United States Patent

Brawn

[15] **3,698,708**

[45] **Oct. 17, 1972**

[54] **VENEER STACKER**

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[73] Assignee: **Carothers Sheet Metal Company,** Eugene, Oreg.

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[52] **U.S. Cl.** **271/74**

[51] **Int. Cl.** **B65h 29/32**

[58] **Field of Search** 209/82; 271/74, 88, 89

[56] **References Cited**

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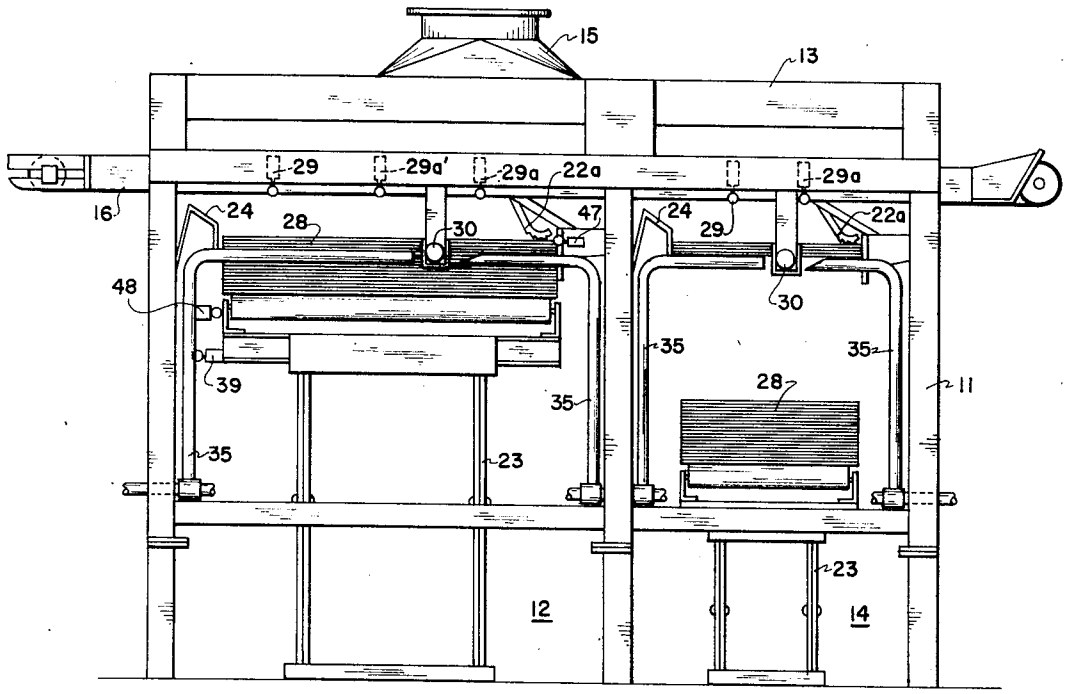
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Primary Examiner—Richard A. Schacher

[57] **ABSTRACT**

Apparatus for sorting and stacking veneer sheets comprising a vacuum infeed conveyor transporting individual sheets of veneer width-wise to a position above a scissors lift table whereupon parallel-motion knockdown arms are actuated to force the sheet loose from the vacuum conveyor and down onto the top of a pile forming on the lift. Squaring of the pile of sheets into a uniform stack is accomplished by the knockdown arms which move the forward lateral edge of the sheet up against a fixed stop acting in conjunction with a pair of actuatable even-ender pusher arms which align the longitudinal edges of the sheet. When a predetermined pile height is reached, as determined by the downward indexing of the scissors lift, the completed pile is discharged from the apparatus by an outfeed conveyor. While the pile is being discharged a pair of accumulator members are moved into position beneath the knockdown arms so as to temporarily support and retain the initial several sheets of a new pile as the scissors lift is discharged and recycled to the position where it is ready to receive the new pile in formation. A modification of the apparatus provides one or more additional bin locations adjacent the first bin location to receive and segregate the veneer sheets into stacks according to size or other criterion.

