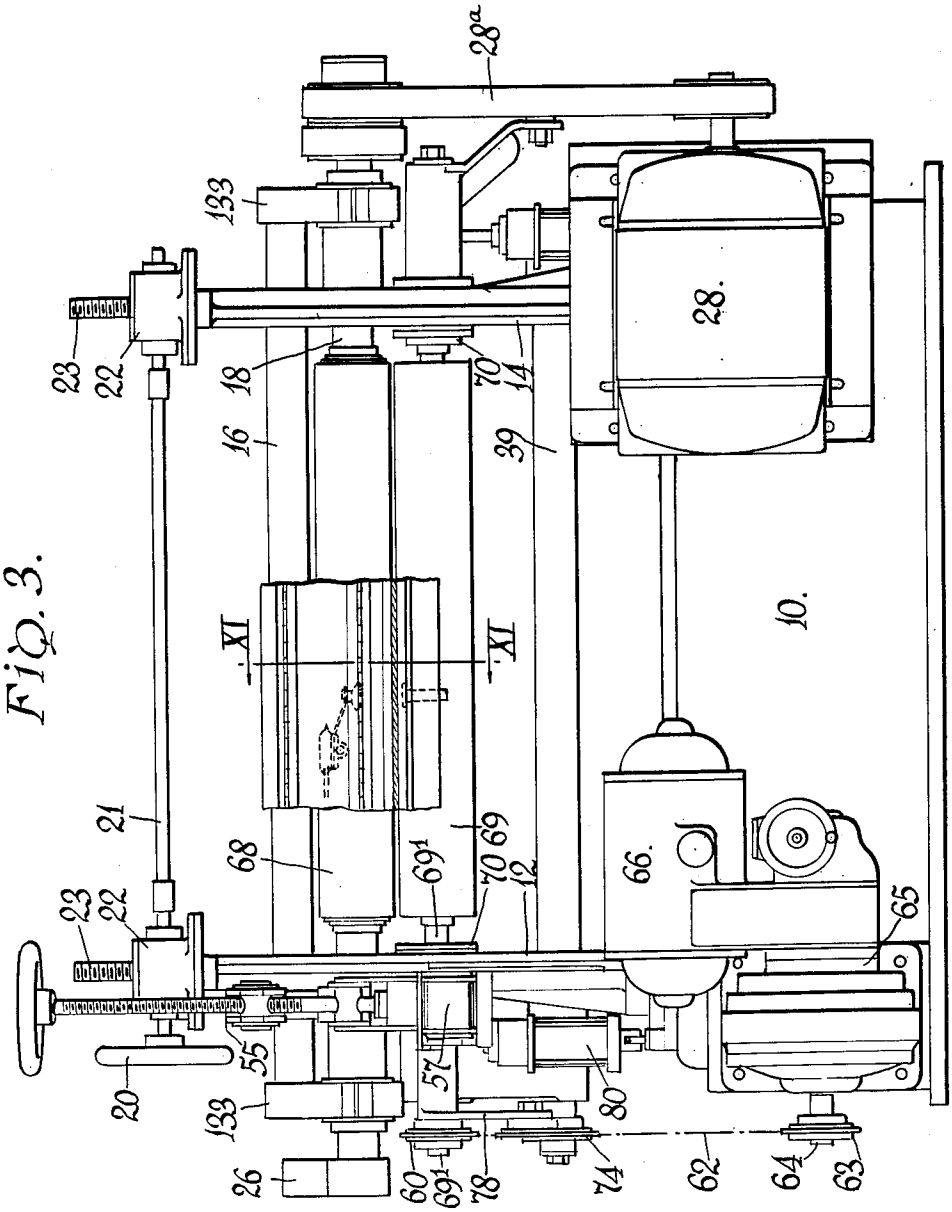
BY: Beau, Brooks, Buckley & Beau,
ATTORNEYS.

April 30, 1963 W. C. BURT 3,087,282

SURFACE FINISHING MACHINE

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Fig. 3.



INVENTOR
William C. Burt,

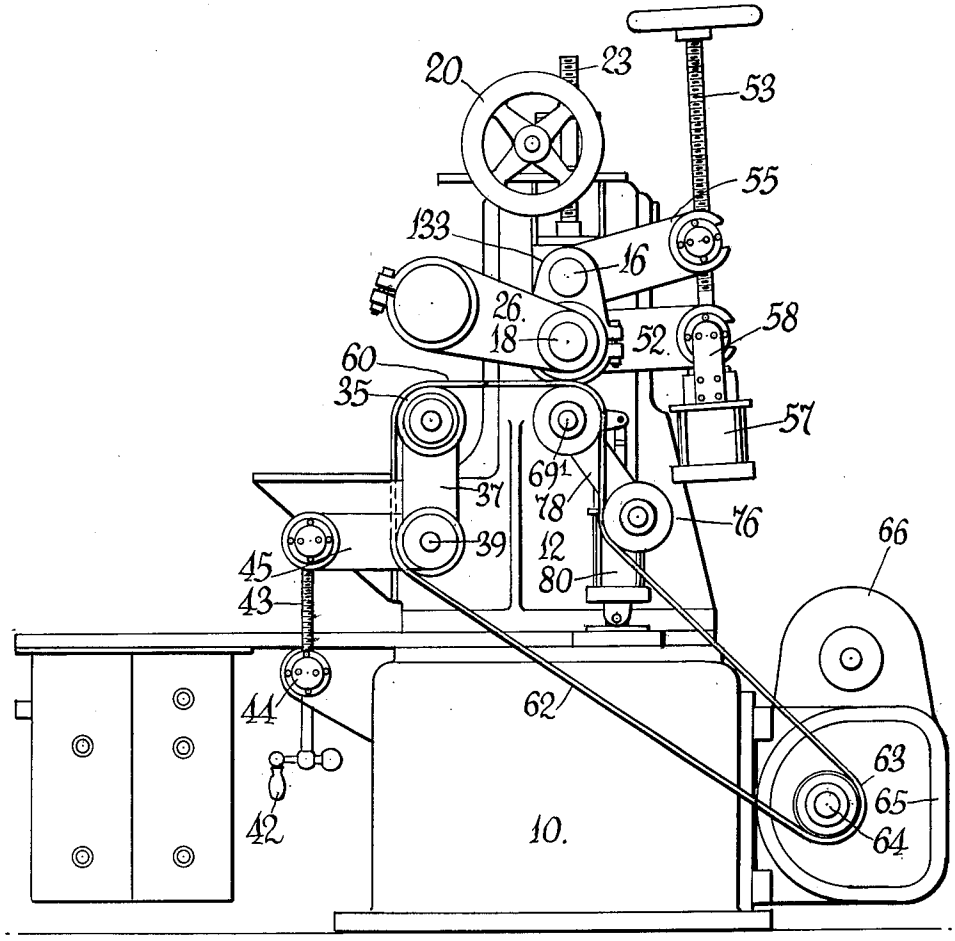
BY: Beau, Brooks, Buckley & Beau,
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SURFACE FINISHING MACHINE

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Fig. 4.



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FIG. 6.

