

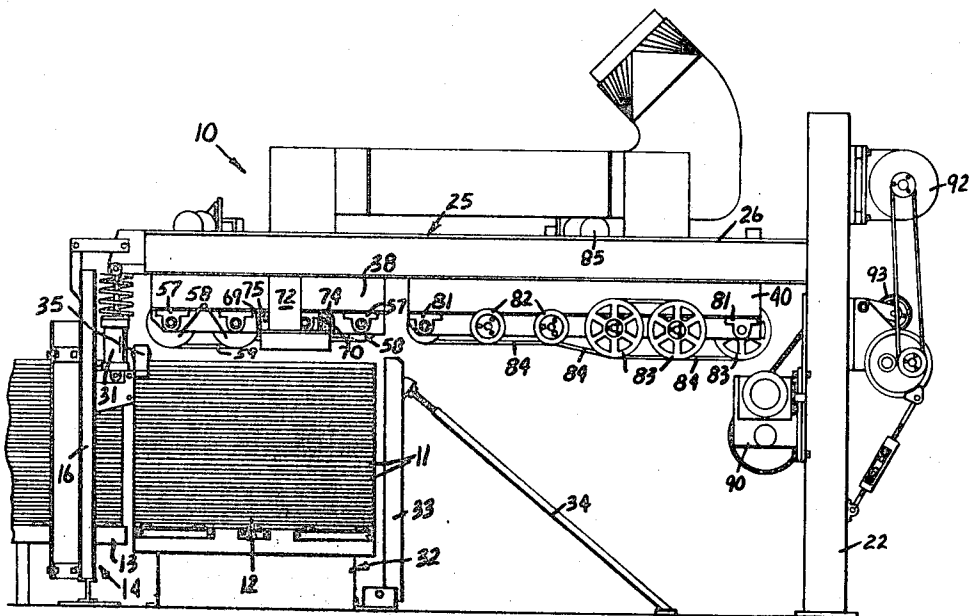
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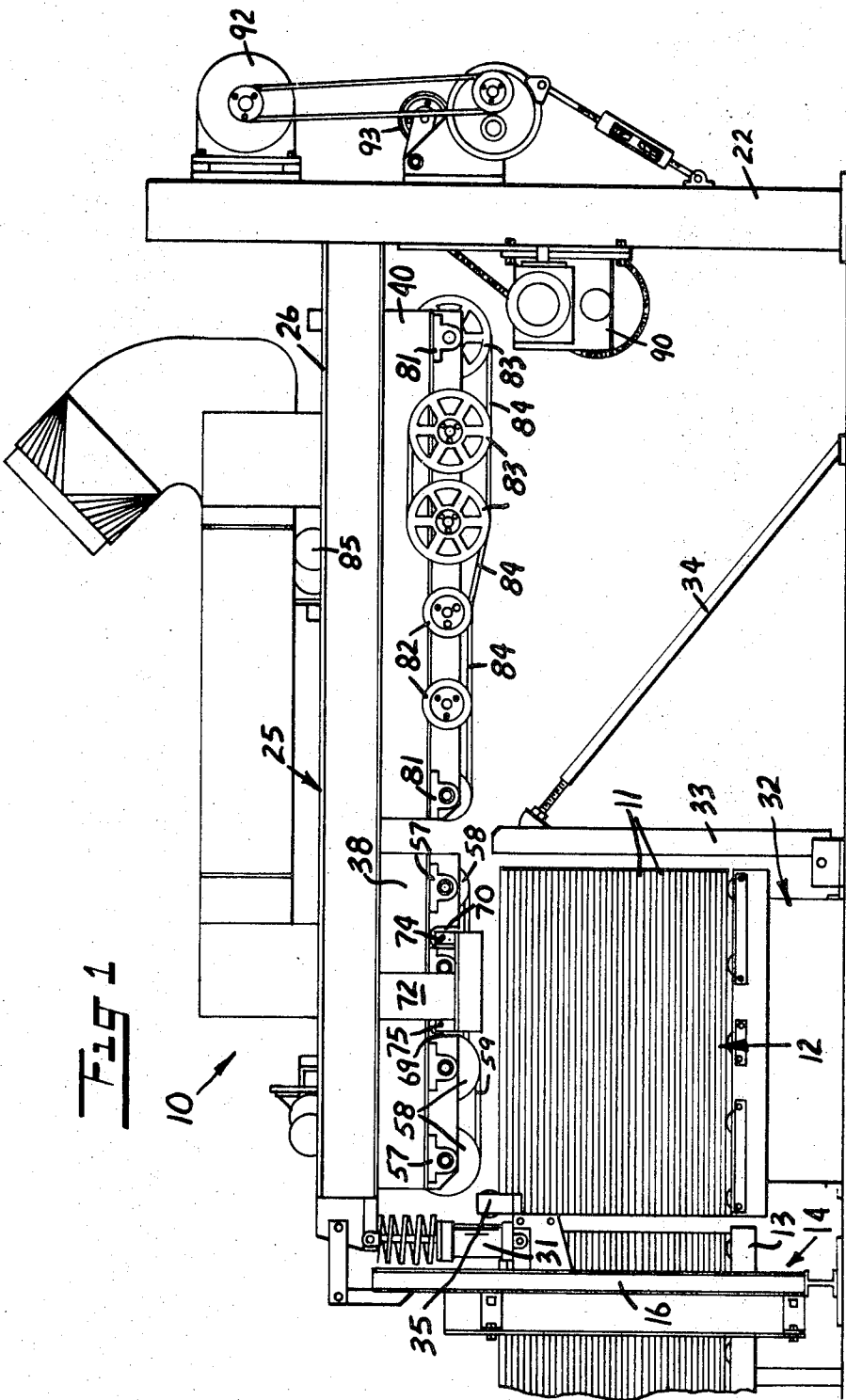
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[54] **VACUUM FEEDER FOR PLYWOOD VENEER
 CORE SHEETS**
8 Claims, 6 Drawing Figs.

