Sept. 10, 1968 W. C. KEYES 3,400,493

BELT SANDING AND POLISHING MACHINE

Filed Feb. 16, 1966 3 Sheets-Sheet 1

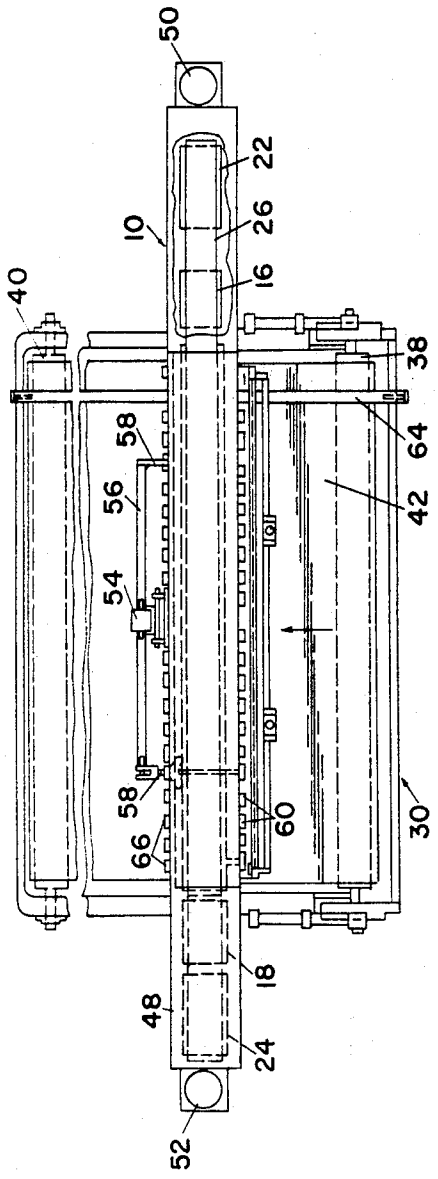


FIG. 1

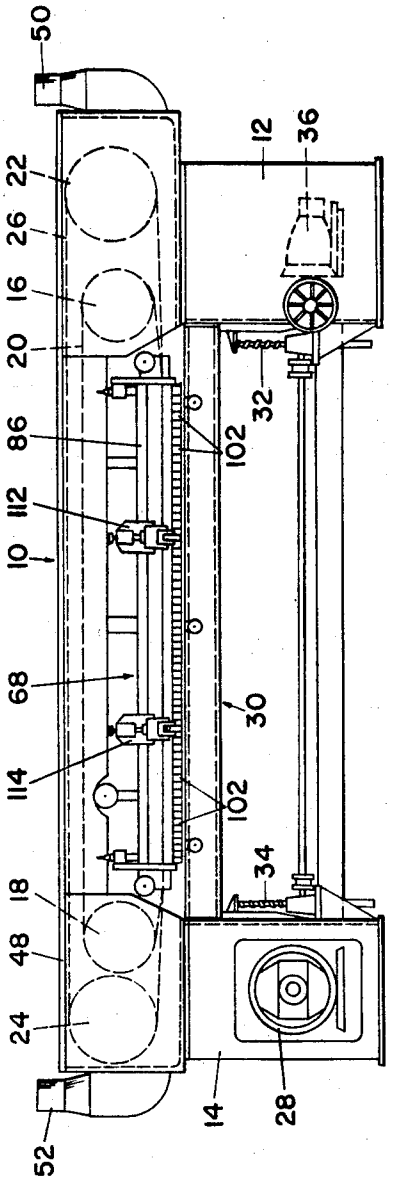


FIG. 2

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BELT SANDING AND POLISHING MACHINE

