May 13, 1958 J. J. PEARL 2,834,384

VENEER JOGGERS AND JOINTERS

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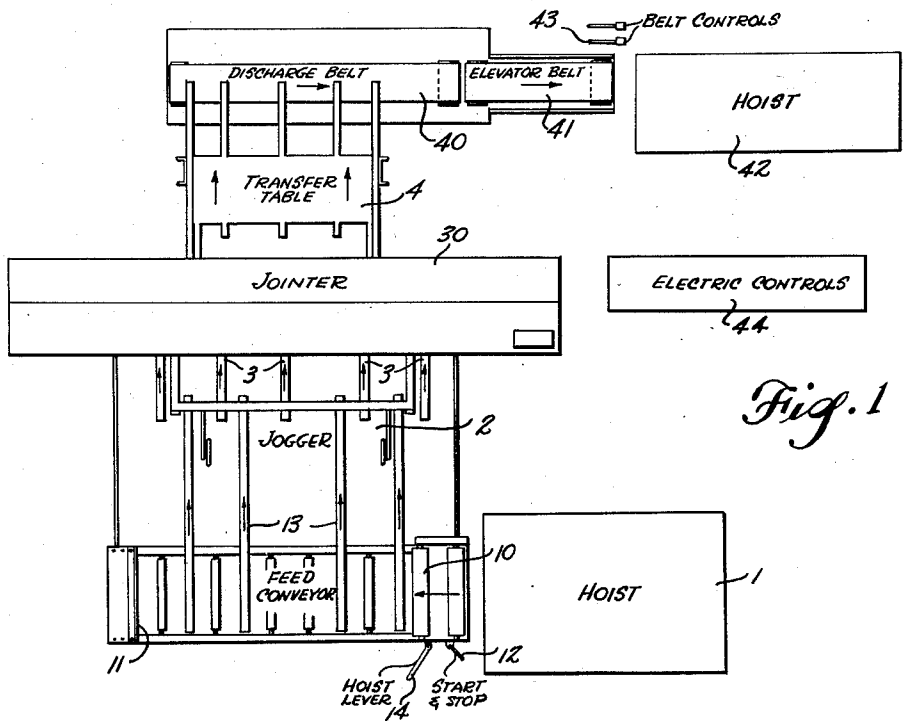
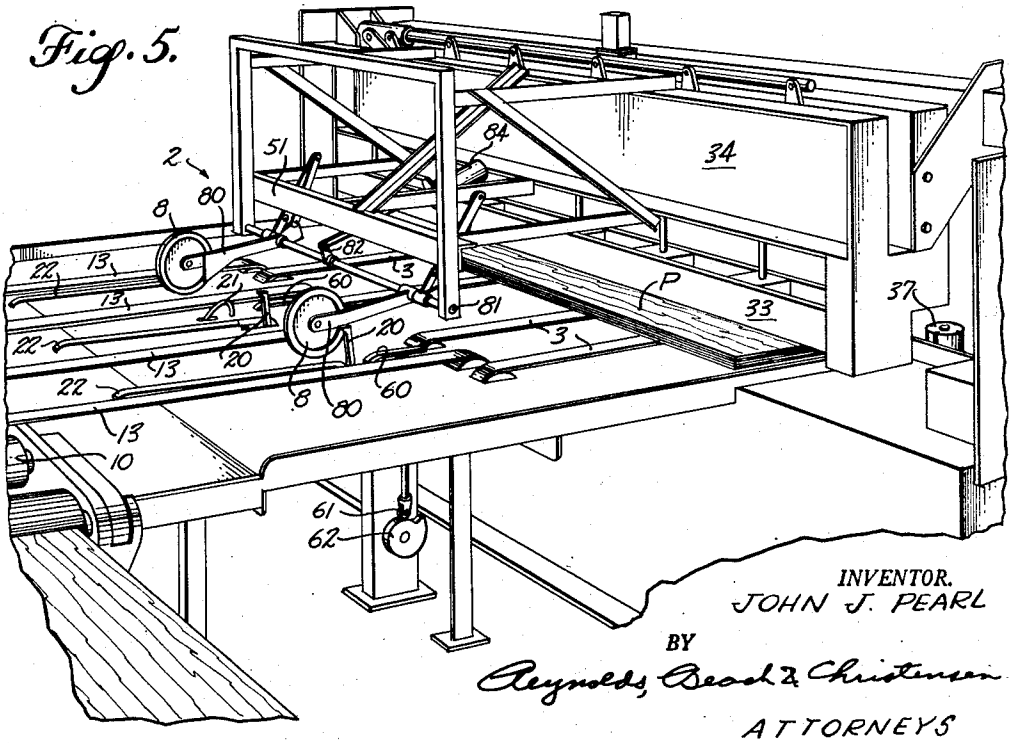


Fig. 1

Fig. 5.



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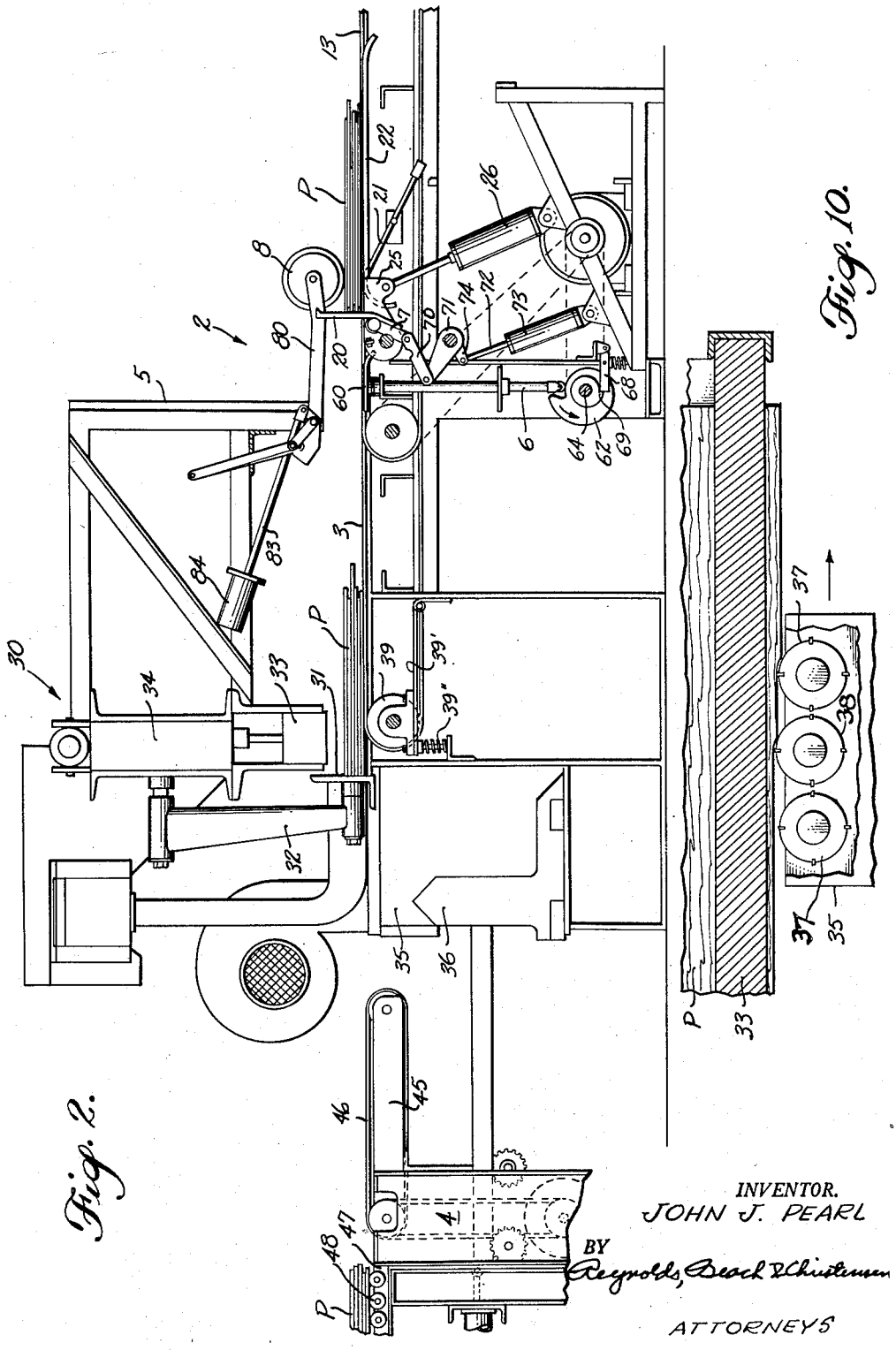