2 Claims, 9 Drawing Figures



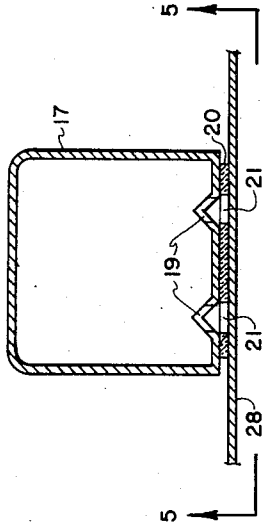


FIG. 4

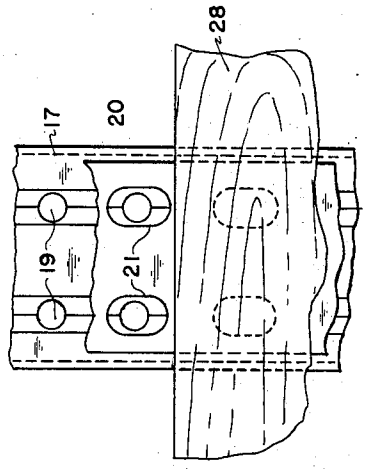


FIG. 5

FIG. 1

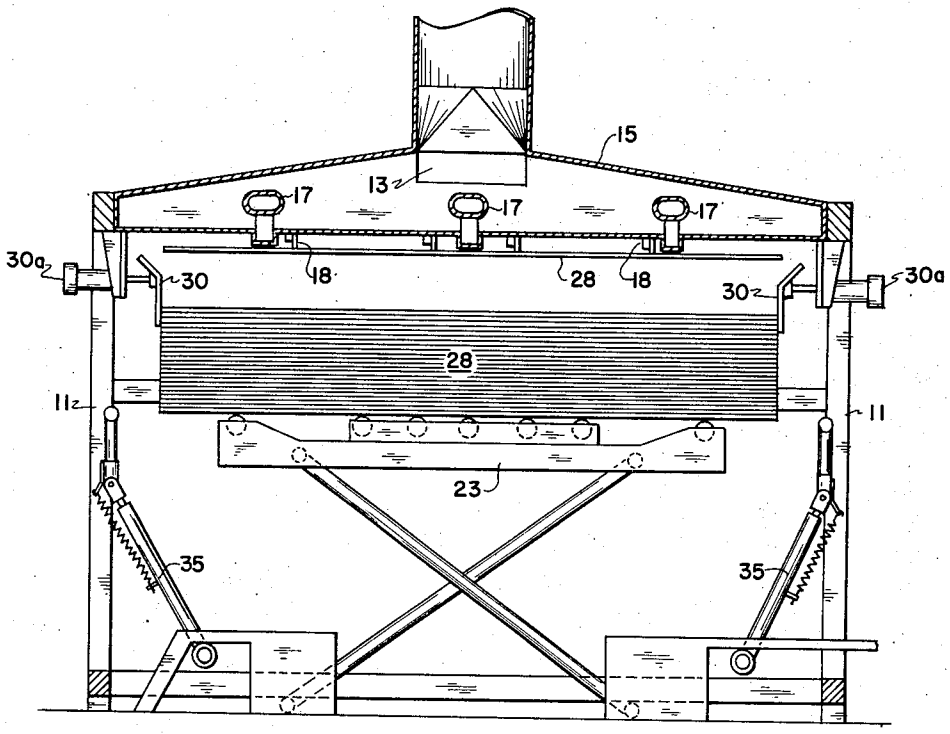

15
13
17
17
17
30a
30
18
28
18
30
30a
28
11
11
23
35
35

FIG. 1A