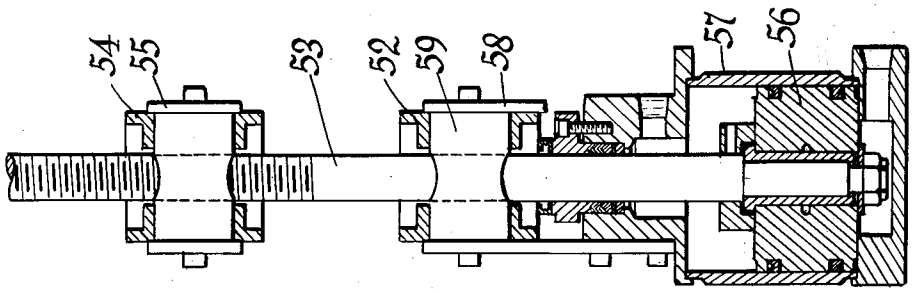
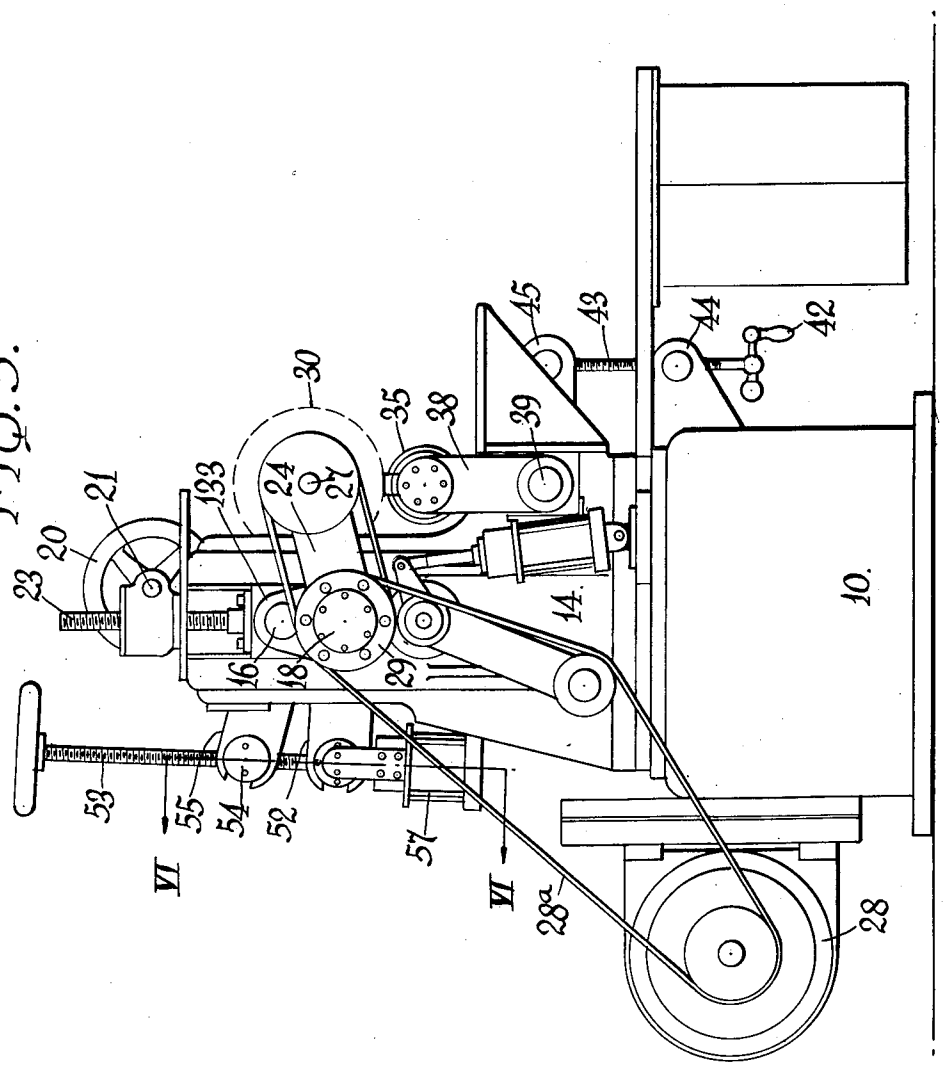


FIG. 5.

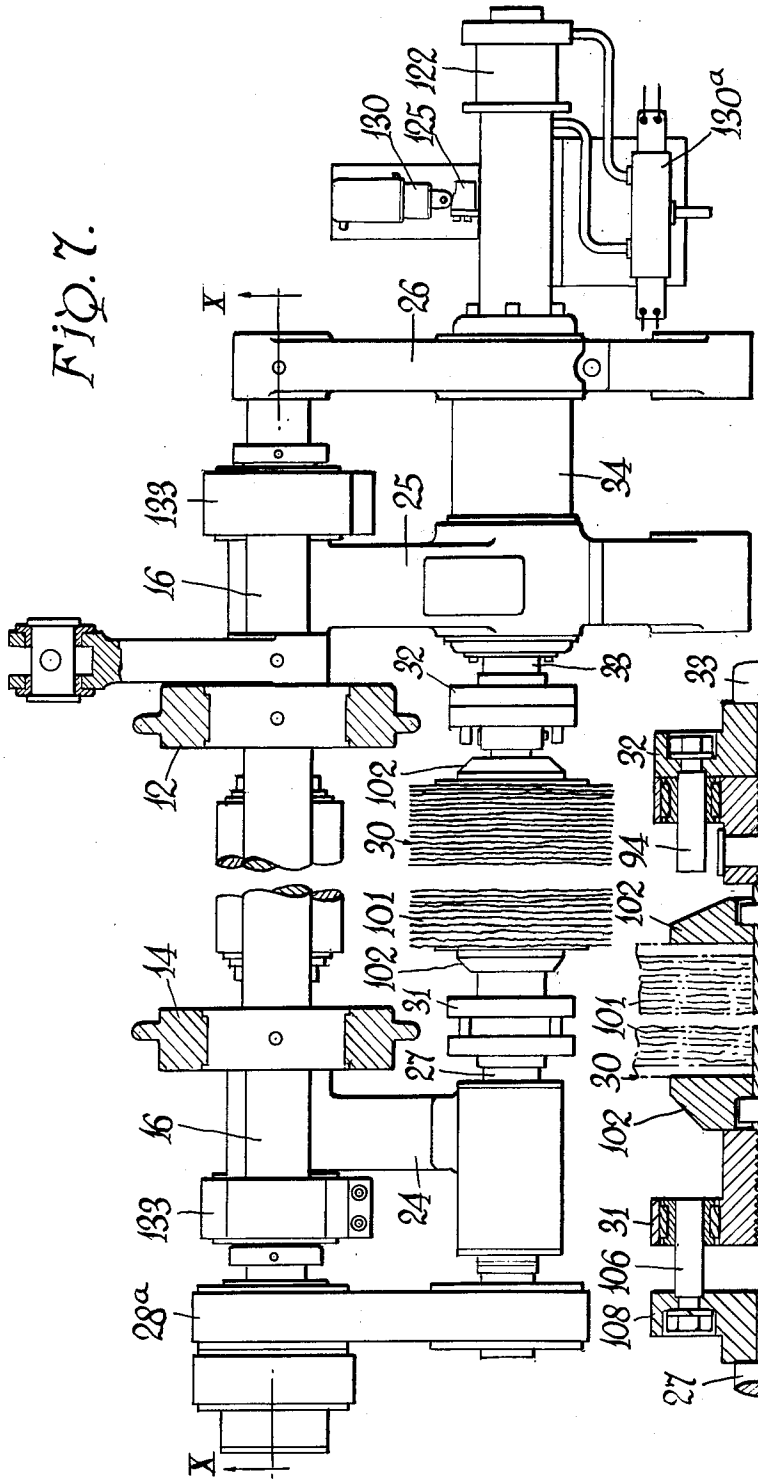


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SURFACE FINISHING MACHINE

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Fig. 7.



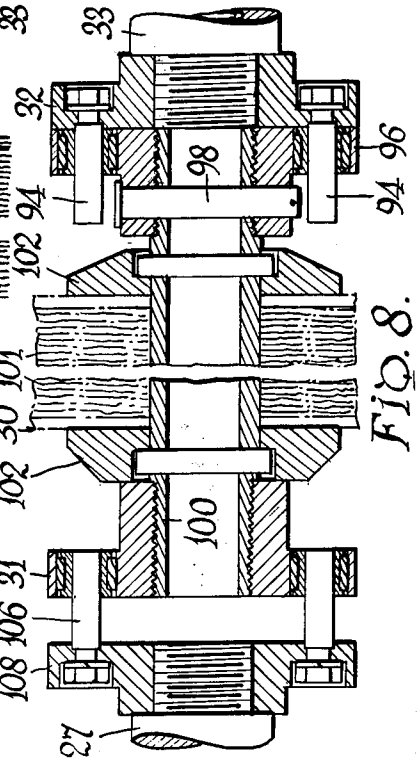


Fig. 8.