Fig. 2.

Fig. 10.

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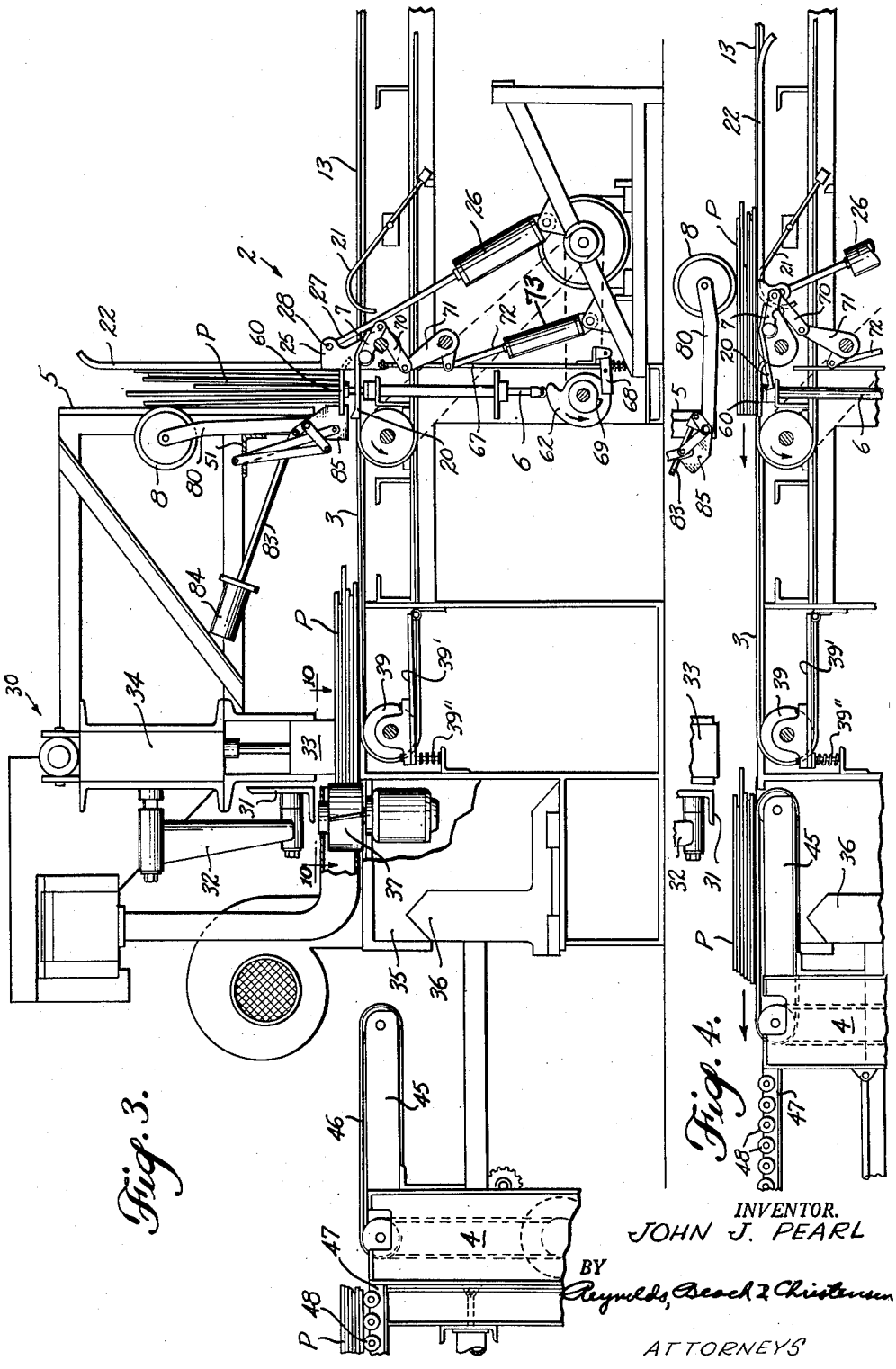


Fig. 3.

Fig. 4.

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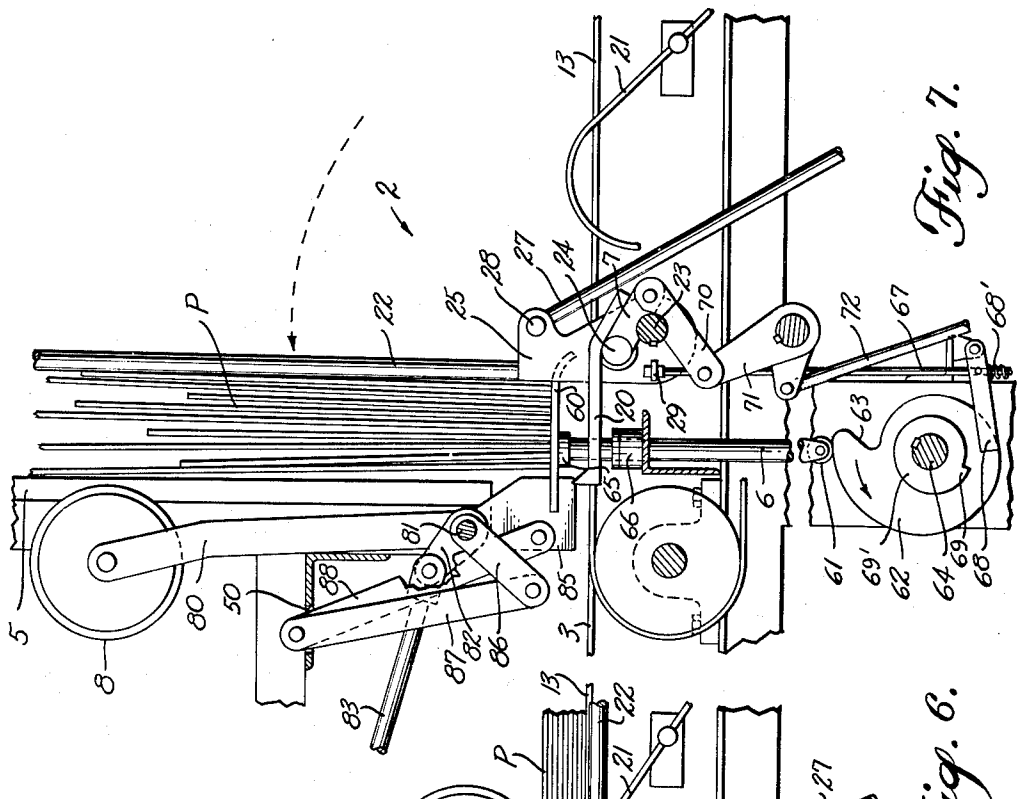


Fig. 7.

