United States Patent

[11] 3,589,072

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[21] Appl. No. **820,242**
[22] Filed **Apr. 29, 1969**
[45] Patented **June 29, 1971**
[73] Assignee **Clair Manufacturing Co., Inc.**
Olean, N.Y.

[54] **FINISHING MACHINE**
3 Claims, 20 Drawing Figs.

[52] **U.S. Cl.** **51/45,**
51/165, 51/39, 51/92
[51] **Int. Cl.** **B24b 7/00**
[50] **Field of Search** 51/34, 40,
39, 100, 45, 92, 165.01, 165.03

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Primary Examiner—William R. Armstrong
Attorney—Bean & Bean

ABSTRACT: This invention relates to surface finishing machines, and more particularly to improvements in such machines of the type that are especially adapted to rough, brush polish, glaze, buff, satin finish, mirror finish, or otherwise finish sheet, plate, strip, coil, or any other type workpieces such as name plates, decorative hardware, engravure stock, printed circuit panels, or the like.

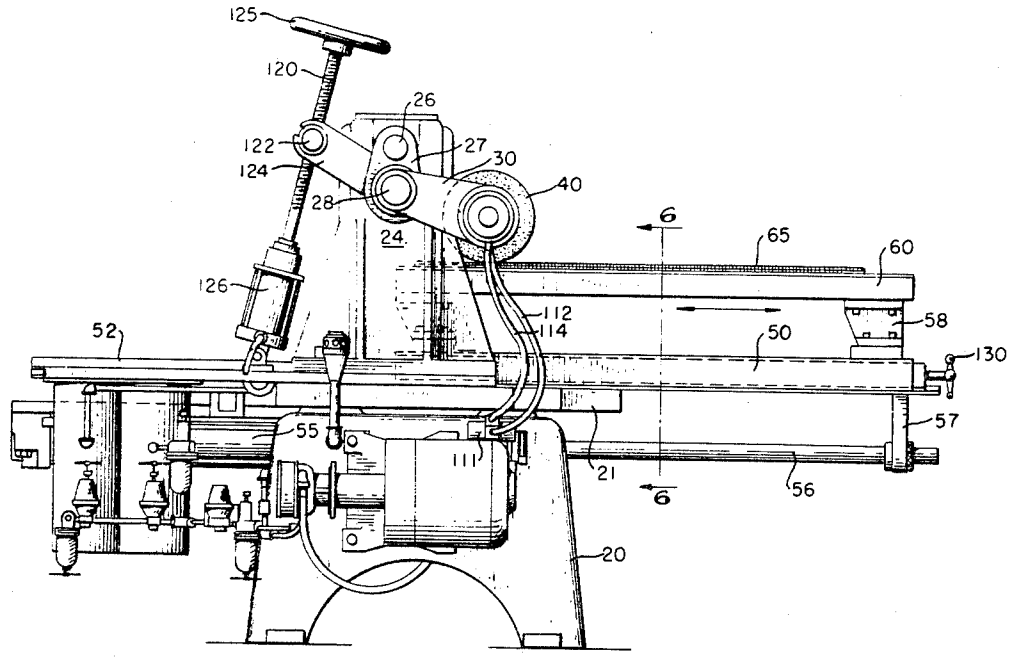


Fig. 1.

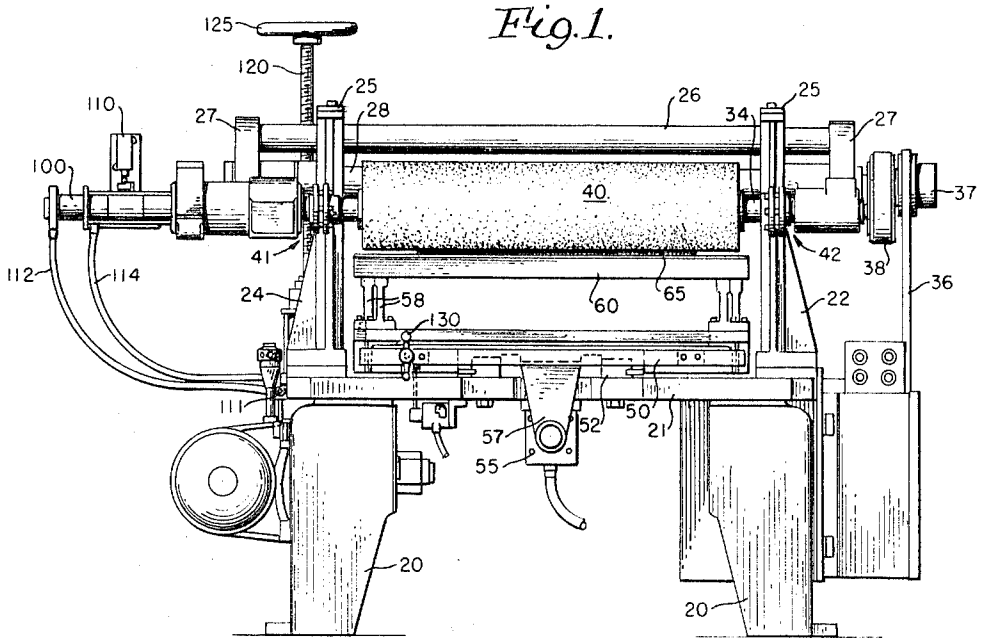
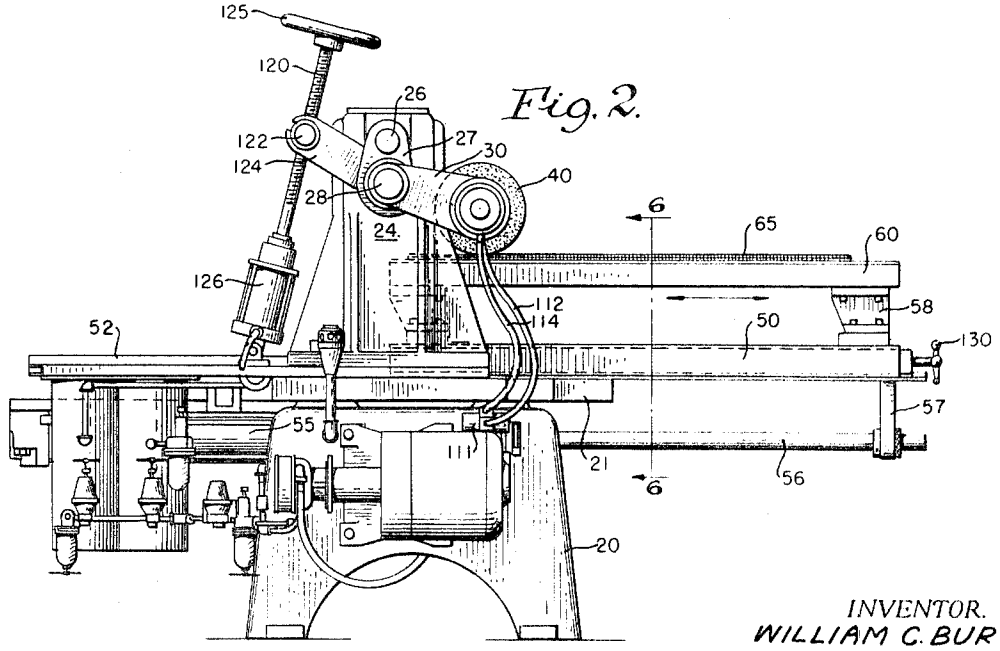