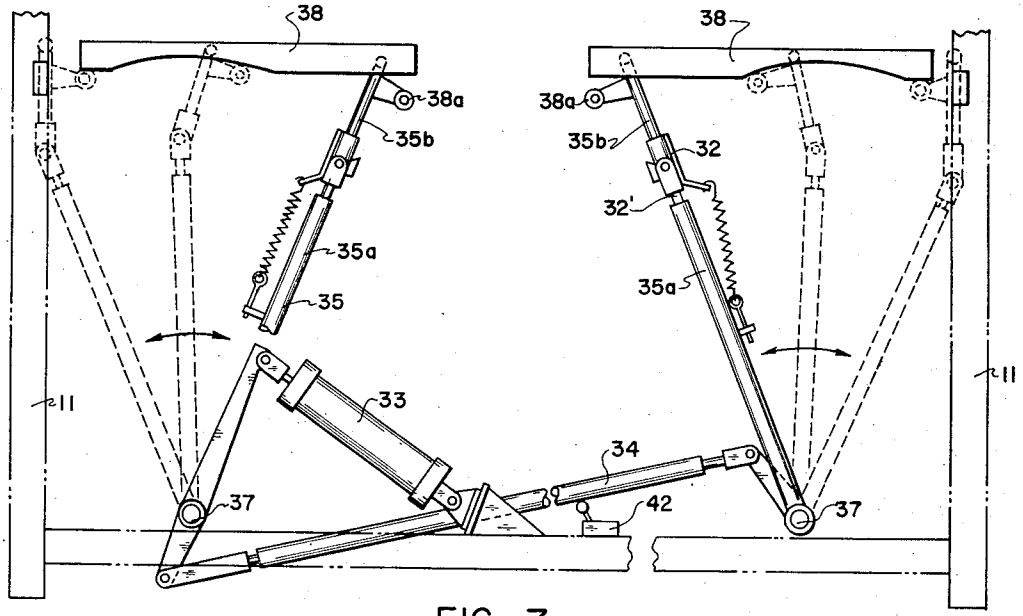

38
38
38a
35b
35a
35
33
11
37
34
42
38a
35b
32
32'
35a
11
37

FIG. 7

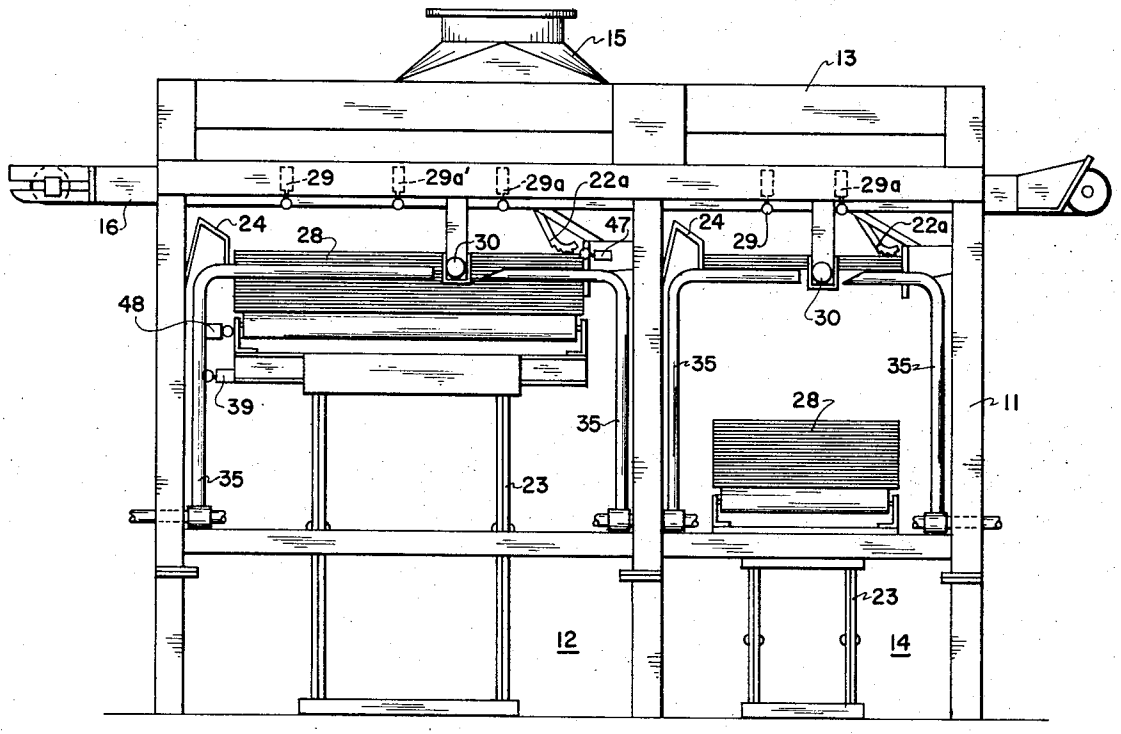

15
13
29
29a'
29a
22a
29a
16
24
28
30
47
24
29
22a
48
30
35
35
39
28
11
35
23
35
23
12
14