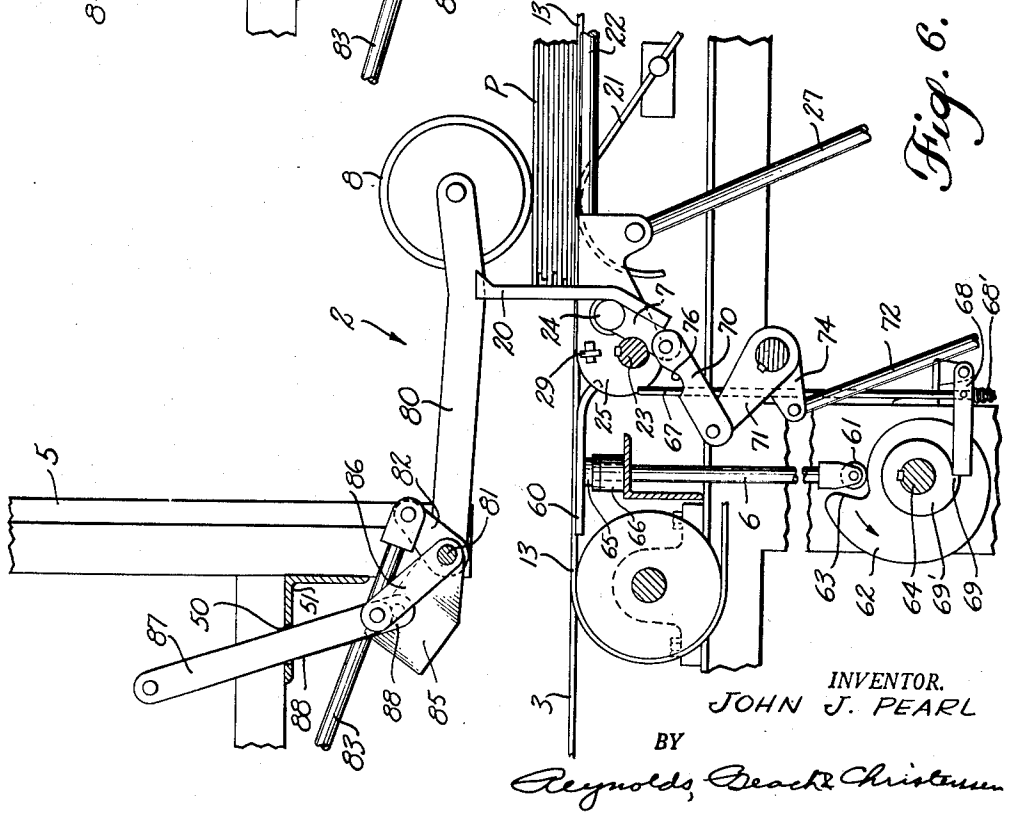


Fig. 6.

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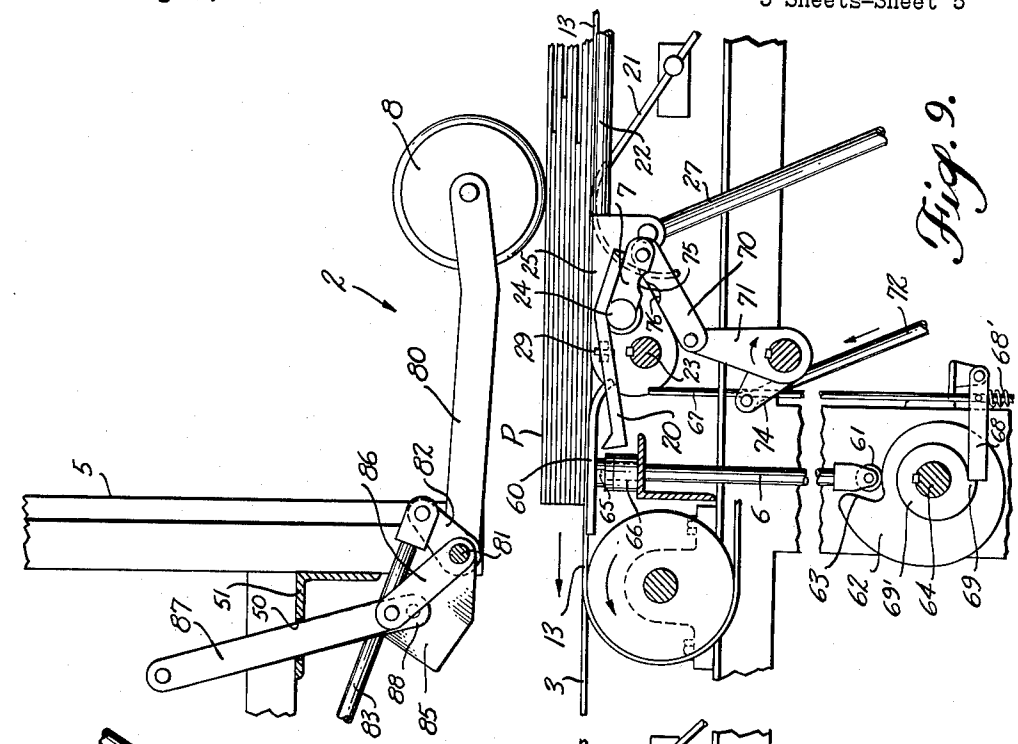


Fig. 9.