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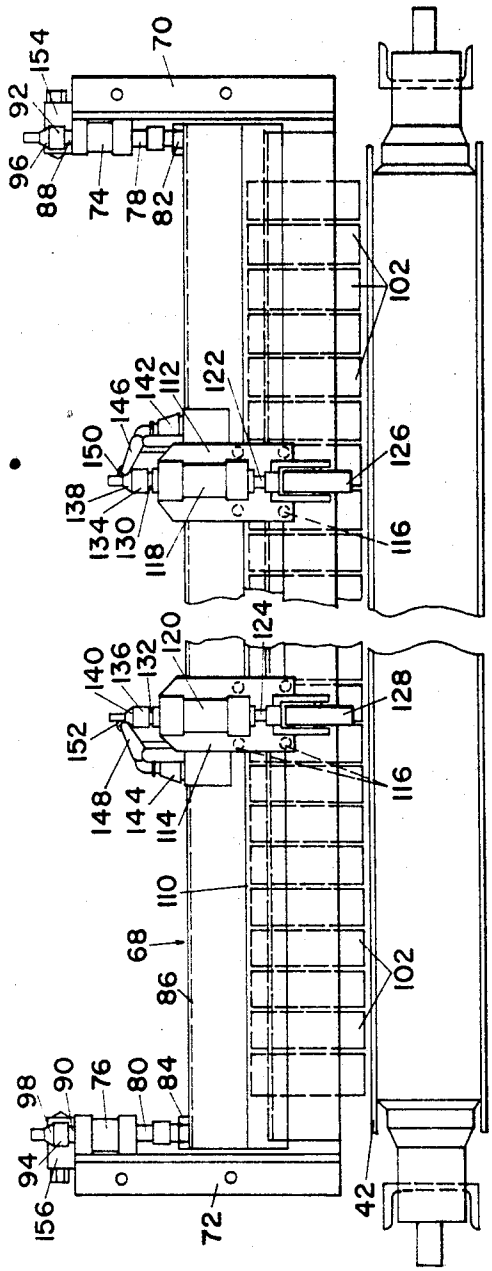


FIG. 3

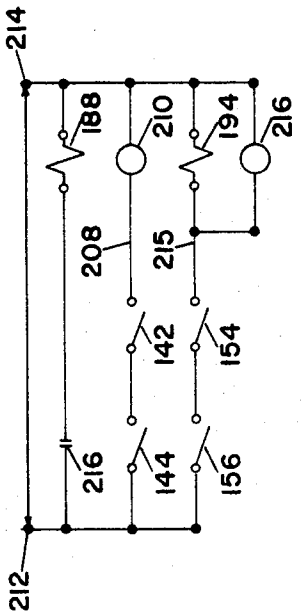


FIG. 6

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BELT SANDING AND POLISHING MACHINE

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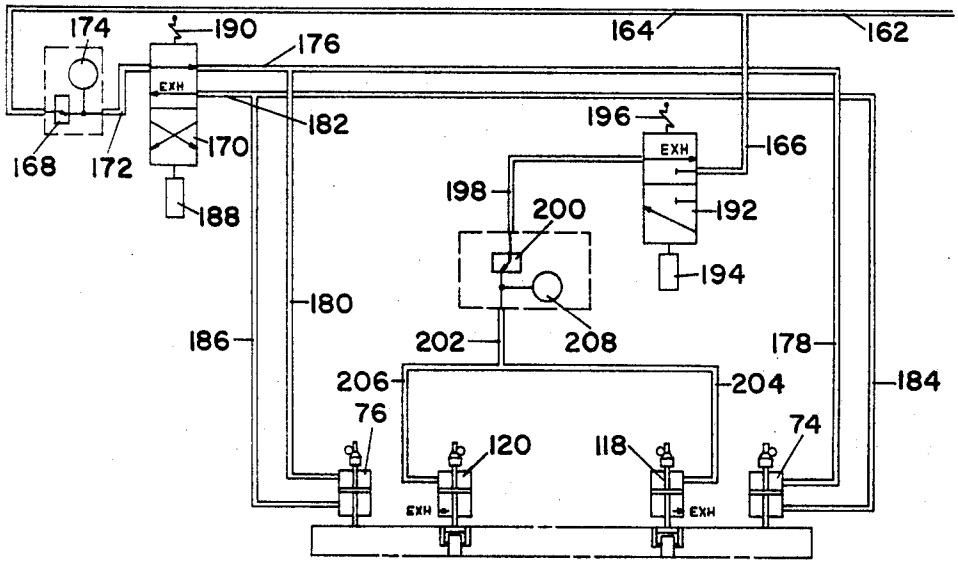