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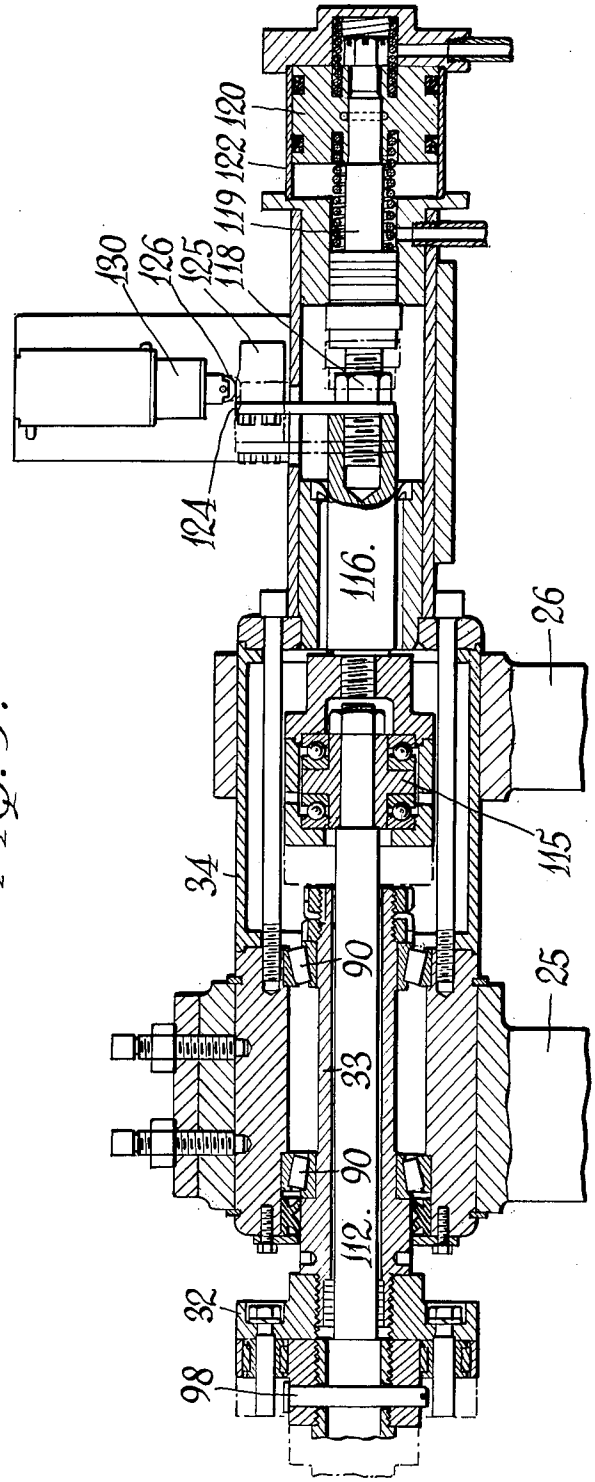


Fig. 9.

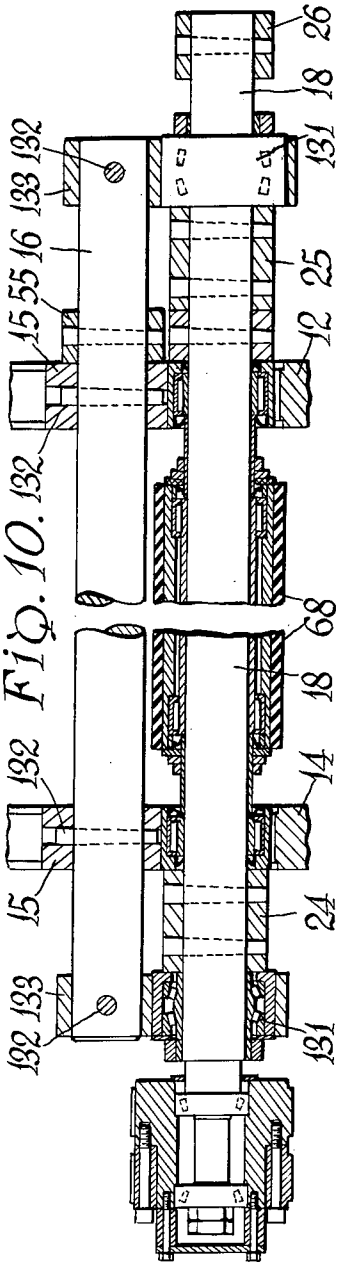


Fig. 10.

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Fig. 11.

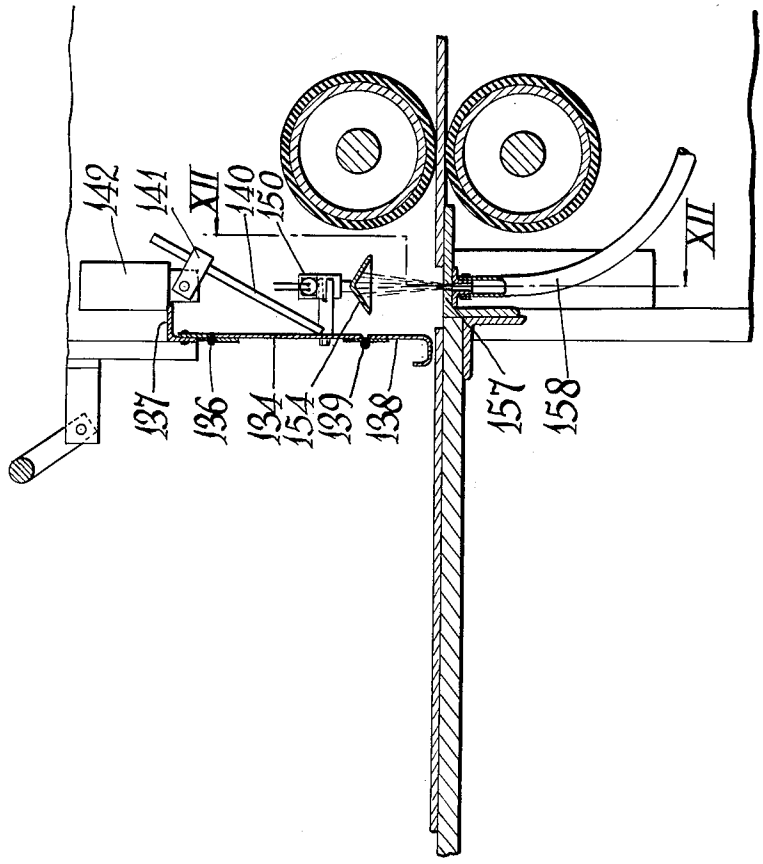
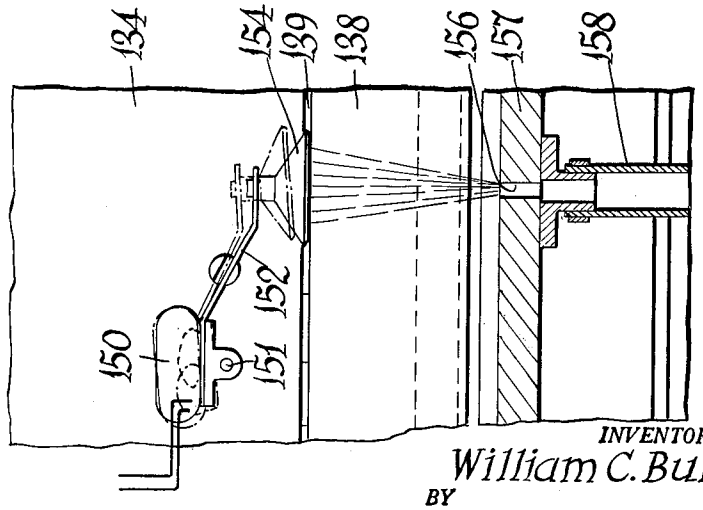


Fig. 12.