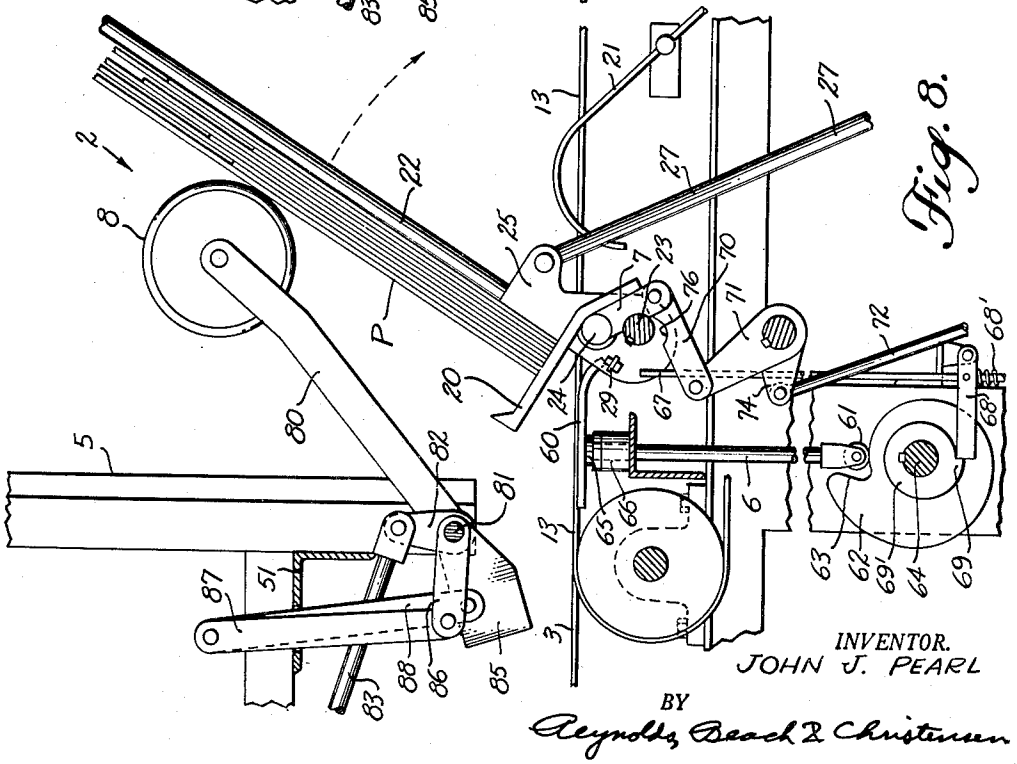


Fig. 8.

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VENEER JOGGERS AND JOINTERS

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Application August 2, 1955, Serial No. 525,911

19 Claims. (Cl. 144—117)

The present invention relates to a machine for jogging and jointing sheets and is particularly well adapted for processing sheets of veneer, although the principles of its operation and comparable structural features could be incorporated in a machine for processing sheets of other types.

A principal object of the present invention is to provide such a machine which will execute a jogging and jointing cycle of operations on a stack of sheets automatically, so that minimum work and attention of the machine operator or operators is required.

A further object is to provide such a jogging and jointing machine which will joint one edge of each sheet in a pack of sheets of random width, and which will accommodate sheet packs of different thicknesses within limits. The thickness of the sheets in the pack makes no difference in the operation.

Another object is to provide such a machine which is very fast in operation, but which will not continue to operate when packs of sheets to be jointed are not being supplied to the machine.

An additional object is to provide a jogging and jointing machine which is accurate in its operation and which reduces waste of sheet material as much as possible.

A machine capable of accomplishing the foregoing objects may incorporate a sheet pack supply conveyor which delivers to a jogger successive packs of sheets to be jointed in horizontal position. The pack of sheets is then tipped on edge, and while the sheets in the pack are confined loosely the pack is raised and dropped, so that the lower edges of the sheets strike supporting elements to register such lower edges. The sheet pack is then returned to horizontal position, moved beneath a clamping bar, and while being held by such bar the sheet edges in registry are jointed. When the clamping bar is released, the pack of sheets is discharged in the same direction as it is fed from the jogger to the jointer by a transfer table.

Details of a preferred type of machine are shown in the accompanying drawings.

Figure 1 is a diagrammatic plan view illustrating the relationship of various components of the machine.

Figure 2 is an end elevation view of a portion of the machine showing its parts in one operative position, and Figure 3 is a similar view showing parts in a different operative position, sections of which have been broken away.

Figure 4 is an end elevation view of the machine with parts in still a different position and having portions of the machine broken away.

Figure 5 is a top perspective view of a portion of the machine.

Figures 6, 7, 8 and 9 are similar detail end elevation views of a portion of the machine on an enlarged scale, showing the parts in different operative positions.

Figure 10 is a horizontal sectional view through a portion of the machine, taken on line 10—10 of Figure 3.

In the manufacture of plywood it is customary to make individual plies of a plurality of sheets joined together in

edge abutting relationship. Particularly for the face plies it is important that the joint or joints between the veneer pieces be tight. Consequently, the abutting edges of the veneer sheets are usually secured together either by tape or by edge-gluing. In either case in order to make a tight joint it is necessary for the abutting edges of the veneer sheets to be perfectly straight and smooth. To prepare such edges to be joined, the edges may be planed by a jointer head and both for economy of operation and to support veneer sheet edges more firmly during the jointing operation, several of such sheets may be clamped in a pack for jointing.

The most usual length for a face veneer sheet used in the manufacture of plywood is approximately one hundred inches, which would be used in the manufacture of plywood sheets having a finished length of eight feet and a finished width of four feet. Veneer sheets of this length are too unwieldy for one man alone to handle conveniently, and consequently it has been the practice for two workmen to load and unload a veneer jointer. Where several sheets have been jointed simultaneously, the workmen have placed the veneer edges at one edge of the pack approximately in registry prior to the pack being clamped in the jointer clamp. Because of the unwieldy size of sheets, the great amount of care and time consumed in hand jogging, and the fact that the unprepared stockpile and the finished stockpile are on the same side of the machine and thus one in the way of the other, the operation is slow and awkward.

The deficiencies and disadvantages of a manually operated jointer have been eliminated by the jogging and jointing machine of the present invention. The general character of this machine and the nature of its operation may be understood from the diagrammatic illustration of it shown in Figure 1. A stack of veneer sheets to be jointed may be placed on the hoist **1** adjacent to the feed rolls **10**. From such stack of sheets a workman may start a pack of desired size onto the feed rolls, which pack is moved endwise by them until its leading end strikes an adjustable barrier **11** to arrest further movement of the sheet pack. When the workman desires this pack of sheets to be fed to the jogger **2**, he may manipulate the control handle **12** to depress the feed rolls **10** so that the pack of sheets will be lowered onto continuously moving, parallel belts **13**, moving in a direction transversely of the direction in which the pack is fed by the rolls **10**.

By the belts **13** the pack of veneer sheets is moved transversely of its length to the jogger **2**, at which such sheet pack is stopped automatically. At this location the sheet pack is tipped on edge, raised and allowed to drop several times, so that the lower edges of the sheets strike sheet-supporting means to bring their lower edges into registry automatically. The sheet pack is then tipped back to dispose the sheets again in substantially horizontal position, and the pack is fed forward by additional belts **3**, while the edges of the sheets in the pack remain in registry, to the jointer **30**. The sheet pack is there clamped in position while the registering edges of its sheets are jointed.

Following the jointing operation and release of the sheet pack from the jointer clamp, the sheet pack is moved on in the same direction by the transfer table **4** onto a discharge belt **40** from which the pack is conveyed by an elevating belt **41** onto a stack of sheets having one edge jointed, which is accumulated on a truck **42**. It will be seen, therefore, that the jogging and jointing machine processes the sheets automatically and requires attention only for initial feeding of packs of sheets to the machine and for accumulation of the jointed sheets in a stack for removal from the machine. For feeding the sheets a workman may adjust the elevation of the hoist **1** appro-

priately at will by manipulation of the hoist control lever 14, and a workman similarly may adjust the slope of the belt 41 by manipulation of the control lever 43.