FIG. 5

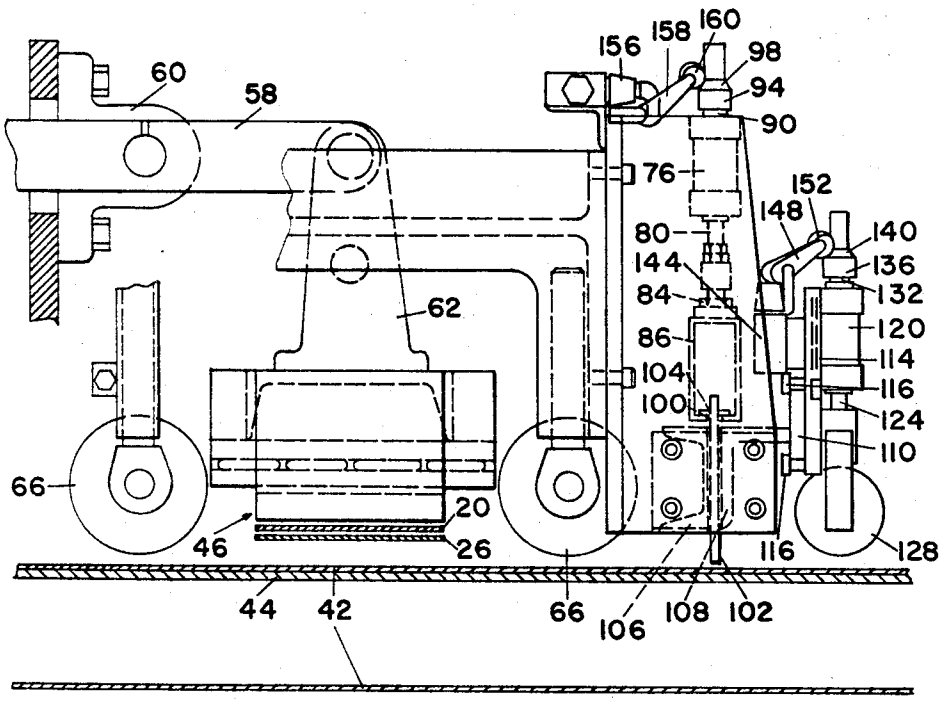


FIG. 4

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3,400,493

# BELT SANDING AND POLISHING MACHINE

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## ABSTRACT OF THE DISCLOSURE

A work positioning and aligning apparatus for a belt sanding machine having a plurality of work engageable segments depending from a support member and adapted to interrupt the advancement of a workpiece. An electrical switching means senses the presence of a workpiece and, after a time delay in which the workpiece abuts the work engageable segments and is caused to be aligned thereby, activates a fluid power means to raise the support member and segments and allows the workpiece to pass thereunder.

This invention relates to belt sanding and polishing machines, and more particularly, to means for maintaining accurate alignment of a workpiece or workpieces regardless of the orientation or sporadic feeding of such workpieces onto the inby end of a conveyor means.