Fig. 2.



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Fig. 3.

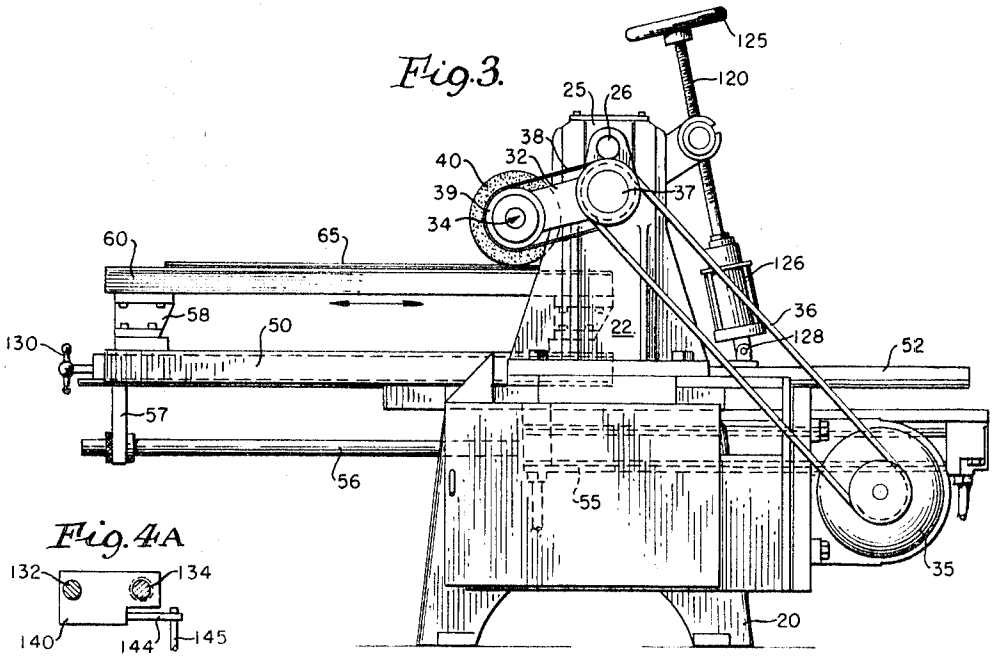


Fig. 4A

Fig. 4B

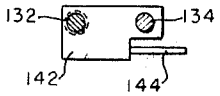
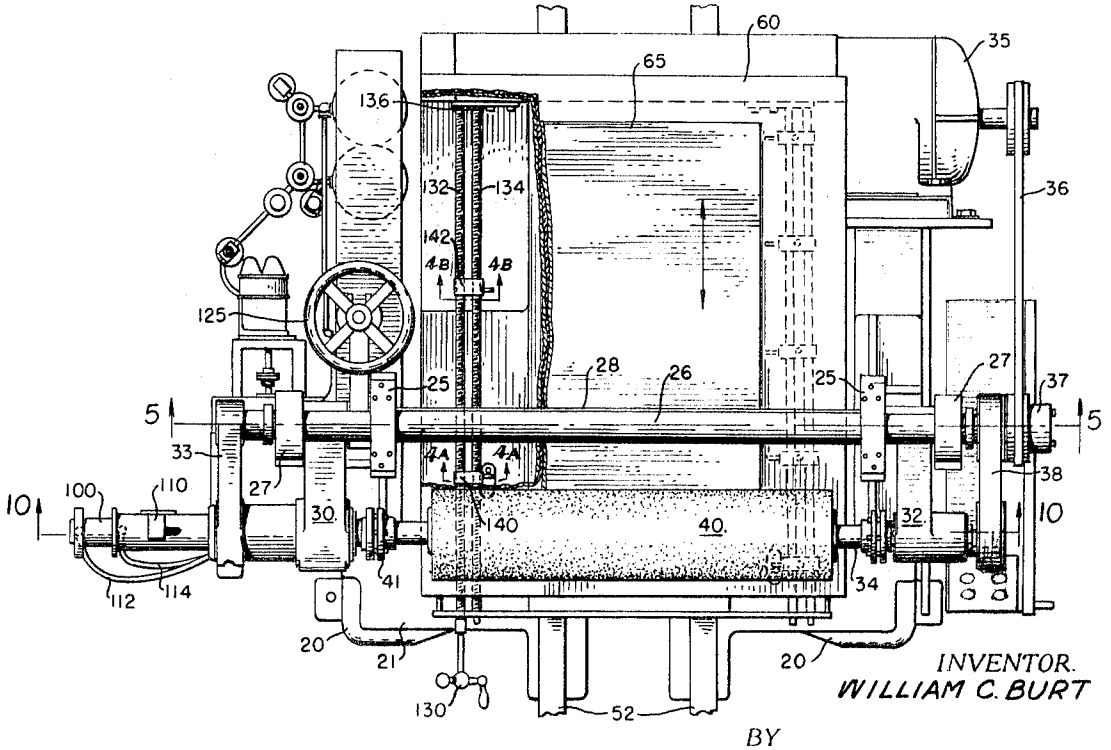