When a pack of veneer sheets is being carried by the belts 13 to the jogger 2, retractable stop bars 20 are in the raised or operative position shown in Figures 2 and 6. The leading edge of a sheet pack P will engage these stop bars so that further movement of the pack will be arrested, although the belts continue to move and slip beneath the pack. As shown in Figure 5, a plurality of stop bars 20 are provided, there being preferably at least three in alignment, one being located near each end of the pack and the third being located between such end stop bars. When the pack is thus stopped by the stop bars, the edges of the sheets at the leading edge of the pack are not in registry as is shown best in Figure 6.

To register the leading edges of the sheets in the pack such pack is tipped on edge and jogged while the sheets are confined loosely. This operation is initiated automatically by the pack moving into engagement with the stop bars 20 depressing the switch actuating lever 21, which controls operation of the sheet pack tipping mechanism. Such mechanism includes a plurality of flipper bars 22 carried by the rock shaft 23. The flipper bars, of which there may be three as shown in Figure 5, extend parallel to the belts 13 and are located between them. The stop bars 20 are carried by pivots 24 mounted on the flipper bar supporting plates 25 which are secured to the rock shaft 23 so that when this rock shaft is turned to swing the flipper bars from the horizontal position shown in Figure 6 to the upright position shown in Figure 7, the flipper bars and stop bars will tip as a unit carrying with them the sheet pack P.

As the flipper bars 22 are tipped into upright position, the sheets of the pack P cannot move appreciably beyond vertical position because the initially uppermost sheet will engage the stop frame 5 as shown in Figure 7. Turning of rock shaft 23 thus to swing the flipper bars may be accomplished by a fluid actuated piston and cylinder actuator 26 shown in Figure 3, the piston rod 27 of which is connected by a pivot 28 to one of the flipper bar supporting plates 25. The flipper bars will be held in the upright position shown in Figures 3 and 7 during the jogging operation to confine the sheets loosely between such bars and the stop frame 5. The spacing of the flipper bars 22 from such stop frame in the design of the machine will determine the maximum thickness of a pack of sheets which can be jogged.

Jogging of the sheets in the pack P is effected by raising them while on edge and allowing them to drop so that the lower edges of the sheets sharply impact supporting means because of the abrupt lowering of the sheet lifting means. Such sheet lifting means include a plurality of upright lifting rods 6 having crossbar heads 60 extending parallel to the belts 13 and located between them as shown in Figure 5. These crossbar heads are of a length greater than the spacing between the stop frame 5 and the flipper bars 2 in their upright positions shown in Figures 3 and 7 so as to extend beneath the full width of the pack of sheets. The lower ends of such lifting rods carry cam follower rollers 61 which engage spiral cams 62 to support the lifting rods.

The spiral cams 62 include an abrupt shoulder 63 which is stopped in the upright position shown in Figure 6 when the jogger is not operating so that the lifting rods 6 are down far enough to dispose their heads 60 below the upper surfaces of the belts 13. Such heads in that position will also be below the stop bars 20 in their horizontal positions shown in Figure 7, assumed during a jogging operation. As the cam shaft 64 on which the cams are mounted is rotated in the counterclockwise direction as seen in Figures 6 and 7, each cam 62 will gradually raise its lifting rod until it reaches the maximum upper position shown in Figure 7. As the cam rotates farther the follower 61 will drop abruptly past the cam shoulder 63 and the lifting rod will fall to its lowermost position shown in Figure 6. The rod will be arrested in that position by engagement of the collar 65 on its upper end with the guide sleeve 66 so that the cam follower roller 61 will not strike the cam 62.

As the lifting rods 6 are moved upward to their uppermost positions of Figure 7, they will lift with them the sheets of the pack P. As these rods drop subsequently, the sheets of the pack will drop correspondingly abruptly. As the lifting rod heads 60 approach close to their lowermost position the lower edges of the sheets will impact sharply against the stop bars 20 disposed in the horizontal positions shown in Figure 7 at an elevation slightly above that of the lifting rod bar heads 60 in their lowermost positions of Figure 6. As the shaft 64 revolves to turn cams 62 through several revolutions, the sheet pack P will be raised and dropped several times to effect a jogging operation which will bring the lower edges of all the sheets in the pack into registry, as shown in Figure 7. The sheets would not normally simply slide edgewise into such registry upon being tipped on edge, because such veneer sheets usually are warped sufficiently so that when the sheets are confined between the flipper bars 22 and the stop frame 5 there will be sufficient friction between their surfaces to prevent such sliding action without being jogged.

Vertical reciprocation of the lifting rods 6 to effect the jogging operation described preferably is initiated automatically by upward swinging of the flipper bars 22. To effect such control of the jogging mechanism an abutment 29 is mounted on a flipper bar supporting plate 25 eccentrically of the rock shaft 23 in a position to engage and depress endwise the upright jogger control rod 67. This control rod is pivotally connected to the pivoted pawl 68 which normally is held in its upper position by a spring 68' so that its swinging end will engage the stop shoulder 69 on an eccentric collar 69' carried by the cam shaft 64.

As soon as the abutment 29 depresses the control rod 67 in the manner shown in Figure 7, to release the pawl 68, the cam shaft 64 will begin to turn in the counterclockwise direction indicated by the arrow in Figure 7, being driven, for example, by a control cam disengaged clutch. The flipper bars 22 may be held in the upright position shown in Figure 7 by the actuator 26 for a predetermined time interval corresponding to several jogs, and then may be lowered. As soon as the control rod 67 is relieved of the pressure of abutment 29 on it, the spring 68' simultaneously will swing the pawl 68 upward into the position shown in Figure 6 and raise the control rod again into its upper position. When the cam shaft 64 has turned sufficiently to bring the stop shoulder 69 of the eccentric 69' into abutment with the end of the pawl 68, rotation of the cam shaft will be arrested with the cams 62 in the positions shown in Figure 6, so that the lifter rods 6 are in their fully retracted positions.

Upon completion of the jogging operation the flipper bar actuator 26 will retract to lower the flipper bars 22 and stop bars 20 from their positions of Figure 7 through their positions of Figure 8 back to their positions of Figure 6. Thereupon the pack of jogged sheets will be ready to resume its movement to the left, as seen in Figure 9, but in order to enable such movement the stop bars 20 must be retracted to positions below the upper sides of the belts 13, as shown in Figures 4 and 9. Despite the capability of such bars to be moved to such retracted positions, they must be held firmly in fixed relation to the flipper bars during the jogging operation as described in order to withstand the impact of dropping the sheet pack on them.

The operating mechanism provided for the stop bars 20 initially will support such stop bars in the upright position shown in Figures 2 and 6, then will latch the stop bars and flipper bars in their angular relationship as the flipper bars are raised into the upright position shown in

Figures 3 and 7, and finally will retract the stop bars to the positions shown in Figures 4 and 9 after the jogging operation has been completed. As mentioned previously, the stop bars are carried by pivots **24** on the flipper bar supporting plates **25**. Integral with these bars is a link **7** which is connected by a further link **70** to one arm **71** of a bell crank. The piston rod **72** of a fluid operated piston and cylinder actuator **73** is connected to the other arm **74** of the bell crank.