In machines of this type wherein work is fed perpendicularly to the longitudinal axis of an abrasive belt, a pressure caul is employed to bear against the abrasive belt desirably at the moment a moving workpiece is partially disposed beneath such belt a preselected distance. Otherwise, if pressure is applied to the abrasive belt as the leading edge of a veneered workpiece approaches such belt, there is a possibility of sanding through the lamination of veneer adjacent such edge. Likewise, pressure is removed from the belt by raising the pressure caul while the trailing edge of such workpiece is still disposed beneath the belt. Accordingly, if the plane of the leading edge of the workpiece is askew with respect to the longitudinal axis of the abrasive belt, portions of the leading edge and/or trailing edge of the workpiece may be damaged. Therefore, it is desirable to orient the workpiece in such a manner that the leading edge thereof lies in a plane parallel to the longitudinal axis of the abrasive belt.

Further, it is sometimes expedient to feed two short workpieces of substantially equal widths simultaneously, either by two workmen or by two separate intermittent conveyor feeding arrangements, thus doubling the capacity of the machine. In such operations, it is readily apparent that such sporadic feeding will result in longitudinal misalignment of the side-by-side workpieces beneath the abrasive belt causing a belated sanding operation on the first approaching workpiece, thus leaving the leading edge thereof unfinished. Alternatively, a premature sanding of the second advancing workpiece may occur in which case its trailing edge will be left unfinished.

The sanding and polishing machine of the present invention, as hereinafter described, provides a solution to the above problem by providing means for maintaining a workpiece or workpieces in alignment prior to such workpieces being advanced toward the abrasive belt.

It is, therefore, an object of the present invention to provide a new and improved sanding and polishing machine.

It is another object of the present invention to provide a new and improved sanding and polishing machine having novel work positioning or aligning means.

It is still another object of the present invention to provide a new and improved sanding and polishing machine having novel work positioning or aligning means for insuring proper orientation of workpieces prior to the advancement of such workpieces into the sanding and polishing machine.



It is a specific object of the present invention to provide a new and improved sanding and polishing machine having a novel stop gate assembly for precluding the advancement of workpieces into the sanding and polishing machine until the leading edges of such workpieces are properly oriented with respect to an abrasive belt of the sanding and polishing machine.

These and other objects of this invention will become more apparent upon consideration of the following detailed description thereof when taken in conjunction with the following drawings, in which:

FIGURE 1 is a top plan view, with parts broken away, of a sanding and polishing machine in which a preferred illustrative embodiment of the invention is incorporated;

FIGURE 2 is a front elevational view of the sanding and polishing machine of FIGURE 1;

FIGURE 3 is an enlarged front elevational view of the stop gate assembly;

FIGURE 4 is an enlarged side elevational view of the stop gate assembly, showing portions rearwardly thereof schematically;

FIGURE 5 is a diagrammatic view illustrating the pneumatic circuit for the stop gate assembly; and

FIGURE 6 is an electrical circuit diagram for the stop gate assembly.

With reference to FIGURES 1 and 2 of the drawings, it will be seen that a sanding and polishing machine constructed in accordance with the principles of this invention comprises a suitable elongated horizontal frame, generally designated **10**, suitably supported by a base comprising vertically extending pedestals **12** and **14**. Journaled for rotation in suitable bearings on frame **10** are a pair of back-up belt pulleys **16** and **18** around which endless back-up belt **20** is trained for movement in an orbital path. Also journaled for rotation in suitable bearings on frame **10** are a pair of abrasive belt pulleys **22** and **24** around which an endless abrasive belt **26** is trained for movement in an orbital path. A suitable motor **28**, mounted in pedestal **14**, drives pulleys **18** and **24** in the same direction through suitable gear reduction and drive connections, not shown but well-known in the art. The back-up belt **20** is driven at approximately ½ the linear speed of the abrasive belt **26**.