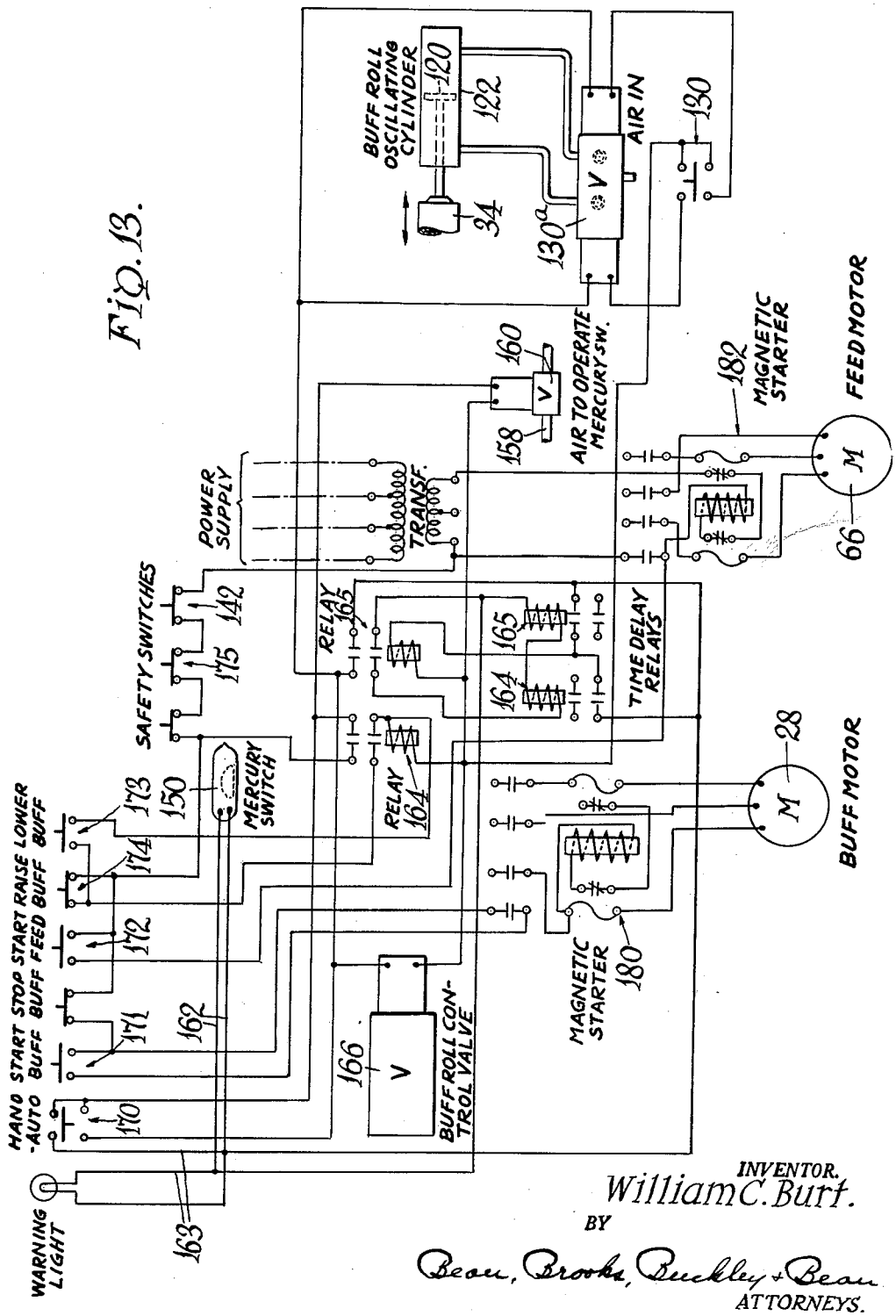
INVENTOR.
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April 30, 1963 W. C. BURT 3,087,282

SURFACE FINISHING MACHINE

Filed Feb. 7, 1961 9 Sheets-Sheet 9

FIG. 13.



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United States Patent Office 3,087,282 Patented Apr. 30, 1963

3,087,282

SURFACE FINISHING MACHINE

William C. Burt, Olean, N.Y., assignor to Clair Manufacturing Co., Inc., Olean, N.Y.

Filed Feb. 7, 1961, Ser. No. 87,558
21 Claims. (Cl. 51—39)

This invention relates to surface finishing machines, and more particularly to improvements in such machines of the type that are especially adapted to grind, bore, clean, abrade, rough, brush, polish, glaze, buff or otherwise finish a sheet, plate, strip, coil or any other type stock pieces.

It is of primary concern in connection with the present invention to provide improvements in machines of the character described above in which the mechanism is characterized by its simplicity and ruggedness and wherein the component parts of the mechanism are so constructed, and arranged relative to each other as to reduce the requisite number of parts to a minimum, thereby obviating much of the complexity of machines of this type, while at the same time providing for efficient and speedy operation and without in any way detracting from the efficiency of the machine.

Of primary concern in connection with the present invention is the provision of a compact machine incorporating in its main frame a single pair of pedestals which support various shaft and shaft components all interrelated in such fashion as to efficiently accommodate the surface finishing of stock operated upon by the machine.

Another object of this invention resides in the provision of a series of cooperatively related shafts which serve as mounting means for the various component parts of the machine whereby such components are efficiently and compactly arranged for the purposes intended.

Another object of this invention is to provide a machine of the character described which includes a fixed position pinch roll and, cooperable therewith, a vertically adjustable pinch roll for effecting the feeding of stock through the machine and in which the vertically movable pinch roll serves as a mounting means for a processing roll rockable about the axis of the adjustable pinch roll in coordination with movement of the stock through the machine so that the processing roll engages and disengages the work in such fashion as to avoid damage thereto, as for example, to the leading and trailing edges thereof.

Another object of the present invention resides in the specific provision of means for stiffening and rigidifying the vertically adjustable pinch roll assembly and to provide rigid support means for the processing roll in such wise that damage to the stock may not readily occur due to distortions of the mounting means for these components and while, at the same time, obviating the necessity for excessively massive structures which would otherwise be required to obtain requisite comparable rigidity.

A further object of this invention resides in the combination of component parts wherein the processing roll of the machine is readily accessible for interchangeability and wherein the same is removed from direct mounting on the main frame of the machine so as to provide for such accessibility and also providing in its construction for the incorporation of reciprocating means compactly arranged and efficiently connected with the processing roll so as to achieve the desired results.

It is another object of the invention to provide a machine as aforesaid which is of improved versatility in that it can be readily arranged to finish relatively wide strip or sheet stock pieces.

Another object of the invention is to provide a machine as aforesaid which is adapted to operate with improved

facility to finish flat stock sheets or strips from the leading edges to trailing edges thereof while avoiding undesirable pick up and/or bending of the trailing edge portions of the stock pieces.

It is an object of the present invention to provide in a machine as aforesaid an improved buff roll and pinch-roll support arrangement.

Another object of the invention is to provide a machine as aforesaid which incorporates improved automatic control arrangements insuring optimum speed and efficiency of the machine operation as well as maximum safety for attendant personnel.

More specifically, it is another object of the invention to provide in a machine as aforesaid an improved support bearing system for the pinch and work rolls whereby deflections and misalignments thereof are minimized, and which is relatively simple and rugged in construction.

Other objects and advantages of the invention will appear in the specification hereinafter.

By way of illustration of one example of the present invention, a machine embodying the features thereof is illustrated in the accompanying drawings, wherein:

FIG. 1 is a side elevation of the machine according to the present invention and showing feed and take-off conveyor asemblies which may be used in association therewith;

FIG. 2 is a rear elevation, looking from the left in FIG. 1, showing the machine with the processing and back-up rolls removed and showing the right hand processing roll support in dotted lines, for the sake of clarity;

FIG. 3 is a front elevation of the machine, looking from the right in FIG. 1, showing a portion only of the safety curtain and the work position detecter mounted thereon so as to obviate obscuring the pinch rolls;

FIG. 4 is a side elevation of the machine from the same side as FIG. 1 but on a larger scale than FIG. 1;

FIG. 5 is a side elevation of the machine on the same scale as FIG. 4 but from the opposite side;

FIG. 6 is an enlarged section taken along the plane of section line VI—VI in FIG. 5 showing details of the manual and automatic mechanism for oscillating the processing roll;

FIG. 7 is an enlarged horizontal section taken along section line VII—VII in FIG. 1 showing the manner in which the processing roll is mounted;

FIG. 8 is an enlarged section taken through the processing roll and portions of the detachable mounting means therefor;

FIG. 9 is an enlarged sectional view taken through a portion of the processing roll mounting means and illustrating the mechanism for effecting reciprocation thereof;

FIG. 10 is an enlarged section taken along section line X—X in FIG. 7 illustrating the rigidifying mounting means for the upper pinch roll assembly;

FIG. 11 is an enlarged vertical section taken along the plane of section line XI—XI in FIG. 3 showing, in detail, the work position detecting means;

FIG. 12 is an elevation, partly in section, as indicated by section line XII—XII in FIG. 11 showing further details of the safety curtain and work position detecting means; and

FIG. 13 is a diagrammatic view showing the electrical circuit for the machine.