Fig. 4



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SHEET 3 OF 7

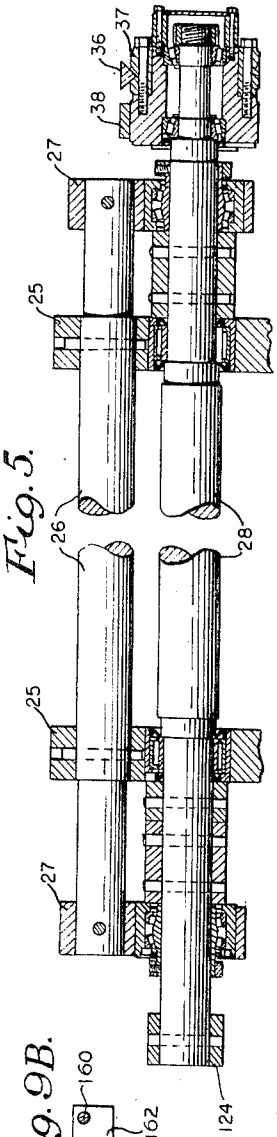


Fig. 5.

Fig. 9B.

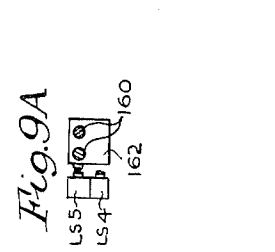


Fig. 9A.

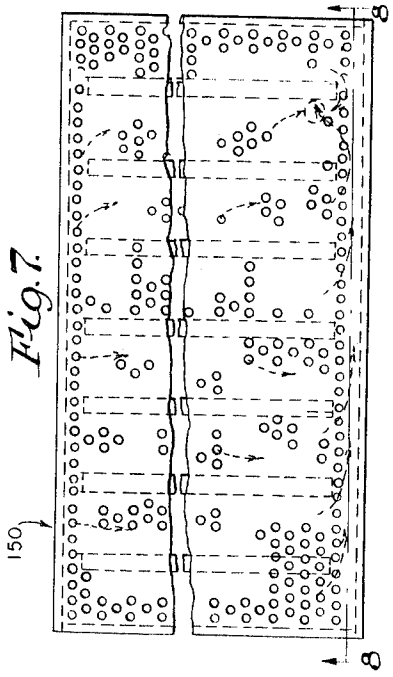


Fig. 7.

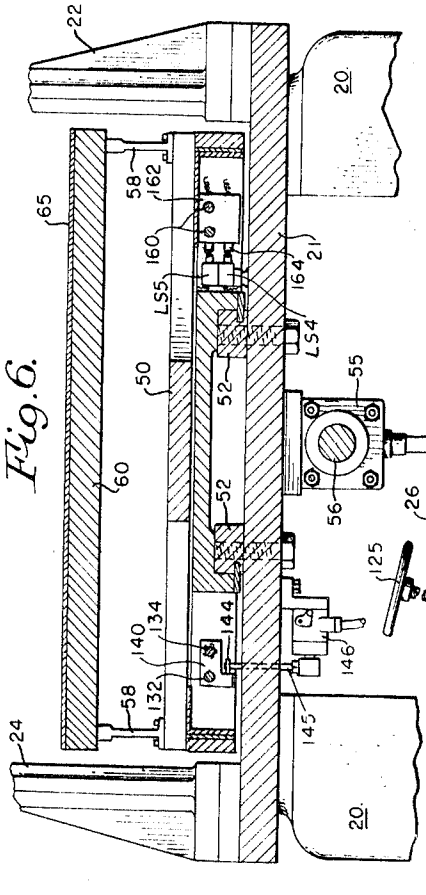


Fig. 6.

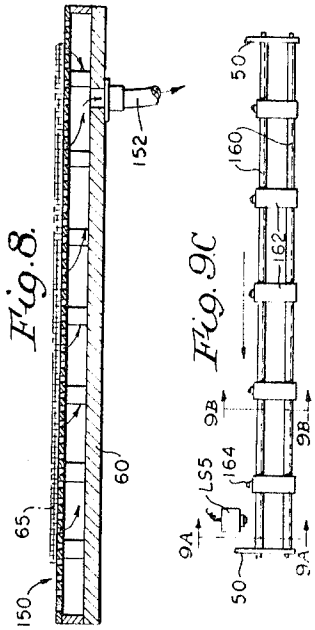


Fig. 8.

Fig. 9C.