A conveyor frame, generally designated **30**, disposed beneath frame **10** is supported by a pair of screw jacks **32** and **34** located on the pedestals **12** and **14**, respectively, and may be selectively raised or lowered through a suitable gear reduction means (not shown) by motor **36** mounted in pedestals **12**. Conveyor frame **30** is provided with rollers **38** and **40** journaled for rotation in suitable bearings at opposite ends of frame **30** and endless conveyor belt **42** is trained about such rollers for the purpose of advancing workpieces beneath abrasive belt **26** in the direction of the arrow shown in FIGURE 1. A base plate **44** (FIGURE 4) is suitably mounted on frame **30** and provides a flat rigid support for the active or upper run of conveyor belt **42**. The conveyor belt is driven by any suitable means, such as an electric motor by way of example, at a uniform speed.

A caul assembly, well-known in the art and generally indicated as **46**, suitably mounted on from **10**, urges the active or lower runs or back-up belt **20** and abrasive belt **26** against a workpiece. Caul assembly **46** and belts **20** and **26** are enclosed within a housing **48** for collecting the dust generated during the sanding and polishing operation, the dust laden air being drawn out of the housing through spaced outlets **50** and **52** disposed at opposite ends of housing **48** by means of any conventional dust removal equipment.

The mechanical means for raising and lowering caul

assembly 46 comprises a suitable hydraulic caul cylinder 54 mounted on frame 10 and operatively connected to an elongated horizontally extending bar 56 having elongated horizontally extending levers 58 secured to the opposite ends thereof and disposed normal thereto. Levers 58 are mounted for pivotal movement in bearings 60, respectively, on frame 10 and have their ends remote from bar 56 connected to brackets 62, respectively, extending upwardly from the caul assembly 46. Thus, when fluid under pressure is properly supplied to the caul cylinder 54 to lower or raise bar 56 the remote ends of levers 58 may be swung either upwardly or downwardly, respectively, about their pivots in bearings 60 to raise or lower caul assembly 46.

A work guide fence 64 (FIGURE 1) is secured on the conveyor frame 30 and extends transversely of the run of abrasive belt 26 for guiding the advance of the workpiece on the conveyor belt 42. A similar work guide fence (not shown) may be disposed on conveyor frame 30 on the opposite end thereof (left hand side as viewed in FIGURE 1) for maintaining workpieces within prescribed paths under the caul assembly. A plurality of vertically adjustable rollers 66 are mounted along the front and rear of housing 48 for urging workpieces against conveyor belt 42.

In order to insure that the leading edge of a workpiece or workpieces will be in alignment in a direction parallel to the longitudinal axis of abrasive belt 26, a work positioning or aligning stop gate assembly, generally indicated as 68, is provided, said stop gate assembly being mounted between a pair of end brackets 70 and 72, rigidly secured to frame 10 and spaced upwardly from conveyor belt 42.

Suitably rigidly secured to end brackets 70 and 72 are a pair of pneumatic cylinders 74 and 76, respectively, having movable piston rods 78 and 80 which are secured as by means of lock nuts 82 and 84 to the opposite ends of an elongated support member 86 which extends substantially along the width of conveyor belt 42 and has a substantially rectangular cross section as shown in FIGURE 4. The other ends of rods 78 and 80 are, of course, attached to pistons (not shown) to which are further attached elongated cylindrical plungers 88 and 90 which extend through the upper ends of cylinders 74 and 76, respectively. Collars 92 and 94 are affixed to the plungers and are provided with beveled shoulders 96 and 98 at their upper ends for a purpose to be hereinafter more fully explained.

Support member 86 is provided with a longitudinal slot 100 along the bottom thereof extending substantially the length of member 86 for receiving a plurality of rectangular, relatively thin, vertically depending segments or stop bars 102. Integral shoulders or protuberance 104 are provided on stop bars 102 adjacent the upper ends thereof for engagement with the bottom of support member 86 to limit the extent of downward travel of such stop bars. It should be noted that the stop bars 102 may be moved vertically with respect to the support member 86 for a purpose to be hereinafter explained.

An elongated structural channel member 106 of a U-shaped cross section and an elongated structural member 108 of an inverted L-shaped cross section extend along the bottom of the stop gate assembly and are suitably rigidly secured at their opposite ends to end brackets 70 and 72. The bight portion of member 106 and the longer leg of member 108 are disposed in a back-to-back spaced relationship to form a slot for accommodating the stop bars 102.