As shown in Figure 6, the link **7** lies alongside the shaft **23** when the stop arms **20** are in their raised position, and such link preferably has a notch **75** which embraces such shaft. As the rock shaft **23** is turned from the position shown in Figure 6 to that shown in Figure 7 by the actuator **26**, movement of the link **7** will pull link **70** to the right as seen in Figure 6, which will effect limited swinging of the bell crank **71**, **74** and extension of the piston rod **72**. Such movement of the linkage **7**, **70** will wrap this linkage around rock shaft **23** to engage a notch **76** in link **70** also with shaft **23** as shown in Figure 7. It will be evident that with the notches **75** and **76** thus engaged with shaft **23** the stop bars **20** will be held firmly relative to the flipper bar supporting plates **25** and the linkage **7**, **70** will be latched against operation in either direction by any force which might be applied by the sheet pack P being dropped on stop bars **20**.

As the flipper bars **22** are lowered from their positions of Figure 7 through their positions of Figure 8 to the horizontal positions of Figure 6 again link **70** will be shifted progressively away from shaft **23**. The actuator **73** may be actuated in sequence with lowering of the flipper bars **22** by automatic sequence control switching mechanism contained in the electrical control box **44**, which contains a series of sequence control cams. When the actuator is energized to move its piston rod **72** outward as indicated in Figure 9, the bell crank **71**, **74** will be turned in the clockwise direction indicated in Figure 9 to move links **70** and **7** for swinging the stop bars **20** downward into the retracted positions shown in Figures 4 and 9. The belts **13** will then resume movement of the pack of sheets P to the left as indicated by the arrows in Figures 4 and 9.

It is desired to have the jogging and jointing machine operate at reasonably high speed. It has been found that when the belts **13** resume movement of the sheet pack P upon retraction of the stop bars **20** after the leading edges of the sheets have been placed in registry, such resumption of movement causes the lower sheets to be moved ahead of the upper sheets in the pack because of the inertia of such upper sheets unless the upper sheets are held down compactly against the lower sheets until all of the sheets have attained a speed of translation equal to the speed of the belts **13**. To accomplish this operation hold-down means are provided, but it will be evident that such hold-down means must be manipulated in coordination with movement of the flipper bars **22** so as not to interfere with the jogging operation.

The hold-down means includes wheels **8** mounted on the swinging end of arms **80** which are carried by the rock shaft **81**. This shaft is rocked by the lever **82** to which is secured the piston rod **83** of a fluid operated piston and cylinder actuator **84** shown best in Figures 2 and 3. Operation of this actuator is coordinated with the operation of the actuator **26** for swinging the flipper bars **22** upward from their horizontal positions.

When there is no pack of sheets on the belts **13** beneath the hold-down wheels **8**, the arms **80** will support these wheels at a distance above the belts **13** slightly less than the thickness of a pack of minimum thickness. As a pack of sheets is moved by these belts into the position shown in Figures 2 and 6, the wheels may be raised somewhat against fluid or spring pressure, if any, in the cylinder of actuator **84**, or shaft **81** can simply act as a torsion spring. The weight of the wheels **8** and arms **80** and such resilience as may be exerted by the actuator **84** will cause the wheels to exert compacting pressure on the pack of sheets. When the actuator **26** is energized to swing the flipper bars **22** upward, however, the actuator **84** will be energized simultaneously to swing arms **80** and wheels **8** upward from the positions shown in Figures 2 and 6 to the positions of Figures 3 and 7. Pressure of the hold-down wheels against the sheet pack will therefore be relieved during the jogging operation. As soon as the flipper bars begin to swing back down, however, as illustrated in Figure 8, the hold-down wheels follow the sheet pack, the discharge of fluid from actuator **26** being constricted to retard lowering of bars **22** but the fluid discharge from actuator **84** being unrestricted, and the wheels hold the pack more or less compacted when it is again supported by the belts **13**.

When the flipper bars have been lowered following a jogging operation, the stop bars **20** are in the raised positions of Figures 2 and 6. Thereafter they are retracted as shown in Figure 9 and described above to enable the belts **13** to resume movement of the pack P to the left as seen in Figures 4 and 9. At that time the compacting pressure of the hold-down wheels **8** on the sheets of the pack will prevent relative movement of the sheets in the pack and will insure that all the sheets will move forward at a uniform acceleration and velocity so that the leading edges of the sheets will remain in registry as shown in Figure 9. The belts **13**, and subsequently the belts **3**, will transport the sheet pack out from under the wheels **8**, but by that time all the sheets of the pack will have been accelerated to the speed of the belts **13** and **3** so that there is no tendency for the sheets to shift relatively.

Coupled with the hold-down mechanism may be provided blocking members **85** which normally are retracted above the bottom of the stop frame **5** as shown in Figures 2 and 6, but which are swingable downwardly as the hold-down arms **80** are swung upward to close the gap between the shaft **81** and the belts **13** during the jogging operation. While the arms **80** are swung upward through an angle of only approximately 90°, the blocking members are swung through an angle of approximately 135°. To effect such amplified swing of the blocking members such members are pivotally mounted on shaft **81** and are swung by jackknife linkage, including the link **86** secured to the shaft **81** and the overlapping links **87** and **88** the former of which is pivotally connected to the link **86** and the latter of which is pivotally connected between the link **87** and the blocking member **85**.

The overlapping links **87** and **88** are arranged to slide through an aperture **50** in a bracket **51** carried by the stop frame **5**. As the link **86** is turned in a counterclockwise direction as seen in Figure 6, therefore, by retraction of the piston rod **83** turning the rock shaft **81**, this link will pull lengthwise downward link **87** which in turn will move lengthwise downward link **88** into the positions shown in Figure 7 because the aperture **50** will prevent appreciable swinging of these links. Such lengthwise movement of link **88** will swing the blocking member from the position shown in Figure 6 into the gap closing position of Figure 7. The blocking member will remain in this position during the jogging operation, and when rock shaft **81** is turned in the clockwise direction as seen in Figure 7, to lower the hold-down arms and wheels, the blocking member will be retracted simultaneously by such shaft movement into the position shown in Figure 9. Preferably such a blocking member is associated with each hold-down means, as shown in Figure 5.

By the time the stop bars **20** have been retracted into the position shown in Figure 9, and preferably earlier, belts **3** will have been energized to move a pack P of jointed sheets from the jointer and to advance the next pack toward the jointer as shown in Figure 4. As a jogged pack of sheets to be jointed is being moved into the position in the jointer shown at the left of Figure

2, a further pack is being moved to the jogger by the belts **13** as at the right in Figure 2. Movement of the sheet pack at the jointer **30** will be arrested by engagement of the registering leading edges of the sheets in the pack with the stop gate **31**, which is supported by parallel links **32** shown in Figures 2 and 3. When the sheet pack reaches this position, the drive for belts **3** is deenergized, the clamp bar **33** is lowered from the position shown in Figure 2 to that of Figure 3, and the stop gate **31** is raised by upward swinging of the parallel links **32**. Such movement of the clamp bar and of the parallel links may be effected by pneumatic piston and cylinder actuating mechanism **34**.

As soon as the clamp bar **33** has been lowered to hold securely the sheets in the pack P and the stop gate **31** has been raised, the jointing cutterhead carriage **35** will be reciprocated along its track **36** to traverse the jointing means past the registering sheet edges for jointing them. Because of the rapidity with which packs of sheets are fed to the jointer, it is undesirable for the jointing means to cut in only one direction of travel of the carriage **35** because it would be necessary to return the carriage as well as to discharge the pack of sheets between successive jointing operations. Immediately after completion of a jointing operation as illustrated in Figure 3 the hold-down bar **33** is raised by the pneumatic actuating mechanism into the position of Figure 4, and while the stop gate **31** remains raised the pack of jointed sheets is fed by the belts **3** onto the transfer table **4** as shown in Figure 4.