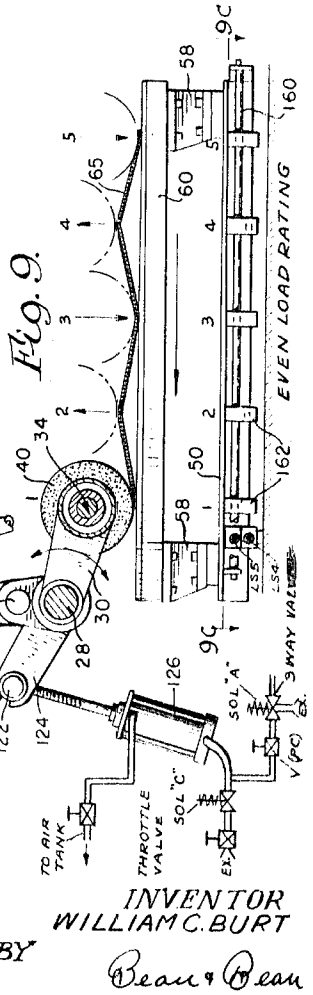


Fig. 9.

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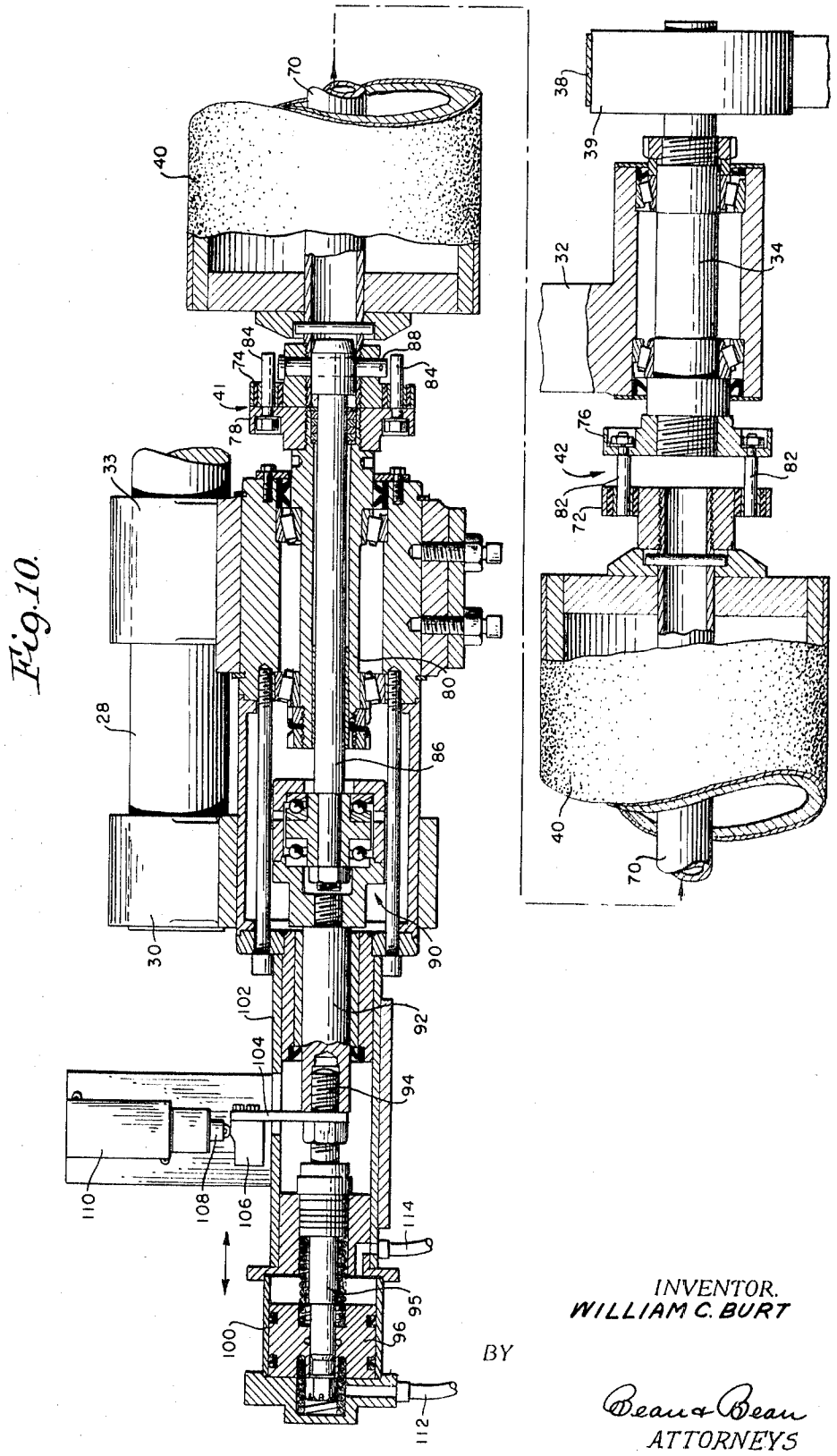
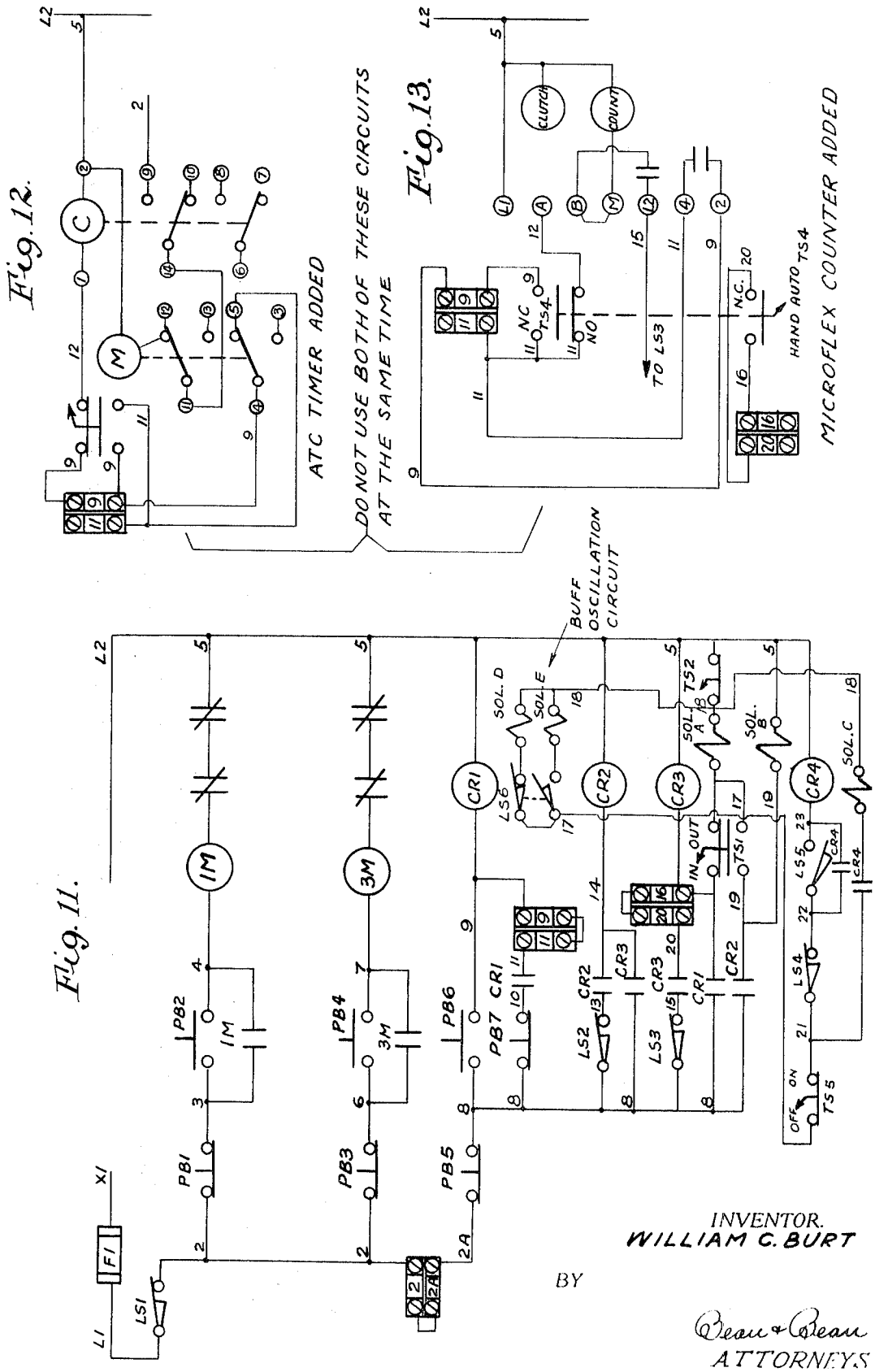