FIG. 2

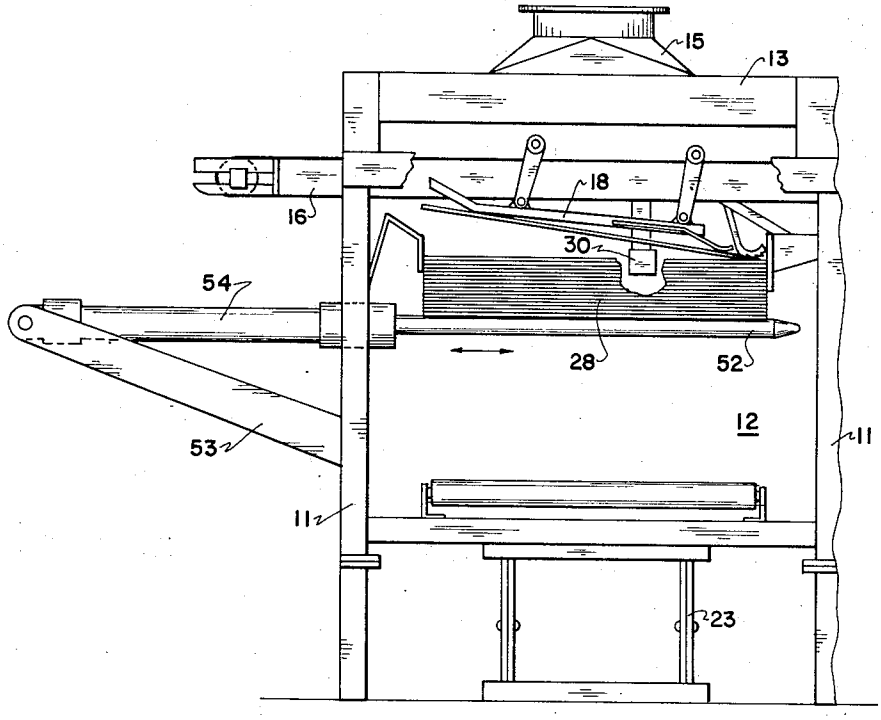

15
13
18
16
30
54
28
52
12
11
53
11
23

FIG. 8

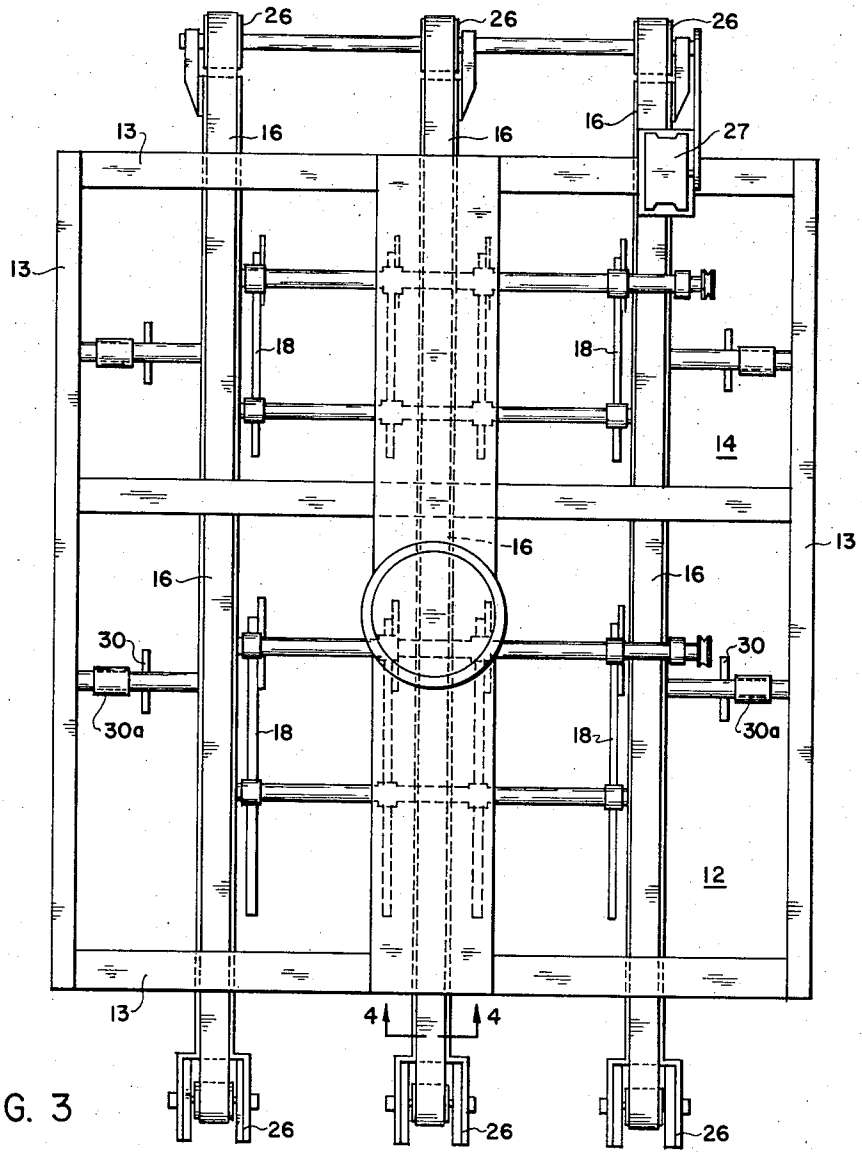

26
26
26
13
16
16
16
27
13
18
18
14
16
16
13
30
30
30a
30a
18
18
12
13
4
4
26
26
26