As shown in the drawings, the machine may be constructed to include a base **10** supporting a pair of upright pedestals **12, 14**, at its opposite sides. The pedestals **12, 14** mount bearing blocks **15** in vertically slidable relation therein, which blocks carry a pair of horizontally disposed shafts **16, 18**, hereinafter referred to as the upper roll shaft **16** and lower roll shaft **18**, respectively. The shafts **16, 18**, are disposed in vertically spaced parallel relation,

and their vertical positions (always in the same spaced relationship) relative to the pedesetals are regulated by means of a hand wheel 20 which operates through a cross shaft 21; a pair of bevel gears 22, 22; and vertical screw shafts 23 which threadedly engage at their lower ends with the bearing blocks 15.

It is to be noted that shaft 16 is non-rotatably carried by blocks 15 whereas shaft 18 is mounted for rotation therein. The purpose of this arrangement will be apparent presently.

The lower shaft 18 mounts in keyed relation thereon, in spaced apart relation, a trio of arms 24, 25, 26, see particularly FIGS. 2 and 7. The arm 24 rotatably supports the buff roll drive shaft 27 which is driven by an electric motor 28 through a belt and pulley system 28*a*, including an idler roll 29 riding freely on the roll shaft 18. To complete the mounting for the processing roll, which is indicated generally at 30, detachable couplings as indicated at 31—32 are provided at each end, and the coupling 32 connects to an idler shaft 33 which is journalled in a housing 34 which is detachably mounted in the arms 25, 26. As shown in the drawing, the roll 30 is shown as being a buffing roll, but it will be understood that in lieu thereof the spindle may mount any other grinding or abrading or brushing or polishing roll, or the like, as may be required for any given instance of use.

The processing roll 30 is opposed by a "back-up" roll 35 (FIGS. 1, 4, 5); the rolls 30, 35, being disposed with their axes of rotation substantially in vertical alignment. Thus, work pieces to be processed as indicated at 36 (FIG. 1) may be fed in horizontal disposed attitude to pass between the rolls 30, 35, whereby the processing roll 30 will surface-finish the top side of the work piece as it passes through the machine.

The back-up roll 35 is journalled at its opposite ends in the upper ends of a pair of crank arms 37, 38 (FIGS. 2, 4, 5) which are keyed at their lower ends to a synchronizer torque shaft 39 which is journalled in the pedestals as indicated at 40—40 (FIG. 2). Thus the crank arms 37, 38, function as stiff arms to rigidly hold the roll 35 up against the work piece at a prescribed elevation, although the crank arms are rockable about the axis of the shaft 39 to displace the back-up roll 35 in fore and aft directions relative to the vertical center line of the processing roll 30. This adjustability is provided to enable the back-up roll to press up either directly against the processing roll in the vertical plane of its axis, or slightly forwardly or rearwardly thereof so as to somewhat "wrap" the work sheet around the processing roll, according to the type of operation preferred. Such adjustments of the back-up roll are obtained by manual adjustments of a hand wheel 42 driving a screw 43 through a fixed nut bearing 44 to raise or lower an extending crank arm 45 keyed to the torque shaft 39, see FIGS. 2 and 4.

The elevational position of the processing roll 30 is regulated by means of a combination hand and pneumatic piston-cylinder control unit. Thus, the processing roll 30 will be moved toward or away from the back-up roll and the work piece supported thereon, by operation of the control unit. As shown best in FIGS. 4, 6, the control unit comprises a piston rod 53 which is threaded at one end in a nut bearing 54 carried by a rigid arm 55. A hand wheel is fitted to the top end of the rod 53 for manual adjustment thereof. At its lower end the rod 53 carries a piston 56 mounting a cylinder 57 from which extend stirrups 58—58 carrying a slide bearing 59 through which the rod 53 freely slides. The bearing 59 is journalled in the outer end of arm 52 for controlling vertical pivoting thereof about the axis of shaft 18 with which the arm 52 is rigid. Initial adjustment of the elevation of the processing roll relative to the work table is effected by manual adjustment of a hand wheel on the threaded piston rod 53. As explained hereinabove, driving of the processing roll 30 by the motor 28 is effected by means of the belt and pulley system geared to the processing roll spindle.

The back-up roll 35 is also power driven by means of a sprocket 60 engaging a chain 62 (FIG. 4) training over a drive sprocket 63 keyed to the output shaft 64 of a speed reducer 65 coupled to an electric motor 66.

To facilitate proper passage of the work pieces through the machine, a pair of pinch rolls 68, 69 (FIGS. 2, 3) are provided in vertical alignment with the opening therebetween in horizontal alignment with the opening between the processing and back-up rolls 30, 35. The upper pinch roll idles freely upon the upper roll shaft 18, and the lower pinch roll 69 is fixed to shaft 69′ which rotates in bearings 70 which are positionally fixed in the pedestals 12, 14. The lower pinch roll 69 is power driven by means of a sprocket 72 on shaft 69′ which also engages the drive chain 62. An idler sprocket 74 is journalled on the torque shaft 39 to guide the drive chain 62, and a chain tensioning sprocket 76 is idle-mounted on one end of a bell crank 78 which is fulcrumed on the lower pinch roll shaft 69′. The other arm of the bell crank connects as indicated at 79 to one end of a pneumatic piston-cylinder unit 80 which is bottomed on the machine base 10. Thus, through maintenance of a constant pressure differential at opposite sides of the piston of the device 80, a constant pressure will be applied through the idler sprocket 76 against the drive chain 62, to maintain the latter in snug driving condition regardless of fore or aft adjustments of the back-up roll 35.

As illustrated in FIG. 9, the processing roll spindle is preferably constructed to include means for causing it to reciprocate the processing roll axially coincident with its rotation, thereby avoiding production of "graining" effects on the finished surface of the work piece. Thus to mount the spindle, the arm 32 is fitted with bearings 90 supporting rotatably the hollow shaft 33 which carries the coupling face plate 32 from which extend pins 94 driving an opposing face plate 96 which is keyed by means of a pin 98 to a hollow roll shaft 100 upon which is mounted the buffing disks 101, or other processing medium as the case may be.

End plates 102—102 are mounted on the shaft 100 at opposite ends of the buffing disks to clamp the latter in place. At the left hand end of the shaft 100 it is fitted with the face plate 31 from which extend pins 106 extending through openings in an opposing face plate 108 which is in turn fixed to the spindle 27 rotatably carried in the arm 24. Thus, although the spindle 100 drives the buffing roll 30 to rotate, the latter is free to reciprocate axially on its spindle bearings. This reciprocation is attained by means of a push-pull rod 112 which engages the pin 98 at one end and extends through the hollow shaft 33 into fixed connection with one race portion of a rotatable thrust connection device as indicated generally at 115; the other portion of the thrust device being connected to a non-rotating thrust shaft 116 which in turn connects as indicated at 118 to the rod 119 of a piston 120 residing in a cylinder 122. The cylinder 122 is fixed to the housing 34; and thus variations of the pressure differential at opposite sides of the piston 120 will cause the latter to reciprocate the buffing roll as it rotates. An arm 124 extends rigidly and laterally from the thrust shaft 116 and carries a cam block 125 bearing against the actuator 126 of a micro switch 130 which is thereby actuated to alternatively reverse the pneumatic pressure control valve 130*a* of the power supply controlling the piston 120. Thus, as the switch contact 126 rides alternately up and down the curved surface of the cam block 125 coincident with reciprocation of the finishing roll 30, the control switch 130 alternately reverses the control valve 130*a* to procure the aforesaid reciprocation of the finishing roll.