Fig. 10.

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Fig. 12.
ATC TIMER ADDED
DO NOT USE BOTH OF THESE CIRCUITS AT THE SAME TIME
Fig. 13.
MICROFLEX COUNTER ADDED
Fig. 11.
BUFF OSCILLATION CIRCUIT
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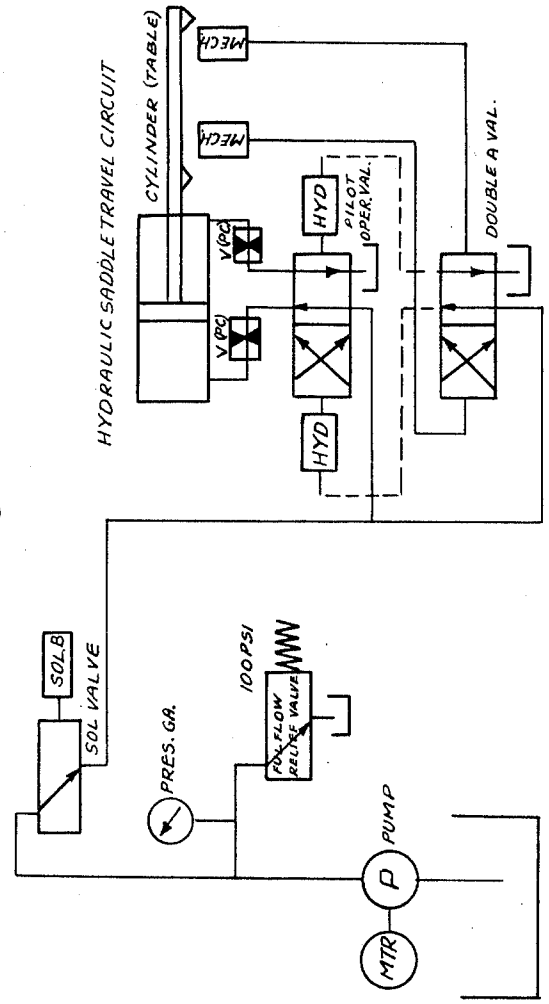