FIG. 3

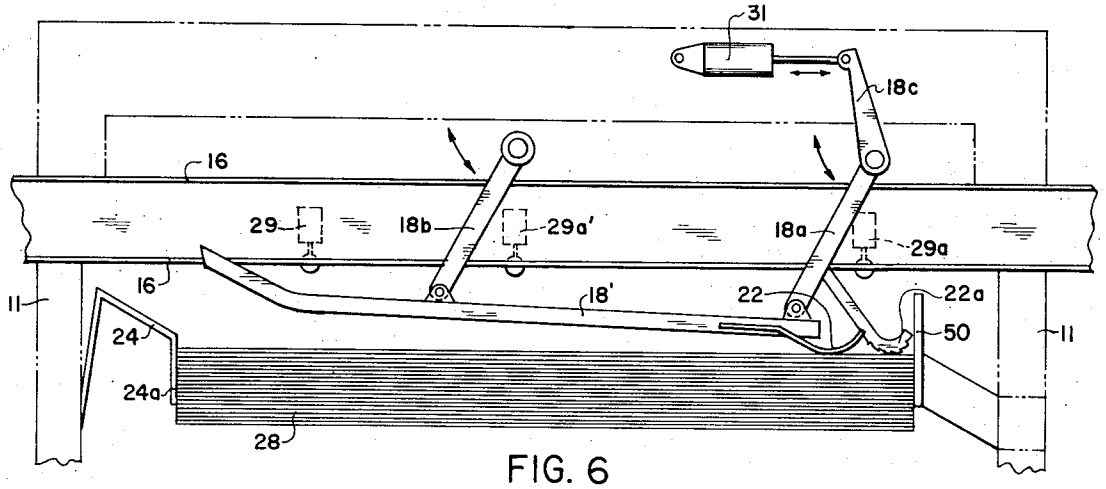

31
18c
16
29
18b
29a'
18a
29a
16
11
18'
22
22a
24
50
11
24a
28

FIG. 6

VENEER STACKER

BACKGROUND OF THE INVENTION

This invention relates to improvements in a veneer stacker for stacking individual sheets or plies of veneer into a uniform pile, and thereafter outfeeding the pile so formed so that it can be strapped, transferred to a dolly or forklift truck or otherwise handled for further processing. More specifically, the veneer stacker of the present invention provides improved means for ensuring that a uniformly-aligned stack of veneer is formed and that the operation of the infeed supplying individual sheets of veneer to the stacker apparatus is not delayed or interrupted while a completed stack of veneer is discharged from the apparatus. Additionally, a modification of the invention extends the apparatus to cover a plurality of bin locations so that veneer sheets fed into the apparatus can be sorted and stacked according to size, grade, moisture content or other criteria for segregation.

Devices for sorting and stacking veneer sheets or plies as they are received from the dryer or the green chain end of the clipper of a veneer line are known to the art and shown for example in Stickney U.S. Pat. No. 3,508,648 and Keller U.S. Pat. No. 3,540,567. Generally speaking, the major difficulties encountered with prior art sorters/stackers of the type described are that (1) they do not satisfactorily align the sheets both longitudinally and laterally so as to form a satisfactorily squared-up stack, and (1) the operation of the apparatus must be interrupted or slowed down, or alternatively an additional holding bin location provided, while a completed stack is removed from the apparatus. Accordingly, a real need exists in the forest products industry for a veneer stacker which will consistently and reliably form individual sheets of veneer into a uniformly-aligned stack which can thereafter be removed from the apparatus in a manner which will avoid disruption or slow-down of the production line.

SUMMARY OF THE PRESENT INVENTION

The present invention is directed to a veneer stacker of the general type described in which a vacuum infeed conveyor transports individual sheets of veneer along their lateral (i.e., transverse-to-the-grain) dimension to a position above a scissors lift table whereupon parallel-motion knockdown arms are actuated to force the sheet loose from the conveyor and down onto the top of a pile forming on the lift table. Even-ending pusher arms acting on the longitudinal (parallel-to-the-grain) sides of the veneer sheet, in conjunction with the parallel-motion knockdown arms and an anti-kickback element for receiving and holding the forward lateral edge of the veneer sheet, ensure uniform longitudinal and transverse alignment of each sheet delivered onto the stack. Accumulator means in the form of actuatable arm elements are provided for temporarily supporting the initial several sheets forming a new pile while the previously-formed stack of veneer is discharged from the apparatus so as to thereby avoid the necessity for interrupting or slowing down the operation of the apparatus, or alternatively providing a temporary holding bin location while a completed stack is removed. In a modification of the apparatus, additional in-line bin locations are provided, each capable of forming a stack of veneer from sheets of predetermined size, so as to provide a sorting capability for the apparatus wherein veneer sheets infeeding to the apparatus of diverse size, grade, moisture content, or other criteria can be segregated according to the sorting criteria and stacked into uniform piles.

It is therefore a principal objective of the present invention to provide a new and improved stacker for veneer sheets and like material which is of economical design, minimizes the possibility of damage or degrade of the veneer in the stacking process, builds up a more compact and uniformly-aligned pile, and provides means for rapidly discharging a completed stack without disrupting or delaying the regular flow of material infeeding into the apparatus.

It is a principal feature of the present invention to provide a veneer stacker of the type described wherein accumulator means are provided for temporarily supporting and retaining the initial group of sheets forming the beginning of a new pile while the completed pile previously formed is outfed from the apparatus.

It is a further feature of the present invention to provide in a stacker apparatus of the improved type described means for sorting the individual veneer sheets according to one or more criteria such as size, species, moisture content and the like and thereafter stacking them into uniform piles at designated bin locations.

The foregoing and other objectives, features and advantages of the present invention will be more readily understood upon consideration of the following detailed description of the invention, taken into conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an end elevational view of an illustrative embodiment of the veneer stacker of the present invention with the accumulator elements shown in the operative position.

FIG. 1A is an end sectional view of the main portion of the veneer stacker with the accumulator element shown in the retracted position.

FIG. 2 is a side elevational view of the veneer stacker, with the outfeed conveyor mechanism removed for the sake of clarity.

FIG. 3 is a top plan view of the veneer stacker.