[52] U.S. Cl. 214/8.5,
 271/14
 [51] Int. Cl. B65g 59/04
 [50] Field of Search 214/8.5(A),
 8.5(D), 8.5; 271/14, 28

ABSTRACT: A vacuum feeder is described for successively removing plywood core sheets from a stack and aligning the sheets and feeding the sheets crosswise forward to a plywood layup station. The feeder includes a first hood that moves down to receive the top sheet of the stack and then moves upward to remove the sheet from the stack. The first hood is shifted transversely to align one end edge of the sheet before conveying the sheet to a second vacuum hood that moves the sheet forward.



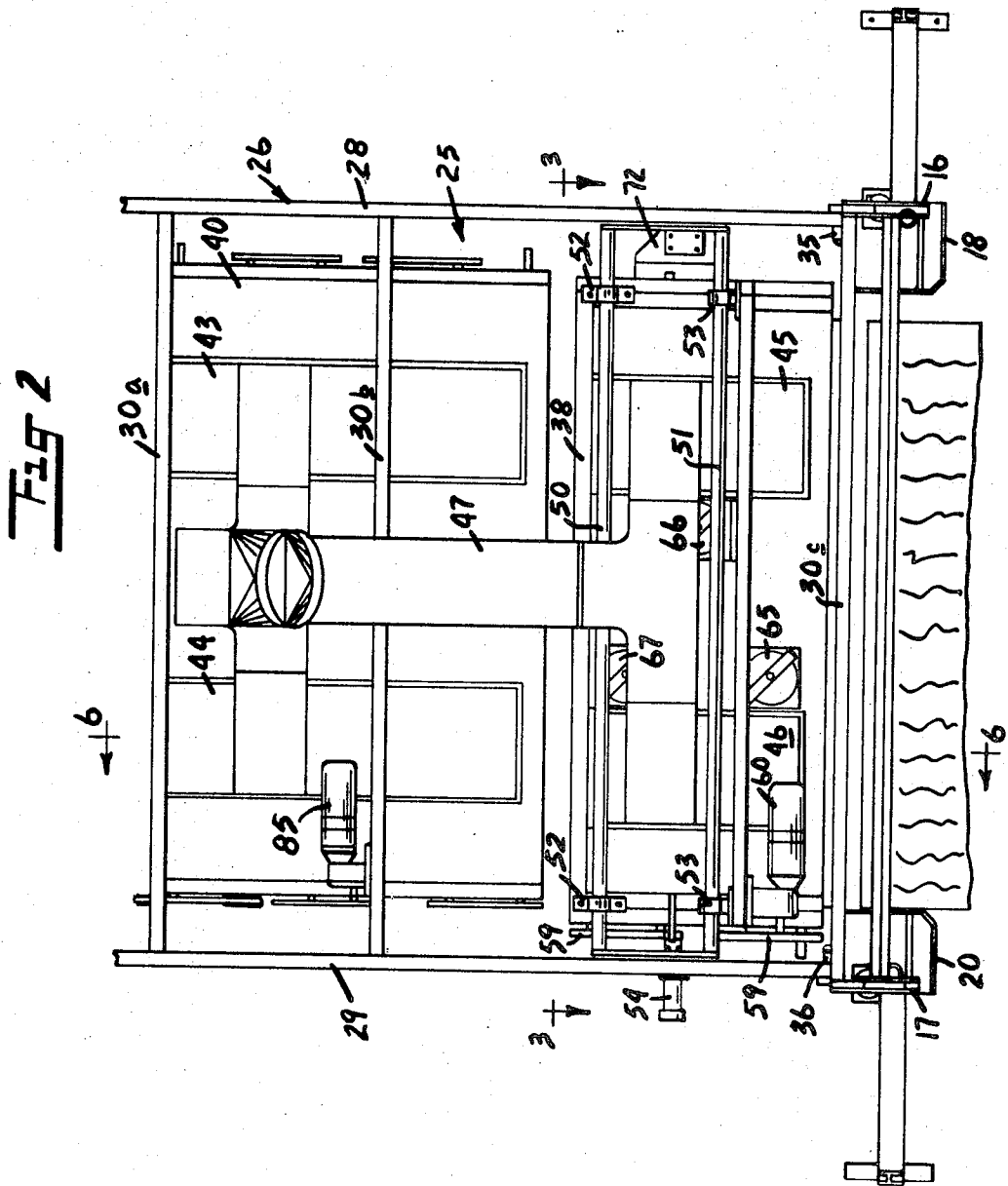


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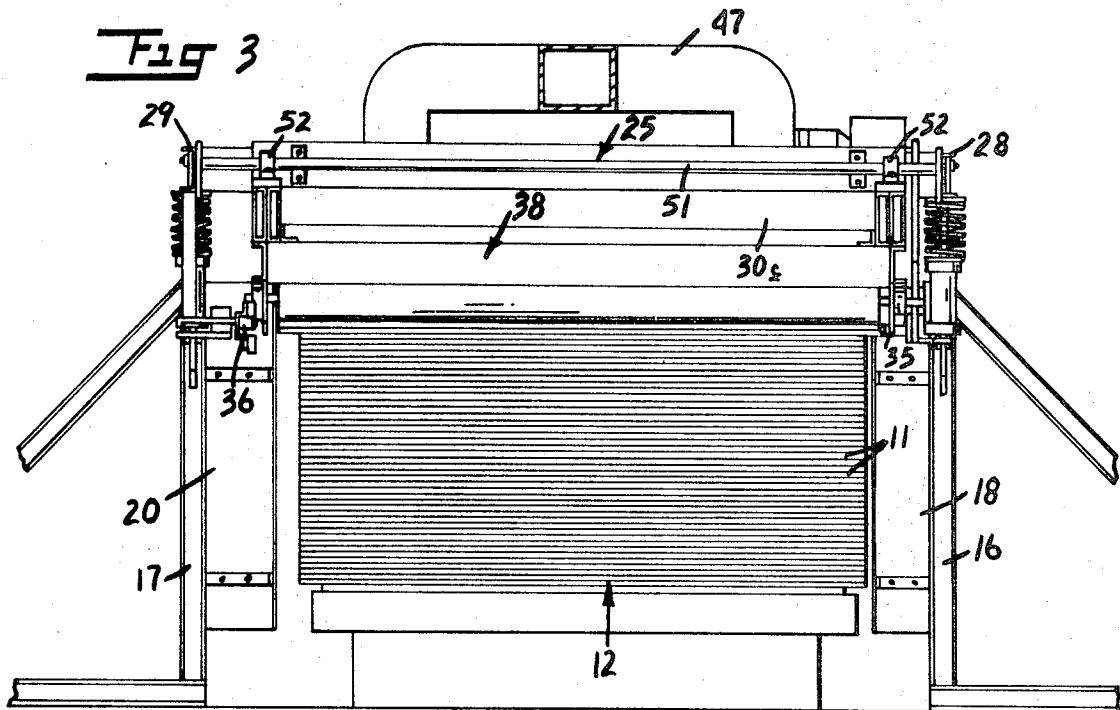
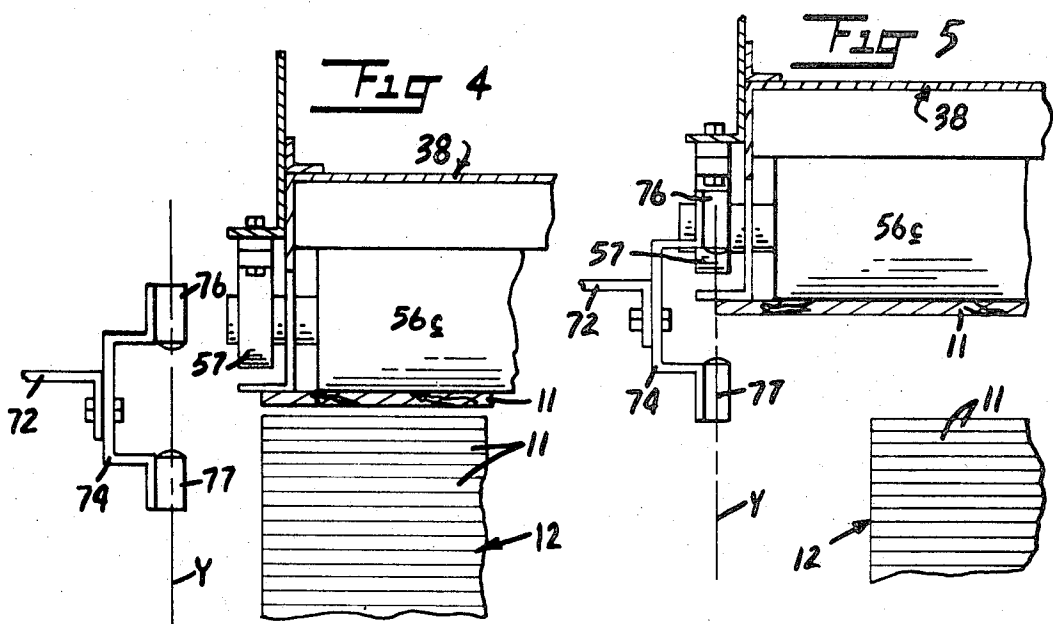
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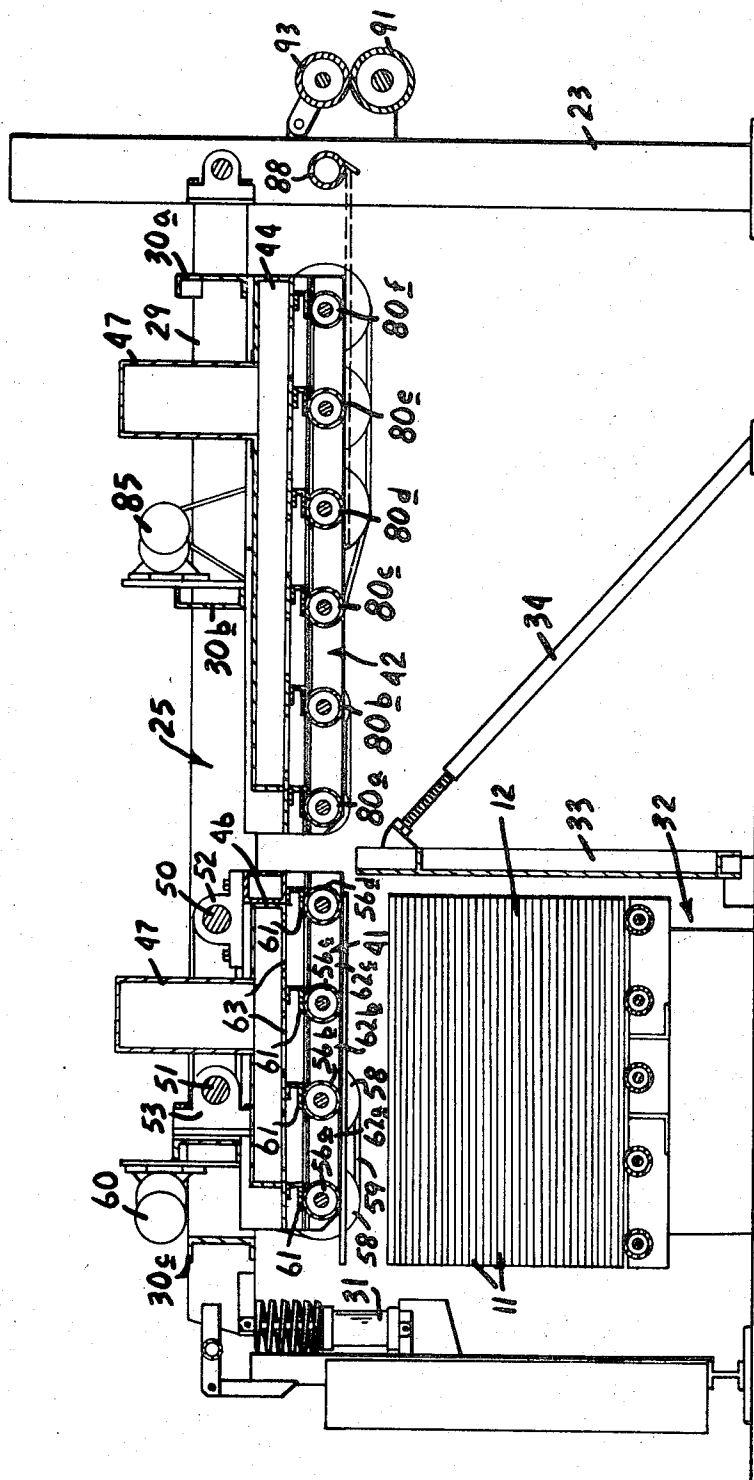