An elongated guide rail 110 secured to the edge of the shorter leg of member 108 extends along the length of the stop gate assembly 68 and carries a pair of brackets 112 and 114, said brackets being selectively positioned along the length of the guide rail and held in the selected position by means of suitable shoulder screws 116.

Rigidly secured as by any suitable means to brackets 112 and 114 are pneumatic actuating cylinders 118 and 120 having piston rods 122 and 124, respectively, longitudinally movable relative thereto and having abutment rollers 126 and 128 rotatably secured to the lower ends of said rods, respectively. The other ends of rods 122 and 124 are connected within their respective cylinders to pistons (not shown) which have elongated cylindrical plungers 130 and 132 extending upwardly therefrom and through the uppers ends of cylinders 118 and 120. Collars 134 and 136, affixed to stems 130 and 132 are provided with beveled shoulders 138 and 140, respectively, at their upper ends for a purpose hereinafter explained.

Suitably rigidly secured to brackets 112 and 114 on the sides opposite the cylinders are a pair of limiting switches 142 and 144 having pivotable levers 146 and 148 provided with rollers 150 and 152 at their free ends, respectively. Vertical movement of plungers 130 and 132 swing levers 146 and 148 upwardly about their respective pivot axes due to the camming action of their respective beveled shouldered collars so as to close the normally open limit switches 142 and 144, respectively.

In like manner, a pair of limiting switches 154 and 156, rigidly secured to end brackets 70 and 72 are provided with pivotable levers 158 having rollers 160 (see FIGURE 4) disposed at their free ends, respectively. Switches 154 and 156 are closed in the same manner as switches 142 and 144 through their respective plunger and lever arrangements.

Referring now to the diagrammatic showing of the pneumatic system in FIGURE 5, it will be observed that a pressure supply conduit 162 connected to a suitable source of fluid pressure (not shown) directs fluid under pressure to conduits 164 and 166. Conduit 164 is connected to a suitable pressure reducing valve 168 which in turn is connected to a directional valve 170 by means of conduit 172. A pressure gauge 174 is tapped into conduit 172 for indicating the pressure supply to directional valve 170. Leading from valve 170 is a conduit 176 connected to the upper sides of the pistons in cylinders 74 and 76 by means of conduits 178 and 180, respectively. Also leading from valve 170 is a conduit 182 connected to the lower sides of the pistons in cylinders 74 and 76 by means of conduits 184 and 186, respectively. Directional valve 170 is provided with a spool valve and the position of such spool valve is controlled by a solenoid 188 and a spring 190.

Conduit 166 is connected to a directional valve 192 having a spool valve therein, the position thereof being controlled by a solenoid 194 and a spring 196. A conduit 198 connects the directional valve 192 to a pressure reducing valve 200. Leading from the pressure reducing valve 200 is a conduit 202 connected to the upper side of the pistons in cylinders 118 and 120 by means of conduits 204 and 206, respectively. A pressure gauge 208 is tapped into conduit 202 for ascertaining the amount of pressure supplied to said conduit and thereby to the cylinders 118 and 120. The lower portions of cylinders 118 and 120 are vented to exhaust to preclude pressure build-up therein.

With reference to FIGURES 5 and 6, the mode of operation is as follows: a workpiece, such as a veneered wood panel, is placed on conveyor belt 42 and is advanced toward the sanding machine. Assuming the leading edge of the workpiece is not parallel with the stop gate assembly, a portion of the leading edge of the workpiece will contact one of the abutment rollers and raise it slightly to actuate its respective plunger and thereby trip the corresponding limit switch. When the other abutment roller is engaged by another portion of the front edge of the workpiece, it will affect closing of its respective limit switch, which is in series with the other switch, to complete a circuit through conductor 208 to energize timer 210, thus maintaining the stop gate assembly 68 down for a predetermined time until the workpiece abuts stop bars 102, which form an aligning gate for the leading edge of the workpiece, thereby allowing the work-

piece to align itself. It should be noted that the exciting current for the circuit shown in FIGURE 6 is supplied from a suitable source (not shown) through input terminals **212** and **214**.