FIG. 4 is a detail sectional view of one of the vacuum infeed conveyor belts taken along the line 4—4 in FIG. 3.

FIG. 5 is an underview of the vacuum conveyor belt taken along the line 5—5 in FIG. 4.

FIG. 6 is an enlarged side view showing details of the knockdown arm mechanism of the veneer stacker.

FIG. 7 is an enlarged end view showing details of the accumulator mechanism.

FIG. 8 is a partial side elevational view showing a modified form of accumulator mechanism for use with a one or two-bin capacity veneer stacker.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings, particularly FIGS. 1-3 initially, an exemplary embodiment of the veneer stacker apparatus comprises a skeletal framework of metal girders and tubing 11 defining two respective bin locations 12, 14 for the stacking of veneer into two piles

segregated according to size or other criteria. Illustratively, the sorting may be on the basis of width with the first bin location **12** receiving sheets of 54-inch width and the second bin location **14** receiving sheets of 27-inch width, which sizes are the standard sheet widths employed in the domestic veneer industry for faces, centers and backs in the lay-up of veneer into 4-by-8 foot plywood panels.

The stacker apparatus is typically located to receive veneer sheets directly from either a veneer dryer or the green chain end of a veneer production line. The infeeding of veneer into the entry end of the stacker is accomplished with a vacuum conveyor **16**, the details of which are described hereinafter, which transports the individual sheets width-wise along their transverse-to-the-grain dimension, by the application of negative pressure or suction to the top surface thereof, to a position directly above the designated bin location **12** or **14**, depending upon the size of the veneer sheet. At this point a pair of knockdown arms **18** is actuated by the tripping of limit switch **29***a* to press the veneer sheet loose from the vacuum conveyor and force the sheet downward and forward until its leading lateral edge (see FIG. **6**) abuts against a fixed stop **50**. The sheet is retained in abutting position against the stop **50** by means of a spring-biased serrated jaw element **22***a* attached to the frame and pressing downward on the forward edge of the veneer pile to prevent kickback of the sheet after it has been brought against the rest **50**. A pair of auxiliary spring arm elements **24** having a vertically-depending leg **24***a* assist in maintaining the the veneer sheet in as the stack is formed.

Immediately after the veneer sheet is removed from the conveyor infeed **16** by the action of the knockdown arms **18**, the longitudinal (parallel-to-the-grain) edges of each veneer sheet **28** is aligned by the energization of actuators **30***a* operating even-ender pusher arms **30** which, through a time delay after the tripping of limit switch **29**, simultaneously retract and then move inwardly toward each other to align the veneer sheet therebetween. After the veneer has been pushed under the anti-kickback jaw **22**, and up against the stop **50** the even-ender pusher arms **30** remain in the extended position bearing against the longitudinal edges of the top plies in the stack thus retaining the veneer sheets in a uniformly-aligned pile as additional sheets are added.

The veneer stack **28** is supported on a scissors lift table **23** which indexes downward, upon triggering of limit switch **47**, in regular increments as the pile builds up. The top of the scissors lift table **23** is formed of a plurality of spaced free-turning rollers **25** aligned parallel to the lateral or short dimension of the sheet to facilitate lengthwise removal of the completed stack of veneer from the side of the apparatus.

When the lift table **23** has indexed downward to a point where a pile of predetermined height (e.g., 30 inches) has been formed, limit switch **39** is thereupon triggered, causing the scissors lift to continue downward until it bottoms out and at the same time bringing into position beneath the infeed conveyor **16** the arms **35** of an accumulator mechanism, the details of which are hereinafter described, for receiving and temporarily supporting the initial group of sheets of a new pile of veneer while the previously-formed stack **28** is removed automatically from the bin location. (During the time the veneer is being temporarily stacked on the accumulator limit switch **42** is maintained triggered which de-activates limit switch **47** controlling the indexing of the scissors lift table **23**.) Discharge of the completed stack after the scissors table **23** has bottomed out is effected by actuation through limit switch **45** of the drive **40** of an endless chain conveyor **43** which transports the completed stack **28**, along its longitudinal dimension, off of the rollers **25** formed into the top of the scissors lift and out of the bin area, and thence onto roller support tables **36** where the completed stack can thereafter be outfed to another conveyor, or transferred to a forklift truck or dolly, as desired.

As the completed stack of veneer **28** moves away from the bin area its trailing edge releases limit switch **45** causing the scissors lift table **23** to commence rising back upward. The lift table continues rising until it triggers limit switch **48** which stops the upward movement of the lift and simultaneously causes the respective accumulator arms **35** to move out from under the pile of veneer which has been stacked thereon during the time while the previously-completed load was being lowered and discharged, and to gently deposit it onto the now fully recycled lift table.

While the scissors lift is recycling the return to the upward position to receive the new stack of veneer, the previously-completed pile continues to move on the outfeed conveyor **43** until trailing edge of the veneer releases a limit switch **41** and the stack stops, resting on the roller support tables **36**.