As shown best in FIGS. 4 and 9, the invention provides an improved support for the processing roll. This is provided for by giving the shaft 18 a supplement bracing via the fixed shaft 16. Whereas the pivotable shaft 18 is primarily journalled on the pedestals 12, 14 only by means of the bearing blocks 15—15, by the arrangement of the invention it is also braced against bending deflec-

tions in its pedestal bearings by means of bearings 131—131 carried rigidly by yokes 133—133 at the extreme opposite ends of the fixed shaft 16 which is keyed to the slide blocks 15—15 as indicated at 132—132. Thus, it will be apparent that the shaft 18 is supported at four separate stations, thereby minimizing any opportunity for it to bend. This firmly braces the arms 24, 25, 26 against lateral deflections responsive to the bidirectional thrust loadings against the units by the processing roll reciprocating mechanism.

As shown in FIG. 3 and in greater detail in FIGS. 11, 12, the feed-in portion of the machine is provided with a safety device comprising a closure panel 134 which hingedly hangs vertically as indicated at 136 from a transverse bracket 137 (FIG. 11), and a bottom panel 138 is hinged at 139 to the lower end of the panel 134 (FIGS. 11 and 12). Thus, the opening into the feed-in portion of the machine is closed to prevent the hands of the machine attendant from entering the machine, while avoiding interference with passage of the stock piece 36. An arm 140 connected to the actuator 141 of a micro switch 142 bears at its lower end against the safety panel 134; and thus in event the attendant's hands press the panel 134 inwardly, or if any other obstruction on the work piece produces this effect, the arm 140 will be displaced to actuate the switch 142 so as to interrupt the power supply and stop the machine.

Also as shown in FIG. 3 and in greater detail in FIGS. 11 and 12, a mercury switch 150 is pivotally mounted at 151 upon the panel 134 and is provided with a rigidly extending arm 152 carrying an inverted air cup 154 which faces downwardly in line with a jet nozzle 156 comprising a drilled hole in a work piece support bracket 157. The nozzle 156 is in open communication with an air supply tube 158 which normally supplies a blast of compressed air to the nozzle 156, as controlled by means of a valve 160 (FIG. 13). Thus, whenever a stock piece is in transit through the machine and disposed above the nozzle 156 it buffers the air blast of the nozzle away from the cup 154 which due to the forces of gravity maintains the mercury switch 150 in the solid line position thereof shown in FIG. 12. However, when the stock piece moves on into the machine and the trailing edge of the stock piece clears the nozzle 156 the air from the nozzle blasts against the cup 154 and lifts the latter to tilt the switch 150 so as to energize a time delay relay system including conductors 162, 163 and relays 164, 165 which then, after a predetermined time lapse, open a circuit controlling valve 166 controlling finishing roll pressure cylinder 60 to cause the finishing roll to rise. The relay system controlling the valve 166 also controls the roll oscillating control valve 132. Thus, by virtue of this arrangement the time delay lags of the relays 164, 165 may be readily adjusted in accord with the feed speed of the machine so that as the trailing edge portions of the stock sheets engage the finishing roll it starts to lift away from the work piece and thereby avoids "kicking" it up and bending it as the work piece passes by. This adjustment may be readily made so that the work piece nevertheless is fully processed to the extreme trailing edge thereof.

As shown in FIG. 13, the electrical control system for the machine includes a "hand-automatic" control switch 170 providing for alternative Manual and Automatic control of the machine. In the Manual phase of operation the switch is set to "hand" control and the buff and feed drive motor control switches 171, 172 are manually closed. Thus the circuit through the magnetic starter 180 to the buff drive motor 28, and the circuit through starter 182 to the feed motor 66, are energized. The work piece is then fed into engagement with the pinch rolls and the switch 173 controlling lowering of the buff is then closed. Any number of work pieces may then be fed successively through the machine until all the work pieces are finished when the "buff raise" switch 174, and either one of several safety switches are manually actuated. One such safety switch is shown at 142 and another as indicated at 175 may be coupled to a safety bar 176 (FIG. 11).

In the automatic control phase of operation of the machine the "hand-automatic" control switch 170 is set at "Automatic." The buff and feed motor control switches 171, 172 are then closed and the "lower buff" switch 173 is closed. However, the finishing roll does not lower because air is blasting against the cup 154 and holding the switch 150 in position opening the circuit to the valve controlling the buff control cylinder 50. The work piece may now be fed into the machine until it is picked up by the pinch rolls. As it covers the nozzle 156 the mercury switch 150 tips down to energize the circuit controlling the buff lowering cylinder 50 (as controlled by the time delay relay system). Then, as any one work piece passes through and clears the nozzle, the air blast actuates the switch 150 to cause the buff roll to raise; and subsequent alternate lowering and raising of the roll automatically takes place as required in accord with subsequent feeding and passage of work pieces through the machine.

It will be readily appreciated that the hereinabove described machine obtains certain advantages which accrue by virtue of the structural relationship of the component parts and particularly as regards their relationship with each other in a combinational sense. For example, it will be noted that the shaft 16 is rigidly carried by the uprights 12 and 14 through the medium of the bearing blocks 15 so as to prevent rotation of this shaft. This shaft performs the dual function of providing the additional support for the shaft 18, through the medium of yoke assemblies 133 and of providing, through the medium of the arm 55, means for controlling the operative positioning of the processing roll. Shaft 18, on the other hand, also serves a dual function. First, it mounts the processing roll and, second, it mounts the upper pinch roll. Shaft 18 carries the three arms 24, 25 and 26 by means of which the processing roll is mounted rigidly to the frame but free and clear thereof so that the processing roll is readily accessible for interchangeability. At the same time this manner of mounting the processing roll readily permits it to have associated therewith the mechanism for effecting the reciprocatory motion of the processing roll. In addition to this, through the medium of arm 52 rigid with shaft 18, the work-engaging or operative adjustment of the processing roll may be effected while this same mechanism, in cooperation with the piston and cylinder unit 57, admits of the controlled oscillatory motion of the processing roll for disengaging the work so as to avoid damage thereto.

Further, the structure shown and described is notable in that the area between the uprights 12 and 14 is unfettered by any mounting means which would restrict the width of work accommodated by the machine. This is accomplished by virtue of the fact that shaft 18 extends beyond the uprights 12 and 14 so that arms 24, 25 and 26 are outboard of the uprights. At the same time, by providing the non-rotatable shaft 16, the necessity for providing excessively massive uprights or additional ones to accommodate for this outboard mounting of the arms is obviated. At the same time, the very presence of the arms 24, 25 and 26, which in effect cantilever the process roll from the uprights, presents this processing roll in such position that it may be readily removed and replaced. At the same time, this arrangement also permits the use of a direct acting means for reciprocating the processing roll which, due to its direct acting relation, may remain uncomplicated even though the processing roll is movable throughout a wide range of adjustment.

I claim:

1. Finishing apparatus comprising work receiving pinch rolls delivering work pieces to a finishing back-up roll, a finishing roll movable toward and away from the work piece when supported by said back-up roll, and a control system regulating movements of said finishing roll to-

ward and away from said back-up roll, said system including automatic control means comprising a device controlled by passage of the trailing edge of a work piece relative to said finishing roll and including a time delay device operable to cause movement of said finishing roll away from work piece contacting position coincident with completion of the finishing operation thereon up to the trailing edge thereof.

2. Finishing apparatus comprising work receiving pinch rolls delivering work pieces to a finishing back-up roll, a finishing roll operable upon a work piece when supported by said back-up roll, and a finishing roll control system providing axial reciprocating movements of said finishing roll automatically during operation of the apparatus, said system including rotatable spindles at opposite ends of said finishing roll, axial lost-motion connection means at opposite ends of said finishing roll connecting the latter to said spindles, rotation drive means coupled to one of said spindles for driving said finishing roll to rotate, a non-rotating thrust shaft coupled to the other of said spindles, a piston coupled to said thrust shaft, a cylinder enclosing said piston and axially fixed relative to the apparatus, a valve controlling alternate applications of fluid pressure in said cylinder at opposite sides of said piston, and automatic reciprocation control means comprising an arm controlled by alternative reciprocative movements of said finishing roll so as to adjust said valve so as to cause said finishing roll to axially reciprocate while in work piece contacting position, means for adjusting the pressure applied by the finishing roll to the work piece, and safety control switches for emergency interruption of operation of the apparatus.