At the end of this predetermined time, time delay relay **216** closes to energize solenoid **188**. When the solenoid **188** is energized, the spool valve within directional valve **170** is displaced to align conduit **176** with exhaust so that the upper side of the pistons within cylinders **74** and **76** will be vented by means of conduits **178** and **180**. Conduit **172** will then be in communication with conduit **182** to direct fluid pressure to the underside of the pistons within cylinders **74** and **76** for the purpose of elevating support member **86** and stop bars **102** thus allowing the workpiece to advance toward and beneath the abrasive belt **26**.

Actuation of cylinders **74**, **76**, trip limit switches **154**, **156**, which are in series, to complete a circuit through conductor **214** to energize solenoid **194** and control relay **216**. Energization of solenoid **194** displaces the spool valve therein to direct fluid under pressure from conduit **166** to **198** and then to the upper sides of the pistons in cylinders **118** and **120** to exert pressure on the workpiece against the moving conveyor belt **42** so as to maintain the alignment of the workpiece effected by the stop gate assembly **68**.

Energization of the control relay **216** and its attendant circuitry (not shown) is effective in responding to the linear rate of travel of conveyor belt **42** for controlling the exact instant of caul assembly lowering in order to insure that the workpiece is properly located beneath the abrasive belt **26**. As this caul assembly control mechanism is conventional and has been widely used in known commercial structures by applicant's assignee, no further explanation or amplification is believed necessary.

As the abutment rollers **126**, **128** drop off the trailing edge of the workpiece, limit switches **142**, **144** are opened to interrupt the circuit in line **208**, thereby de-energizing solenoid **188**. As solenoid **188** is de-energized, spring **190** displaces the spool valve in directional valve **170** to exhaust pressure from the lower sides of the pistons of cylinders **74** and **76** through conduits **184**, **186** and **182** (see FIGURE 5) while fluid under pressure is directed to the upper sides of the pistons to lower member **86** and stop bars **102**. However, since the workpiece is still partially beneath the stop bars **102** and because they are vertically movable with respect to support member **86**, they merely ride on top of the workpiece until such workpiece passes thereby at which time the bars descend by gravity to their "down" position in readiness for the next workpiece.

Lowering of the support member **86** opens limit switches **154** and **156** to interrupt the circuit in line **214** which effects de-energization of solenoid **194**. Spring **196** displaces the spool valve within directional valve **192** to exhaust pressure from the upper sides of the pistons in cylinders **118** and **120** so that the next workpiece can easily raise the abutment rollers. The apparatus is now conditioned for a repetition of the above described cycle.

It should be appreciated that two workpieces of shorter lengths and substantially equal widths may be aligned in a side-by-side relationship by means of the stop gate assembly prior to approaching the caul assembly in a manner similar to that described above in connection with a single workpiece since the cycle will not be initiated until both series-connected switches **142**, **144** are activated.

The principles of this invention contemplate the utilization of only one limit switch, if desired. In such an arrangement, either switch **142** or **144** would be electrically connected in line **208** to initiate the above-described cycle. Moreover, it should be realized that other types of electrical switches, such as static switches for example, may be employed in lieu of the mechanical switches shown within the purview of the principles of this invention.

As a result of this invention, an improved belt sanding and polishing machine is provided for polishing veneered workpieces in an improved and more efficient manner. By the provision of a stop gate assembly incorporating a plurality of segments or stop bars, the workpieces are restricted in their advancement toward the sanding machine until the leading edges thereof are in alignment, thereby insuring that the leading edges of such workpieces will be properly disposed parallel to the longitudinal axis of the abrasive belt. Because a workman need not exercise time-consuming care in depositing workpieces on the conveyor belt, increased production is obtained. Moreover, the workpieces may be transferred to the conveyor belt by any mechanical means of conveyance without any concern for the precise orientation of the leading edges of said workpieces.