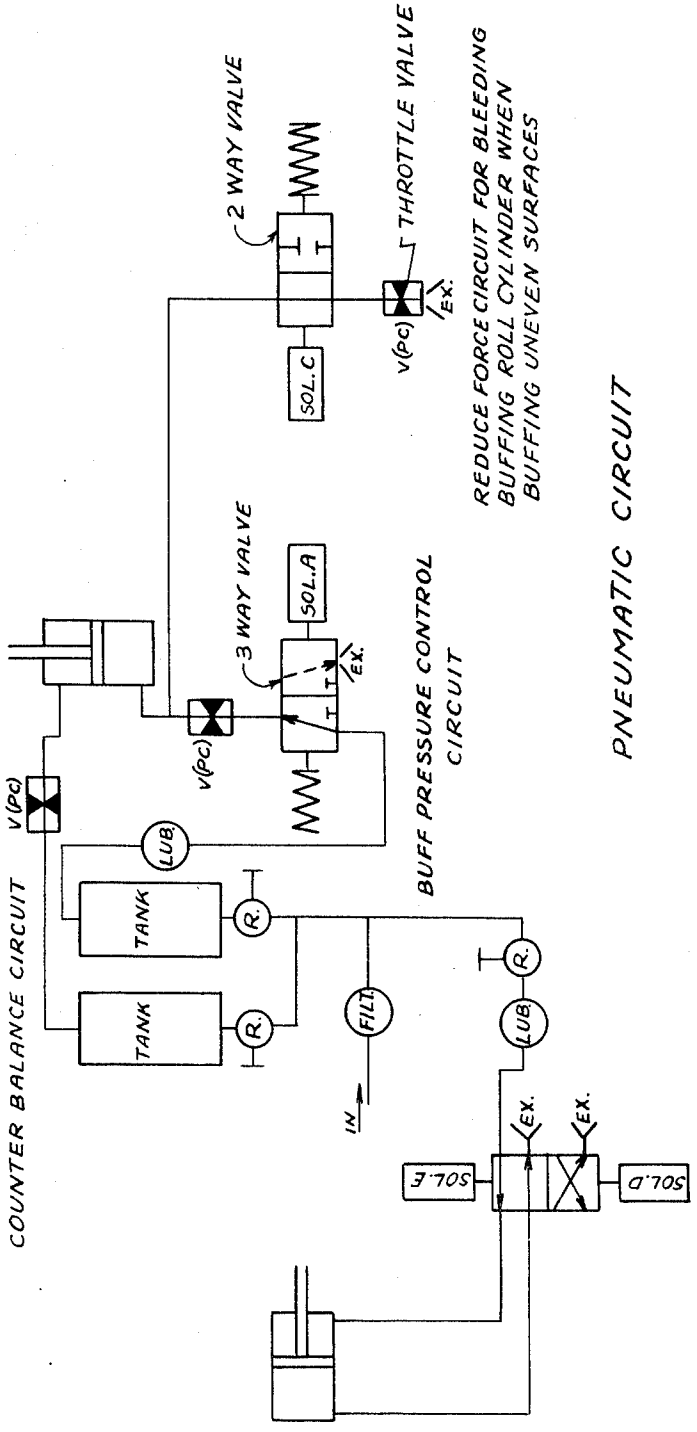
Fig. 14.

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Fig. 15.



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FINISHING MACHINE

BACKGROUND AND GENERAL DESCRIPTION

It is a primary object of the present invention to provide improvements in machines of the character above described; in which the mechanism is of improved 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.

Another object is to provide in a machine as aforesaid an improved reciprocating workpiece supporting table arrangement for transporting workpieces through the machine, and in which the processing roll is rockable about its support axis in coordination with movement of the workpiece through the machine. Hence, the processing roll engages and disengages the workpiece in such fashion as to avoid damage to the leading and/or trailing edges thereof; while at all times processing the workpiece under uniform pressure contact conditions throughout the entire surface area of the workpiece.

A further feature of this invention resides in a specific combination of component parts whereby the processing roll of the machine is readily accessible for interchange purposes, and wherein the same provides means in its construction for the incorporation of reciprocating means compactly arranged and efficiently connected with the processing roll so as to achieve improved workpiece processing results.

It is another object of the invention to provide a machine as aforesaid which is of improved versatility in that it will readily accommodate relatively wide strip or sheet workpieces as well as irregular shapes such as decorative hardware pieces, or the like.

Another object of the invention is to provide an improved machine as aforesaid which is adapted to properly finish flat stock sheets or strips throughout their surface areas from the leading edges to trailing edges thereof, while avoiding undesirable pickup and/or bending of the trailing edge portions of the stock pieces as they pass through the machine.

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

Another object 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.

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:

THE DRAWING

FIG. **1** is a front elevational view of a machine of the invention;

FIG. **2** is a left-hand side elevation of the machine of FIG. **1**;

FIG. **3** is a right-hand side elevation thereof;

FIG. **4** is a top plan view thereof, with portions broken away to show interior mechanism;

FIG. **4a** is a fragmentary sectional view, on enlarged scale, taken as indicated at **4a–4a** of FIG. **4**;

FIG. **4B** is a fragmentary sectional view, on enlarged scale, taken as indicated at **4B–4B** of FIG. **4**;

FIG. **5** is an enlarged scale sectional view taken along the plane of section line **5–5** of FIG. **4**;

FIG. **6** is a fragmentary sectional view taken as indicated by line **6–6** of FIG. **2**;

FIG. **7** is a fragmentary plan view of a vacuum-type workpiece holding table accessory, such as may be readily employed in connection with the machine;

FIG. **8** is a sectional view taken as indicated by line **8–8** of FIG. **7**;

FIG. **9** is a view corresponding to a portion of FIG. **2**, illustrating employment of a modified form of workpiece holding table and processing roll pressure control arrangement;

FIGS. **9A** and **9B** are sectional views taken as indicated by lines **9A–9A** and **9B–9B**, respectively, on FIG. **9C**;

FIG. **9C** is a sectional view taken as indicated on line **9C–9C** on FIG. **9**;

FIG. **10** is a composite fragmentary sectional view, on enlarged scale, taken as indicated by line **10–10** of FIG. **4**; and

FIGS. **11**, **12**, **13**, **14** and **15** are schematic diagrams of the various control systems for the machine.