Immediately after movement of the transfer table from the position shown in Figure 4 to that of Figure 2, it is desired to lower the stop gate **31** into the position of Figure 2 from the position of Figure 4 to limit the travel of the next pack of sheets. If it were necessary to return the jointer carriage **35**, however, before the stop gate **31** could be lowered, it would also be necessary to reduce the speed of belts **3** or increase the spacing between the jogger and the jointer components of the machine in order to afford time for the jointer carriage return even if the speed of such return were considerably accelerated over the speed of the carriage during the jointing operation. Actually no appreciable time is lost by the jointing operation because during that time the next pack of sheets is being jogged, as indicated in Figure 3. The time for return of the carriage could not be utilized profitably, however, if the jointing means were returned along the same path as it followed during the jointing operation, because such movement of the carriage would conflict with discharge of the pack of jointed sheets as illustrated in Figure 4, and lowering of the stop gate **33** as shown in Figure 2.

The necessity for the jointer carriage **35** making a non-working return pass is eliminated by mounting on the carriage **35** three cutterheads in series, as shown in Figure 10, the cutterheads **37** at each end of the carriage being roughing cutters, and the cutterhead **38** between them being a finishing cutter. If a single cut were adequate to produce a sufficiently smooth edge, a single jointing cutter could be employed and could be operative to cut during movement of the carriage in both directions, provided that the speed of cutter rotation were high enough. A better finish is produced, however, if the center jointing head is set somewhat closer to the hold-down bar **33** than the side roughing cutter heads. These heads, of course, will be set closer to the hold-down bar **33** than the stop bar **31**, as shown in Figure 3. In whichever direction the carriage travels, therefore, the leading roughing cutter **37** will first engage and trim the leading edges of the sheet in the pack, and the following finishing cutter **38** will take a smoothing cut. The trailing cutterhead **37** will be spaced from the jointed edges by the width of the finishing cut, so that such trailing cutterhead will not contact the work at all.

The belts **3** are driven by sheaves **39** mounted respectively on the swinging ends of pivoted supporting arms **39'**. The swinging ends of these arms are urged upwardly by springs **39''**. Such sheaves are located directly under the table beneath the hold-down bar **33**, and in its lower position of Figure 3 such hold-down bar has pressed the pack of sheets to depress the sheaves **39** sufficiently so that the upper surfaces of the belts **3** beneath the hold-down bar are flush with the table. As the hold-down bar is raised following the jointing operation, the springs **39''** will swing the sheave supporting ends of arms **39'** upwardly sufficiently to enable the belts **3** to tractively engage the pack of sheets effectively. Also during or even shortly before lifting of the presser bar **33**, the transfer table **4** will be shifted to the right from its position shown in Figure 3 toward its position of Figure 4, so that the cantilever end **45** of this table will move over the top of the jointer carriage track **36** into close proximity to the table beneath the presser bar.

Belts **3** are then energized to move the pack of jointed sheets from the position of Figure 3 beneath the presser bar to the left onto the transfer table **4**, as indicated in Figure 4, and at the same sime will move from the belts **13** toward the jointer the next pack of sheets which have been jogged. When the pack of sheets ahead has been moved onto the transfer table by the belts **46** carried by its overhanging end, the transfer table will be withdrawn to the left as seen in Figure 4 into the position shown in Figures 2 and 3. After the overhanging cantilever portion **45** of the transfer table has been withdrawn from beneath the stop gate **31**, it will be lowered to the position of Figure 2 so that the succeeding pack of sheets transported by belts **3** will be stopped by engagement with the gate **31**.

By the transfer table **4** the pack of jointed sheets is moved into position above the discharge belt **40**, being supported on arms **47** provided with wheels **48**. As the transfer table is moved to the right again for receiving the next pack of sheets that have been jointed, the inertia of the sheet pack on arms **47** will maintain it in a position above the discharge belt **40** so that such arms are withdrawn from beneath the pack. This pack will then drop onto the discharge belt by which it will be carried to the elevator belt **41** for loading onto the hoist **42** as previously described.

In order to prevent the mechanism from moving through a timed sequence without processing a pack of sheets, the switch controlled by switch arm **21** serves as a master controller for the entire machine. When a pack of sheets beneath bar **33**, as shown in Figure 5, has been jointed and a second pack is supported by the arms **47** on the transfer table **4**, as in Figure 2, belts **3** being stopped, the entire automatic operation of the jogging and jointing machine is interrupted when, as shown in Figure 5, there is no succeeding pack of sheets in position to depress the switch actuating arm **21**. As soon as another pack has been moved by belts **13** to the position at the right of Figure 2, the jointing cycle will be resumed. Thereupon the flipper bars **22** are swung upward to the position of Figures 3 and 7, the transfer table **4** then moves to the right as seen in Figure 4, the presser bar **33** is raised, and the belts **3** are driven, simultaneously to move the pack of jointed sheets from beneath such bar onto the belts **46** and to feed the jogged pack of sheets from the position at the right of Figure 2 to the position beneath the jointer presser bar with the stop bar **31** down. When the hold-down bar **33** has been lowered and the stop bar raised traverse of the jointer carriage **35** is again initiated. If by that time an additional pack of sheets has been moved by the belts **13** into the position shown at the right of Figure 2, such pack is jogged simultaneously with jointing movement of the carriage **35** and operation of the machine thus continues as long as successive packs of sheets are furnished to the feed belts **13**. Otherwise, the operation of the machine is interrupted when

the jointing operation is completed until a new pack of sheets is supplied to the jogger.

While the fluid pressure actuators **26, 73** and **84** could be of the hydraulic type, it is preferred that they be pneumatic.

I claim as my invention:

1. A sheet jogging and jointing machine comprising jogging means, feed means operable to transport to said jogging means a pack of sheets with the sheets disposed in substantially horizontal position, means operable to tip such pack of sheets on edge onto said jogging means, means operable to confine loosely the sheets of such pack while on edge during jogging by said jogging means, sheet edge jointing means, means operable to transport the pack of jogged sheets into one side of said jointing means, and means operable to remove the pack of sheets from the other side of said jointing means after being jointed by said jointing means.

2. The machine defined in claim 1, means operable to clamp a pack of sheets in the jointing means, and control means operable after clamping movement of said clamp means to initiate operation of the jointing means.

3. A sheet jogger comprising means operable to confine loosely the sheets of a pack while on edge, lifting means operable to lift such pack of sheets edgewise upward and to drop such sheets, and stop means separate from said lifting means, stationary during movement of said lifting means, engageable by such dropped sheets and operable to terminate abruptly downward movement of the sheets of such pack by impact of their lower edges thereon to register such lower sheet edges.

4. A sheet jogger comprising means operable to tip on edge a pack of sheets to be jogged, means operable to confine loosely the sheets of such pack while on edge, lifting means operable to lift such pack of sheets edgewise upward and to drop such sheets, and stop means separate from said lifting means, stationary during movement of said lifting means, engageable by such dropped sheets and operable to terminate abruptly downward movement of the sheets of such pack by impact of their lower edges thereon to register such lower sheet edges.