A preferred embodiment of this invention having been described and illustrated, it is to be realized that modifications thereof may be made without departing from the broad sphere and scope of this invention as defined in the appended claims.

I claim:

**1.** A sanding and polishing machine comprising: a base; an upper frame mounted on said base; an abrasive belt mounted for movement on said upper frame; a lower frame mounted on said base and spaced beneath said upper frame; said lower frame supporting a conveyor means for advancing a workpiece through a path of travel toward said abrasive belt and normal to said movement of such abrasive belt; aligning means mounted on said upper frame forwardly of said abrasive belt and extending transversely of said path of travel for interrupting the advancement of said workpiece until the leading edge thereof abuts said aligning means and is disposed parallel thereto; and power means for elevating said aligning means to allow the workpiece to pass thereby.

**2.** A sanding and polishing machine as defined in claim **1** having means mounted forwardly of said aligning means for sensing the presence of a workpiece; and control means responsive to said sensing means after a time delay for actuating said power means to elevate said aligning means out of the path of travel of said workpiece.

**3.** A sanding and polishing machine as defined in claim **2** wherein said aligning means comprises a substantially vertically movable support member operatively connected to said power means and having a plurality of aligned work engageable segments supported thereby and substantially vertically movable relative thereto.

**4.** A sanding and polishing machine as defined in claim **3** wherein said sensing means comprises at least one movable member having a portion engageable by an approaching workpiece; said control means activated in response to vertical movement of said movable member for initiating actuation of said power means.

**5.** A sanding and polishing machine as defined in claim **4** having pressure means operatively connected to said movable member for urging said workpiece against said conveyor means; said control means including first electrical switching means for initiating actuation of said power means, time delay means for delaying the actuation of said power means momentarily, and second electrical switching means for actuating said pressure means after the leading edge of said workpiece has advanced beyond said movable member.

**6.** A work positioning and aligning apparatus comprising: a frame; an aligning means mounted on said frame forwardly of a work station and normally disposed transversely of the path of travel of a workpiece approaching said work station for interrupting advancement of said workpiece until the leading edge thereof abuts said aligning means and is disposed parallel thereto; power means for elevating said aligning means; means mounted on the frame forwardly of said aligning means for sensing the

presence of a workpiece; and control means responsive to said sensing means after a time delay for actuating said power means to elevate said aligning means out of the path of travel of said workpiece.

7. A work positioning and aligning apparatus as defined in claim 6 wherein said aligning means comprises an elongated substantially vertically displaceable support member having a plurality of aligned work engageable segments supported thereby and substantially vertically movable relative thereto; said work engageable segments disposed in a side-by-side relationship along the length of said support member.

8. A work positioning and aligning apparatus as defined in claim 7 wherein said support member is of a rectangular cross section having a slot extending longitudinally of said support member along the bottom wall thereof; said work engageable segments having upper portions provided with protuberances, respectively, supported by said bottom wall and portions extending downwardly through and beyond said slot.

9. A work positioning and aligning apparatus as defined in claim 7 wherein said sensing means comprises at least one movable member having a portion engageable by an approaching workpiece; said control means having



electrical switching means activated in response to vertical movement of said movable member for initiating actuation of said power means; said control means including time delay means for delaying the actuation of said power means a sufficient period of time to allow the alignment of the leading edge of said workpiece with said plurality of work engageable segments.

10. A work positioning and aligning apparatus as defined in claim 9 having a pressure means for urging said movable member against said workpiece; said control means including other electrical switching means for actuating said pressure means after the leading edge of said workpiece has advanced beyond said movable member.

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