3. Finishing apparatus comprising work receiving pinch rolls delivering work pieces to a finishing back-up roll, a finishing roll operable upon a work piece when supported by said back-up roll, and a finishing roll control system providing axial reciprocating movements of said finishing roll automatically during operation of the apparatus, said system including rotatable spindles at opposite ends of said finishing roll, axial lost-motion connection means at opposite ends of said finishing roll connecting the latter to said spindles, rotation drive means coupled to one of said spindles for driving said finishing roll to rotate, a non-rotating thrust shaft coupled to the other of said spindles, a piston coupled to said thrust shaft, a cylinder enclosing said piston and axially fixed relative to the apparatus, a valve controlling alternate applications of fluid pressure in said cylinder at opposite sides of said piston, and automatic reciprocation control means comprising an arm controlled by alternative reciprocative movements of said finishing roll so as to actuate said valve to cause the finishing roll to axially reciprocate while in work piece contacting position, and means for adjusting the pressure applied by the finishing roll to the work piece.

4. Finishing apparatus comprising work receiving pinch rolls delivering work pieces to a finishing back-up roll, a finishing roll movable toward and away from the work piece when supported by said back-up roll, said finishing roll being also oscillatable longitudinally relative to said work piece and a control system regulating oscillation and movements of said finishing roll toward and away from said back-up roll, said system including manual control means and automatic control means comprising a device controlled by alternate reciprocation of said roll to reverse it and by passage of a work piece relative to said finishing roll so as to move the latter away from work piece contacting position and to stop oscillation thereof coincident with completion of the finishing operation thereon, means for adjusting the pressure applied by the finishing roll to the work piece, and safety control switches for emergency interruption of operation of the apparatus.

5. Finishing apparatus comprising work receiving pinch rolls delivering work pieces to a finishing back-up roll, a finishing roll movable toward and away from the work piece when supported by said back-up roll, said finishing roll being also reciprocable axially thereof and transversely relative to said work piece, and a control system regulating axial reciprocation and movements of said finishing roll toward and away from said back-up roll, said system including a device actuated by alternate arrivals of said finishing roll at opposite ends of its reciprocatory travel to reverse it and means actuated by passage of the trailing edge of a work piece relative to said pinch rolls so as to stop reciprocation of the finishing roll and to move the latter away from work piece contacting position coincident with completion of the finishing operation thereon up to the trailing edge thereof.

6. Finishing apparatus comprising work receiving pinch rolls delivering work pieces to finishing back-up means, one of said pinch rolls being journalled on a vertically adjustable shaft, arms rigid with said shaft and removably carrying at their free ends a finishing roll operable upon a work piece when supported by said back-up means, and a finishing roll control system fixed to one of said arms providing axial reciprocating movements of said finishing roll automatically during operation of the apparatus.

7. Finishing apparatus comprising work receiving pinch rolls delivering work pieces to finishing back-up means, one of said pinch rolls being journalled on a vertically adjustable shaft, arms rigid with said shaft and removably carrying a finishing roll at their free ends operable upon a work piece when supported by said back-up means, and a finishing roll control system providing axial reciprocating movements of said finishing roll automatically during operation of the apparatus, said system including rotatable spindles at opposite ends of said finishing roll, axial lost-motion connection means at opposite ends of said finishing roll connecting the latter to said spindles, rotation drive means coupled to one of said spindles for driving said finishing roll to rotate, a non-rotating thrust shaft coupled to the other of said spindles, a piston coupled to said thrust shaft, a cylinder enclosing said piston and axially fixed relative to the machine, a valve controlling alternate applications of fluid pressure in said cylinder at opposite sides of said piston, and automatic reciprocation control means comprising an arm controlled by alternative reciprocative movements of said finishing roll so as to actuate said valve to cause the roll to axially reciprocate while in work piece contacting position, and means for adjusting the pressure applied by the finishing roll to the work piece.

8. Finishing apparatus of the character described comprising a frame having a pair of uprights, a pair of bearing blocks, one associated with each upright, and being disposed for vertical sliding adjustment thereon, a rotatable shaft journalled in said bearing blocks to extend between said uprights, a fixed shaft carried by said bearing blocks to extend parallel to said rotatable shaft between said uprights, an upper pinch roll journalled on said rotatable shaft, a lower pinch roll journalled in said frame below the upper pinch roll and cooperable therewith to engage and translate work through the machine, arms fixed to said rotatable shaft to project laterally therefrom away from said uprights, a processing roll carried by said arms remote from said uprights, a back-up roll carried by said frame in alignment with said processing roll, and means carried by said fixed shaft for rocking said rotatable shaft to vertically position said processing roll.

9. In a machine of the character described, the combination of a frame including uprights delineating the maximum width of stock which may be handled by the machine, a lower pinch roll journalled by the frame between said uprights, an upper pinch roll assembly carried by said uprights for vertical motion relative thereto, means for fixing said upper pinch roll assembly in predetermined position relative to the lower pinch roll to engage and translate stock through the machine, said

upper pinch roll assembly including a rotatable shaft having an upper pinch roll journalled thereon and which shaft projects beyond said uprights, arms fixed to said shaft outboard of said uprights so as to leave the region therebetween free and unimpeded to accommodate the maximum width of stock as aforesaid, a processing roll journalled between the free ends of said arms, and means for rocking said arms, independently of any vertical adjustment of the upper pinch roll assembly, to vertically adjust said processing roll.

10. Finishing apparatus comprising work receiving pinch rolls delivering work pieces to a finishing back-up roll, a finishing roll movable toward and away from the work piece when supported by said back-up roll, said finishing roll being also axially reciprocable for transverse back and forth movement relative to said work piece, and a control system regulating axial oscillation and movements of said finishing roll toward and away from said back-up roll, said system including a device actuated by alternate arrivals of said roll at opposite ends of its axial travel to reverse it and means actuated by passage of the trailing edge of work piece relative to said finishing roll so as to stop reciprocation thereof and to move the latter away from work piece contacting position coincident with completion of the finishing operation thereon up to the trailing edge thereof, and means for adjusting the pressure applied by the finishing roll to the work piece.

11. Finishing apparatus comprising work receiving pinch rolls delivering work pieces to finishing back-up means, one of said pinch rolls being journalled on a vertically adjustable shaft, arms rigid with said shaft and removably carrying at their free ends a finishing roll operable upon a work piece when supported by said back-up means, and a finishing roll control system carried by one of said arms providing axial reciprocating movements of said finishing roll automatically during operation of the apparatus, said system including rotatable spindles at opposite ends of said finishing roll, axial lost-motion connection means at opposite ends of said finishing roll connecting the latter to said spindles, rotation drive means coupled to one of said spindles for driving said finishing roll to rotate, a non-rotating thrust shaft coupled to the other of said spindles, a piston coupled to said thrust shaft, a cylinder enclosing said piston and axially fixed relative to the machine, a valve controlling alternate applications of fluid pressure in said cylinder at opposite sides of said piston, and automatic reciprocation control means comprising an arm controlled by alternative reciprocative movements of said finishing roll so as to adjust said valve so as to cause said roll to axially reciprocate while in work piece contacting position.

12. Finishing apparatus comprising a frame, a lower pinch roll rotatably mounted in fixed relation on said frame, a pair of horizontally spaced bearing blocks slidably mounted on said frame above said lower pinch roll for vertical adjustment relative thereto, a shaft journalled in said bearing blocks, an upper pinch roll journalled on said shaft, a plurality of arms fixed to said shaft and projecting laterally therefrom, away from said frame, a processing roll removably carried by said arms in spaced parallel relation to said shaft and free and clear of said frame, means for rocking said shaft to vertically position said processing roll, a back-up roll carried by said frame below said processing roll, and means carried by said arms for effecting axial reciprocation of said processing roll.