DETAILED DESCRIPTION

As shown in the drawing herewith, the machine is constructed to include a pair of stanchions **20–20** supporting a bedplate **21** which in turn supports a pair of upright pedestals **22**, **24**, at its opposite sides. The pedestals **22**, **24** mount in vertically adjustable relation bearing blocks **25–25** which carry therebetween a nonrotatably mounted bridge shaft **26**. The shaft **26** is thereby disposed in vertically adjustable but horizontally disposed relation. By means of stirrups **27–27** the shaft **26** carries a rotatably lower shaft **28** in parallel spaced apart relation thereto; which in turn by means of arms **30**, **32**, **33** rotatably support the buff roll drive shaft unit **34** which is driven by an electric motor **35** through means of a belt **36**; a pulley **37**; and idler roll **38** riding freely on the roll shaft **28**; and a drive belt **39**. To complete the mounting for the processing roll, which is indicated generally at **40**, detachable couplings as indicated at **41—42** are provided at each end thereof (FIG. **10**). As shown in the drawing herewith, the roll **40** is shown as being a buffing roll; but it will be understood that in lieu thereof the couplings **41—42** 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 workpiece mounting carriage portion of the machine is illustrated herein to comprise a platform **50** which is mounted upon the baseplate **21** by means of slideways **52** so that the platform **50** is reciprocable horizontally in directions transverse to the roll **40**. A hydraulic piston-cylinder unit **55** is mounted under the baseplate **21** and the piston rod **56** thereof extends in the direction of platform travel and into connection with a bracket **57** carried by the platform **50**. Thus, hydraulic actuation of the piston-cylinder unit **55** will cause the platform **50** to reciprocate toward and away from the roll **40**. Upright brackets **58** extend from the corner portions of the platform and support in suitably elevated relation thereon the workpiece support table **60** upon which workpieces to be processed as indicated at **65** are disposed. The workpieces may simply lie flatwise as shown on the table **60**, or may be otherwise fastened thereto if need be by any suitable means, whereby reciprocation of the table by means of the cylinder **55** will cause the workpiece to pass back and forth in processing contact under the roll **40**.

As best illustrated at FIG. **10**, the processing roll support mechanism is constructed to include means for causing it to axially reciprocate the processing roll coincident with its rotation, thereby avoiding production of "graining" effects or the like on the finished surface of the workpiece. Thus the process roll mounting spindle as indicated at **70** is fitted with faceplates **72—74** at its opposite ends arranged to mate with corresponding coupling faceplates **76—78** keyed to the roll drive shaft **34** and a hollow shaft **80** carried by the arm **33**, respectively. The faceplate **76** is fitted with axially extending pins **82** engaging the opposing faceplate **72** which is fixed to the roll support spindle **70**. Thus, although the shaft **34** drives the roll **40** to rotate, the latter is free to reciprocate axially within the limits of the open space provided by the fact that the distance between the faceplates **72—74** is provided so as to be less than the distance between the faceplates **76—78**. Similar pins **84** flexibly interconnect the faceplates **74—78**. Reciprocation of the roll **40** is attained by means of a push-pull rod **86** which engages the faceplate **74** at one end by

means of a pin **88** and extends through the hollow shaft **80** into fixed connection at its other end with one race portion of a rotatable thrust connection device as indicated generally at **90**; the other portion of the thrust device being connected to a nonrotating thrust shaft **92** which in turn connects as indicated at **94** to the rod **95** of a piston **96** residing in a cylinder **100**. The cylinder **100** is fixed to a housing **102** carried by the arms **30—33**; and thus variations of the pressure differential at opposite sides of the piston **96** will cause the latter to reciprocate the roll **40** as it rotates. An arm **104** extends rigidly and laterally from the thrust shaft **95** and carries a cam block **106** bearing against the actuator **108** of a push switch **110** which is thereby actuated to alternatively reverse a valve **111** controlling delivery of compressed air alternately through conduits **112, 114** opposite sides of the piston **96** in the cylinder **100**. Thus, as the cam surface of the block **106** actuates the control switch **110** coincident with each shift of the arm **104**, it causes the roll to reciprocate axially while it rotates.

The elevational position of the processing roll **40** is regulated by means of a combination hand and pneumatic piston-cylinder control unit so that the working pressure of the processing roll **40** against the workpiece may be adjusted at will and will thereupon operate uniformly against the work. The control unit comprises a piston rod **120** which is threaded at one end through a nut bearing **122** which is carried by a crank arm **124** which is keyed to the roll position control spindle **28**. A handwheel **125** is fitted to the top end of the rod **120** for manual adjustment thereof. At its lower end the rod **120** carries a piston riding within a cylinder **126** which is based upon the machine frame by means of a pivot connection **128** (FIG. 3). Depending upon the thickness of the workpiece to be processed, the roll **40** will first be vertically adjusted by means of the handwheel **125** to such a position that when compressed air is delivered to the cylinder **126** as by the control system of FIG. **15**, the piston thereof will bias the arms **30, 32, 33**, so as to press the roll **40** against the workpiece with the desired degree of pressure. Thus, although the table will be "-mechanically" adjusted vertically in the first place to different workpiece thicknesses, after the initial adjustment the working pressure against the processing roll will in all cases be determined and maintained by the air pressure within the cylinder **126**. Inasmuch as this is of a resilient nature a substantially uniform pressure will at all times be exerted by the roll against the entire surface area of the workpiece.