Returning now to the details of the stacker construction, the vacuum infeed conveyor **16** comprises a plenum chamber **15** on the top of the apparatus which has a negative pressure created therein by an air blower (not shown). The plenum is connected by ducts **13** on the top periphery of the stacker frame **15** to a plurality of air boxes **17** spaced in rows extending along the direction of travel of the veneer sheets as they feed into the apparatus. The bottom of each of these air boxes **17** is perforated with a plurality of small spaced apertures **19**. An endless conveyor belt **20**, supported on pulleys **26** and driven by motor **27**, travels immediately beneath each of the longitudinally-extending air boxes and is perforated along its length with a corresponding array of spaced openings **21** so that the veneer sheet **28** is held under vacuum and conveyed by the traveling belts **20**.

As previously mentioned, the veneer sheet **28** is carried into the apparatus by the vacuum infeed conveyor **16** until it reaches a position above its designated bin location whereupon limit switch **29***a* is tripped which actuates the knockdown arms **18**. Referring to FIG. **6**, the knockdown arms each comprises a horizontal runner arm **18'** which is pivotally supported for parallel-motion action at two points along its length by arm members **19***a*, **18***b* which in turn are pivotally connected to the support frame **11**. A forwardly projecting spring finger **22** depends from the leading edge of the runner **18'** to assist in the lateral alignment of the sheet into the stack. An extension **18***c* of one of the swing arms **18***a* is connected to a pneumatic or fluid-operated actuator **31**. The actuator rod is normally extended so that the knockdown arm **18** associated therewith is held elevated above the plane of the conveyor belts **20** in the non-operative position.

Upon energization of the actuator **31** when limit switch **29***a* is tripped, the actuator rod retracts, causing the horizontal runner **18'** of the knockdown arm **18** to move downward through the plane of the conveyor belts forcing the veneer sheet loose and onto the top of the veneer stack **28**. The parallel-motion movement of the knockdown arm causes the runner to contact the veneer sheet along a substantial length thereof, rather than at just one point, thus ensuring that the sheet is maintained substantially horizontal as it is deposited by the pair of concurrently-acting knockdown arms or to the top of the pile. The continuing downward arcuate motion of the swing arms **18***a*, **18***b* about their respective pivot points slides the sheet forward by the action of the projecting spring finger **22** until its leading edge abuts against the fixed stop **20**. Reversal of the actuator **31** then quickly retracts the knockdown arm **18** back upward beyond the plane of the conveyor belt into the nonoperative-position ready for the next actuating signal from the limit switch **29***a*.

In the case of a two-bin sorter handling two different widths of veneer, for example **54** inch sheets and **27** inch sheets, judicious placement of a second limit switch **29***a* ', spaced ahead of limit switch **29***a* by more than the width of the smaller category of sheet and coupled to a coincident circuit for triggering the action of the respective knockdown arms **18**, may be provided in the first bin location **12** receiving the wider sheets. This will permit the shorter width sizes of veneer sheet to pass over the first bin location **12** without actuation of its knockdown arms, and onto the second bin location **14** where limit switch **29***a* (FIG. **2**) will be tripped for actuating the knockdown arms associated therewith. The principle of coincident limit switches with variable spacing can of course be extended to a multi-bin stacker handling a variety of sheet widths. Additionally other sorting criteria can be provided, through the use of memory logic and control devices working with inputs corresponding to thickness, moisture content and the like, to segregate veneer sheets into a plurality of stacks of respectively uniform characteristics.

The accumulator mechanism, the details of which are best shown in FIG. **7**, comprises on each lateral side of a bin location a pair of pivotable arm members **35** formed of a vertical leg portion **35***a* and a horizontal arm portion **35***b*. The vertical leg portion **35***a* has its lower end pivotally connected to the stationery frame **11** and its upper end pivotally connected for limited articulation to the horizontally-extending arm portion **35***b*. An actuator **33**, directly connected to one of the pair of accumulator arms **35** and coupled to the other of the pair by linkage mechanism **34**, provides the means, under control of limit switch **39**, for moving the respective arms **35** between the retracted position (shown in dotted lines) and the operative position shown. In the retracted position of the accumulator arms the rod of the actuator **33** is extended, forcing the respective arms outwardly about their pivot points **37** so that the upward terminus of the vertical leg portion **35***a* of each of the accumulator arms bears against the respective side members of the skeletal support frame **11**. Because of the articulation provided by the pivot **32** between the vertical leg portions **35***a* and the horizontal portion **35***b*, each of the accumulator arms may be more fully withdrawn from the center of the bin location than if each of the accumulator arms were a rigid member.