13. In a machine of the character described, the combination of a frame including uprights delineating the maximum width of stock which may be handled by the machine, a lower pinch roll journalled by the frame between said uprights, an upper pinch roll assembly carried by said uprights for vertical motion relative thereto, means for fixing said upper pinch roll assembly in predetermined position relative to the lower pinch roll to engage and translate stock through the machine, said upper pinch roll assembly including a rotatable shaft having an upper pinch roll journalled thereon and which shaft projects beyond said uprights, arms fixed to said shaft outboard of said uprights so as to leave the region therebetween free and unimpeded to accommodate the maximum width of stock as aforesaid, a processing roll journalled between the free ends of said arms, means for rocking said arms, independently of any vertical adjustment of the upper pinch roll assembly, to vertically adjust said processing roll, and means carried by said arms for effecting axial reciprocation of said processing roll.

14. Finishing apparatus comprising work receiving pinch rolls delivering work pieces to a finishing back-up roll, a finishing roll operable upon a work piece when supported by said back-up roll, and a finishing roll control system providing axial reciprocating movements of said finishing roll automatically during operation of the apparatus, said system including rotatable spindles at opposite ends of said finishing roll, axial lost-motion connection means at opposite ends of said finishing roll connecting the latter to said spindles, rotation drive means coupled to one of said spindles for driving said finishing roll to rotate, a non-rotating thrust shaft coupled to the other of said spindles, a piston coupled to said thrust shaft, a cylinder enclosing said piston and axially fixed relative to the apparatus, a valve controlling alternate applications of fluid pressure in said cylinder at opposite sides of said piston, and automatic reciprocation control means comprising an arm controlled by alternative reciprocative movements of said finishing roll so as to adjust said valve so as to cause said finishing roll to axially reciprocate while in work piece contracting position.

15. Finishing apparatus comprising work receiving pinch rolls delivering work pieces to a finishing back-up roll, a finishing roll operable upon a work piece when supported by said back-up roll, and a finishing roll control system providing axial reciprocating movements of said finishing roll automatically during operation of the apparatus, said system including rotatable spindles at opposite ends of said finishing roll, axial lost-motion connection means at opposite ends of said finishing roll connecting the latter to said spindles, rotation drive means coupled to one of said spindles for driving said finishing roll to rotate, a non-rotating thrust shaft coupled to the other of said spindles, a piston coupled to said thrust shaft, a cylinder enclosing said piston and axially fixed relative to the apparatus, a valve controlling alternate applications of fluid pressure in said cylinder at opposite sides of said piston, and automatic reciprocation control means comprising an arm controlled by alternative reciprocative movements of said finishing roll so as to actuate said valve to cause the finishing roll to axially reciprocate while in work piece contacting position, and means for automatically moving said finishing roll away from work contacting position coincident with completion of the finishing operation thereon up to the trailing edge thereof.

16. Finishing apparatus comprising work receiving pinch rolls delivering work pieces to a finishing back-up roll, a finishing roll movable toward and away from the work piece when supported by said back-up roll, said finishing roll being also oscillatable longitudinally relative to said work piece and a control system regulating oscillation and movements of said finishing roll toward and away from said back-up roll, said system including manual control means and automatic control means comprising a device controlled by alternate reciprocation of said roll to reverse it and by passage of a work piece relative to said finishing roll so as to move the latter away from work piece contacting position and to stop oscillation thereof coincident with completion of the finishing operation thereon.

17. Finishing apparatus comprising a frame, a lower

pinch roll rotatably mounted in fixed relation on said frame, a pair of horizontally spaced bearing blocks slidably mounted on said frame above said lower pinch roll for vertical adjustment relative thereto, a shaft journalled in said bearing blocks, an upper pinch roll journalled on said shaft, a plurality of arms fixed to said shaft and projecting laterally therefrom, away from said frame, a processing roll removably carried by said arms in spaced parallel relation to said shaft and free and clear of said frame, a fixed shaft carried by said bearing blocks spaced from and parallel to the first shaft, supplemental bearing means carried by said fixed shaft and engaging said first shaft adjacent said arms, means carried by said fixed shaft for rocking said first shaft to vertically position said processing roll, and back-up means carried by said frame below said processing roll.

18. Finishing apparatus of the character described comprising a frame having a pair of uprights, a pair of bearing blocks, one associated with each upright, and being disposed for vertical sliding adjustment thereon, a rotatable shaft journalled in said bearing blocks to extend between said uprights, a fixed shaft carried by said bearing blocks to extend parallel to said rotatable shaft between said uprights, an upper pinch roll journalled on said rotatable shaft, a lower pinch roll journalled in said frame below the upper pinch roll and cooperable therewith to engage and translate work through the apparatus, arms fixed to said rotatable shaft to project laterally therefrom away from said uprights, a processing roll carried by said arms remote from said uprights, back-up means carried by said frame in alignment with said processing roll, means carried by said fixed shaft for rocking said rotatable shaft to vertically position said processing roll, and supplemental bearing means carried by said fixed shaft outboard of said uprights and engaging said rotatable shaft thereat.

19. In a machine of the character described, the combination of a frame including uprights delineating the maximum width of stock which may be handled by the machine, a lower pinch roll journalled by the frame between said uprights, an upper pinch roll assembly carried by said uprights for vertical motion relative thereto, means for fixing said upper pinch roll assembly in predetermined position relative to the lower pinch roll to engage and translate stock through the machine, said upper pinch roll assembly including a rotatable shaft having an upper pinch roll journalled thereon and which shaft projects beyond said uprights, arms fixed to said shaft outboard of said uprights so as to leave the region therebetween free and unimpeded to accommodate the maximum width of stock as aforesaid, a processing roll journalled between the free ends of said arms, said assembly also including a fixed shaft extending beyond said uprights and disposed parallel to and above said rotatable shaft, supplemental bearing means carried by said fixed shaft and engaging said rotatable shaft outboard of said arms, and means carried by said fixed shaft for rocking said rotatable shaft to vertically adjust said processing roll.

20. Finishing apparatus comprising a frame, a pair of laterally spaced uprights fixed to said frame, a lower pinch roll journalled in said frame between said uprights, a pair of vertically adjustable bearing blocks carried by said uprights, a rotatable shaft carried by and journalled in said bearing blocks, a fixed shaft carried by said bearing blocks, both of said shafts being extended laterally beyond said uprights, an upper pinch roll journalled on said rotatable shaft for cooperation with the lower pinch roll to translate work pieces through the apparatus, back-up means carried by said frame longitudinally thereof beyond said pinch rolls, arm means fixed to said rotatable shaft outboard of said uprights and projecting longitudinally of the frame in the direction of said back-up means, there being at least a pair of such arms disposed closely to respective uprights, a processing roll mounted between said pair of arms, supplemental bearing means carried by said fixed shaft and journalling said rotatable shaft at points closely adjacent to and outboard of said pair of arms, and means carried by said fixed shaft for rocking said rotatable shaft to vertically position said processing roll.

21. Finishing apparatus comprising a frame, a pair of laterally spaced uprights fixed to said frame, a lower pinch roll journalled in said frame between said uprights, a pair of vertically adjustable bearing blocks carried by said uprights, a rotatable shaft carried by and journalled in said bearing blocks, a fixed shaft carried by said bearing blocks, both of said shafts being extended laterally beyond said uprights, an upper pinch roll journalled on said rotatable shaft for cooperation with the lower pinch roll to translate work pieces through the apparatus, back-up means carried by said frame longitudinally thereof beyond said pinch rolls, arm means fixed to said rotatable shaft outboard of said uprights and projecting longitudinally of the frame in the direction of said back-up means, there being at least a pair of such arms disposed closely adjacent to respective uprights, a processing roll mounted between said pair of arms, supplemental bearing means carried by said fixed shaft and journalling said rotatable shaft at points closely adjacent to and outboard of said pair of arms, said arm means including a third arm fixed to said rotatable shaft at one end thereof outboard of said supplemental bearing means, means carried by said third arm and one arm of said pair of arms for effecting cyclic axial reciprocation of said processing roll, and means carried by said fixed shaft for rocking said rotatable shaft to vertically position said processing roll.

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