As best illustrated at FIGS. **4, 6, 14**, the range of workpiece holding platform travel is regulated by means of a valve **146** controlling alternate applications of fluid pressure to the cylinder **55**. In turn, operation of the valve is controlled by means of a handwheel **130** keyed to a lead screw **132** which is rotatably carried by the table **50** at its opposite ends. A parallel disposed lead screw **134** is similarly mounted on the bed **50**, and the screws **132—134** are geared to rotate together by means of a gear system as indicated at **136** (FIG. 4). A pair of blocks **140—142** are mounted on the parallel lead screws in screw-threaded relation therewith, and are thereby arranged to be longitudinally shiftable relative to the bed **50** by rotation of the control handle **130**. The blocks **140, 142** each carry fingers **144** arranged to extend laterally into abutting engagements with the upper end of a control arm **145** extending vertically from the actuator of the valve **146** (FIG. **6**) which controls alternate delivery of hydraulic pressure to opposite ends of the cylinder **55**. Thus it will be appreciated that suitable manual adjustments of the handwheel **130** will regulate the range of reciprocation of the workpiece carrying table.

Whereas certain type workpieces may readily be processed by simply laying them on the table **65**, as illustrated at FIGS. **7, 8**, a vacuum table **150** may be employed so as to support the workpieces **65** at a slight elevation above the table plate **60**. Hence, a source of vacuum may be applied thereto as indicated at **152** to assist in holding thin sheets or the like in proper processing position.

It is also a special feature of the machine of the invention that the processing roll pressure regulating mechanism is readily adjustable so that the machine may process with improved facility workpieces of irregular contour. As illustrated at FIGS. **9, 9A, 9B** and **9C**, a pair of slide rods **160–160** are arranged to extend longitudinally of the platform **50** and are fixed at their opposite ends thereto. A plurality of control blocks **162** are slidably mounted upon the rails **160–160** and are thereby adapted to be adjustably positioned on the slide rails longitudinally thereof. The blocks **162** include finger portions **164** which are set so as to extend alternately into abutting registry with the actuators of a pair of pilot valves designated LS4 and LS5 FIGS. **9, 9A, 9B, 9C** and **11**) which are positionally fixed on the stationary machine frame. The parts are so arranged that if a workpiece **65** having a vertical profile of the type shown at FIG. **9** is to be processed by the roll **40**, the control blocks **162** may be manually shifted and set on the rods **160** so as to vertically coincide, alternatively, with the peaks and valleys of the workpiece; so that as the table **60** reciprocates back and forth toward the processing roll the control blocks come successively into operative positions relative to the pilot valves, according to the settings of the control blocks.

For example, the control block designated **1** at FIG. **9** may have its bottom finger **164** extended so as to actuate pilot valve LS4 as the table begins to carry the workpiece to the roll **40**. The valve LS4 thereupon controls the air pressure supply system so as to permit the pressure in the cylinder **126** operating to press the roll downwardly to bleed off; thereby permitting the roll to accommodate to the rising configuration of the workpiece portion illustrated at station **2** without applying excessive pressure against that portion of the workpiece surface. Then when the roll reaches station **2** of the control block **162** thereat actuates the pilot valve LS5 so as to reenergize and/or restore the pressure supply system to the cylinder **126**, thereby accommodating the roll **40** to the lowering profile of the workpiece leading to station **3** thereon; and so on, throughout the extent of the workpiece. Note that the control blocks **162** may be successively located at any suitable positions along the rails **160** so as to provide any desired lead and lag operations of the pressure control system and that the pressure bleed off and rebuild sequences may be readily regulated as to timing and degree, so as to accommodate the operation to the processing of any regularly or irregularly contoured workpiece shapes.

I claim:

1. In a workpiece surface finishing apparatus comprising a base supporting a workpiece carrying table motivated to reciprocate workpieces relative to a finishing roll, said finishing roll being mounted for movement toward and away from the plane of reciprocation of said workpiece when supported by said table, and a control system regulating movements of said finishing roll toward and away from said table, the improvement wherein said control system produces substantially uniform working pressure relationships between said finishing roll and the variously profiled surface portions of the workpiece and comprises in combination:

a fluid cylinder;

a piston movable relatively within said cylinder, one of said cylinder and piston being fixed to said base and the other thereof being coupled to said finishing roll to effect movement thereof;

a counter balance circuit for applying air at relatively high pressure tending to move said piston relatively towards one end of said cylinder whereby the weight of said finishing roll is counter balanced and said finishing roll is moved away from said workpiece;

a finishing roll pressure control circuit for selectively applying air at relatively low pressure to said one end of said cylinder, said low pressure partially counterbalancing said high pressure such as to permit movement of said finishing roll under the influence of gravity towards said workpiece, the difference between said high and low pressures determining the pressure of said finishing roll on said workpiece;

a reduce force circuit for decreasing said low pressure applied to said one end of said cylinder; and

means to control operation of said reduce force circuit in accordance with changes in profile of said workpiece surface.

2. The improvement as set forth in claim 1, wherein said operation control means includes sensor means fixed to said base and a plurality of operator means carried by said table, said operator means being positionally adjustable in the direction of table reciprocation to substantially coincide with changes in profile of said workpiece surface, said sensor means being responsive to said operator means for controlling operation of said reduce force circuit.

3. The improvement as set forth in claim 2, wherein said reduce force circuit includes valve means, said sensor means controlling operation of said valve means to bleed air from said one end of said cylinder to decrease said low pressure.