5. A sheet jogger comprising spaced supporting members operable to support the sheets of a pack while on edge, means separate from said supporting members, spaced lengthwise of such sheets from said supporting members, operable to lift such pack of sheets edgewise upward above said supporting members and operable to drop such sheets onto said supporting members to register the lower edges of such sheets, and means operable to confine loosely the sheets of such pack while on edge.

6. A sheet jogger comprising feed means operable to feed a pack of sheets to be jogged, including spaced parallel elongated transport members movable lengthwise, stop means engageable by the leading edge of a pack of sheets fed by said feed means to arrest movement of such pack, a plurality of flipper bars extending generally parallel to said transport members and retractable therebetween for movement of a pack of sheets thereover, pivot means supporting said stop means and said flipper bars for conjoint swinging to tip on edge a pack of sheets moved into a position overlying said flipper bars by said transport members, and jogging means operable to lift such sheet pack and to drop it abruptly for impact against said stop means to dispose in registry the lower edges of the sheets in such pack.

7. A sheet jogger comprising jogging means, feed means operable to move a pack of sheets in substantially horizontal position to one side of said jogging means, stop means operable to arrest movement of such a pack of sheets moved by said feed means upon reaching said jogging means, pack tipping means operable to tip such a pack of sheets on edge for jogging of the sheet pack by said jogging means, and means operable to retract said stop means to enable removal of the sheet pack from the side of said jogging means opposite that to which the sheet pack was moved by said feed means.

8. A sheet jogger comprising jogging means, feed means operable to move a pack of sheets in substantially horizontal position to one side of said jogging means, stop means engageable by the leading edge of a sheet pack moved by said feed means to arrest movement of such sheet pack at said jogging means, pack tipping means operable to tip such a pack of sheets on edge, pivot means supporting said stop means and said pack tipping means for conjoint movement to tip the sheet pack and for return movement, and means operable following return movement of said stop means and said pack tipping means to retract said stop means to enable removal of the sheet pack from the side of said jogging means opposite that to which the sheet pack was moved by said feed means.

9. A sheet jogger comprising jogging means, feed means operable to move a pack of sheets in substantially horizontal position to one side of said jogging means, stop means engageable by the leading edge of a sheet pack moved by said feed means to arrest movement of such sheet pack at said jogging means, pack tipping means operable to tip such a pack of sheets on edge, a rock shaft turnable to swing said pack tipping means to tip such pack of sheets on edge and for return movement, pivot means supporting said stop means and said pack tipping means, latch means operable to hold said stop means and said pack tipping means against relative movement while said pack tipping means is in position tipping a pack of sheets on edge, and means operable following return movement of said pack tipping means and said stop means to effect retracting movement of said stop means relative to said pack tipping means to enable removal of the sheet pack from the side of said jogging means opposite that to which the sheet pack was moved by said feed means.

10. A sheet jogger comprising jogging means, feed means operable to move a pack of sheets in substantially horizontal position to said jogging means, hold-down means engageable with the upper side of such a pack of sheets at the jogging means, pack tipping means operable to tip such a pack of sheets on edge on said jogging means, and means operable to retract said hold-down means to enable said pack tipping means to tip the sheet pack on edge.

11. A sheet jogger comprising jogging means, feed means operable to move a pack of sheets in substantially horizontal position to one side of said jogging means, pack tipping means operable to tip such a pack of sheets on edge on said jogging means, movable blocking means operable to block movement of the pack of sheets away from said pack tipping means during jogging by said jogging means, and means operable to retract said blocking means to enable the pack of sheets to be discharged from the side of said jogging means opposite that to which it was moved by said feed means.

12. A sheet jogger comprising jogging means, feed means operable to move a pack of sheets in substantially horizontal position to one side of said jogging means, sheet tipping means operable to tip a pack of sheets on edge, hold-down means engageable with the upper side of a pack of sheets at said jogging means, blocking means at the side of said jogging means remote from said sheet tipping means, moving means operable to retract said hold-down means when said sheet tipping means is moved to tip a pack of sheets on edge, and means operable by said moving means to move said blocking means into a position blocking movement of a pack of sheets tipped on edge away from said sheet tipping means simultaneously with retraction of said hold-down means.

13. A sheet jogger comprising jogging means, pack tipping means operable to tip a pack of sheets on edge on said jogging means, and means actuated by said pack

tipping means in moving to tip a pack of sheets on edge, operable to initiate operation of said jogging means.

14. A sheet jogger comprising jogging means including a lifting member operable to lift a pack of sheets on edge on said jogging means, a spiral cam rotatable to lift said lifting member gradually and to drop said lifting member abruptly, cam drive means, latch means operable in latched position to restrain rotation of said spiral cam by said cam drive means, pack tipping means operable to tip such a pack of sheets on edge on said jogging means, and means actuated by said pack tipping means in moving to tip a pack of sheets on edge, operable to release said latch means for rotation of said spiral cam by said cam drive means.

15. A sheet jointer comprising clamping means operable to clamp a pack of sheets, jointing means including two roughing cut jointer heads spaced apart lengthwise of the edge of the pack of sheets to be jointed, a finishing cut jointer head disposed between said roughing cut jointer heads and located closer to the pack of sheets held by said clamping means than said two roughing cut jointer heads, and means operable to effect relative movement between said clamping means and said jointing means to effect jointing of an edge of the sheets in such pack first by a selected one of said roughing cut jointer heads, depending upon the direction of relative movement of said clamping means and said jointing means, and thereafter by said finishing cut jointer head.

16. A sheet jointer comprising a clamping bar operable to clamp a pack of sheets, guide means extending parallel to said clamping bar, jointing means including a carriage guided by said guide means for movement parallel to said clamping bar and including two roughing cut jointer heads spaced apart thereon lengthwise of said clamping bar, and a finishing cut jointer head between said roughing cut jointer heads, closer to said clamping bar than said two roughing cut jointer heads, and operable to finish cut the edge of the sheet pack to be jointed following cutting of such pack edge by the roughing jointer head ahead of said finish jointer head in the direction of carriage movement, and means operable to move said carriage in both directions along said guide means.

17. A sheet jogging and jointing machine comprising jogging means, feed means operable to transport to said jogging means a pack of sheets with the sheets disposed in substantially horizontal position, means operable to tip such pack of sheets on edge onto said jogging means, means operable to confine loosely the sheets of such pack while on edge during jogging by said jogging means to register the sheet edges engaged therewith, sheet edge jointing means, and means operable to transport the pack of jogged sheets from said jogging means to said sheet jointing means with such edges maintained in substantial registry.

18. A sheet jogger comprising jogging means, feed means operable to move a pack of sheets in substantially horizontal position to said jogging means, pack tipping means operable to tip the pack of sheets on edge on said jogging means, and means operable to remove the pack of sheets from said jogging means and to return the sheet pack into substantially horizontal position.

19. A sheet jogger comprising jogging means, feed means operable to move a pack of sheets in substantially horizontal position to said jogging means, pack tipping means operable to tip the pack of sheets on edge on said jogging means, and means operable to remove the pack of sheets from said jogging means.

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