Reversal of the actuator **33** swings the pair of actuator arms **35** away from the side walls and into the operative position over the now-completed pile formed on the lift table **23** where the horizontal arm portions **35***b* of the respective accumulators **35** provide temporary support for the initial sheets of a new pile **28** dropping from the conveyor into the bin location while the stack previously formed therein is removed off the scissors table. A cam **38** is provided for coaction with an associated cam follower **38***a* carried on each of the accumulator arm **35** so as to maintain the sheet support surface provided by the accumulator arms in a horizontal plane as the respective accumulator arms are moved between their operative and non-operative positions. In this manner the pile of veneer sheets forming a new stack is maintained substantially stationary as the accumulator arms **35** are withdrawn to permit the scissors lift table **23** to move into position and receive the new pile. To effect this the connection in each of the accumulator arms between its horizontal arm portion **35***b* and its vertical leg portion **35***a* is provided by a spring-biased coupling **32'** permitting a short axial displacement therebetween so as to enable the support plane formed by the respective accumulator arms to be maintained fixed in space as each of the horizontal arm portions **35***b* is moved between its operative and retracted positions. (In the absence of the cam mechanism and coupling arrangement provided it will be apparent that the support surface formed by the accumulator arms would move vertically as the arms are swung between the operative and retracted positions, thus producing a corresponding displacement in the position of the pile **28** which in turn might interfere with the operation of the knockdown arms **18** or the even-enders pusher arms **30**.)

It will be understood that, for each bin location, a total of four such accumulator arms **35** are preferably provided to swing into the center of the bin location to provide a temporary support plane for the initial group of sheets forming a new pile while the previously-formed pile is being unloaded. If desired, it may be feasible to extend the length of the horizontal arm portions **35***b* of a pair of accumulator for substantially the full width of the veneer sheet and, by using a construction of sufficient load-bearing capacity, accomplish the necessary support with but a single pair of accumulator arms **35** rather than the four depicted in this illustrative embodiment.

FIG. **8** depicts a modified form of accumulator mechanism in which the pivoting arms of the previous embodiment is replaced by a pair of horizontally-reciprocable rods **52** extending from associated hydraulic actuator cylinders **54** which are supported by respective girders **53** and mounted onto the adjacent sides of bin frame **11**. In this modification actuation of the respective actuators **54**, in response to a control signal received as before from the triggering of limit switch **39**, causes the normally-retracted rods **52** to extend across the width of the bin stall **12** forming a temporary support plane for the initial group of sheets **28** of a new pile while the previously-formed stack is discharged and the lift table **23** recycled. Because of the outward horizontal extension of the actuator cylinders **54** beyond the side of the stacker frame **11** it will usually not be feasible, by reason of space and conveyor length considerations, to utilize this modified

form of accumulator mechanism except for veneer stackers of only one or two-bin capacity.

The terms and expressions which have been employed in the foregoing abstract and specification are used therein as terms of description and not of limitation, and there is no intention, in use of such terms and expressions, of excluding equivalents of the features shown and described, or portions thereof, it being recognized that the scope of the invention is defined and limited only by the claims which follow.

What is claimed is:

1. Apparatus for stacking veneer sheets comprising:
   a. vacuum infeed conveyor means for horizontally transporting individual sheets of veneer by suction applied to their respective upper surfaces to a predetermined position above a bin location area,
   b. knockdown arm means actuable to force said respective sheets loose from said conveyor and down onto the top of a pile formed of said sheets, said knockdown arms comprising a horizontal member, pivotally supported at two points by vertical swing arms so as to move with parallel motion in a vertical arcuate path, and forwardly-projecting spring finger means depending from the leading edge of said horizontal member to assist in the lateral alignment of the sheet into the stack, said horizontal member and said projecting spring finger contacting the top surface of said veneer along the substantial length thereof causing each sheet deposited to be maintained in a substantially horizontal orientation as it is deposited onto the top of said pile of sheets,
   c. fixed stop means positioned to contact and terminate the forward travel of the leading edge of a sheet deposited on the top of said pile at a predetermined vertical plane location where a lateral edge of said pile is to be formed, and
   d. a spring-biased serrated jaw anti-kickback element contacting the upper surface of said leading edge of a sheet as it is deposited on said pile and acting to retain it in a horizontal position abutting against said stop until the next sheet is deposited onto said pile.

2. In an apparatus for stacking veneer sheets inside a bin wherein individual sheets of veneer are horizontally transported to a predetermined position above said bin and then are deposited on top of a pile formed of said sheets, and accumulator means are provided for temporarily supporting the initial sheets of a new pile while a completed pile of sheets is removed from said bin, the improvement wherein said accumulator means comprises:
   a. a pair of support arm members each respectively formed of a vertical leg portion mounted for pivotal movement in a vertical arc relative to the frame of said bin, a horizontal portion, and spring-biased coupling means providing limited articulation of said vertical leg portion relative to said horizontal portion,
   b. actuator means for moving said support arm members between respective retracted and actuated positions, and
   c. cam-and-follower means controlling the vertical articulation of said horizontal portion of said respective support arm members wherein the pile of veneer sheets deposited and supported thereon are maintained in a horizontal plane at a substantially constant elevation as said support members move between said actuated and retracted positions.

* * * * *