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FIG 6



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VACUUM FEEDER FOR PLYWOOD VENEER CORE SHEETS

BACKGROUND OF THE INVENTION

This invention relates to equipment for handling veneer sheets and more particularly to vacuum feeders for feeding core sheets to a plywood layup station.

This is a companion application to a copending U.S. patent application Ser. No. 814,581, filed Apr. 9, 1969, "Method and Apparatus for Automatically Laying Up Plywood Panels."

Plywood core material is generally referred to as material placed between the face veneer sheets in the formation of plywood panels. Generally the core material is of low grade quality having cracks, knots, knotholes and other defects therein. Core crossband sheets are those sheets having the wood grain running perpendicular to the lengths of the sheets. Often the crossband sheets are constructed from several smaller individual pieces four feet in length that are placed side by side to form a sheet having a length of eight feet. String, tape or edge gluing is sometimes used to hold the individual pieces together to form an integrated sheet.

It is very difficult to handle formed crossband sheets especially to separate the sheets in a stack and rapidly convey the sheets without damaging or breaking the sheets. One of the principal reasons why it has been difficult to develop automatic plywood layup equipment is the inability to effectively and efficiently machine handle the crossband sheet.

One of the principal objects of this invention is to provide a veneer sheet feeder that is reliable and efficient for successively picking up plywood core sheets from a stack and accurately conveying the sheets to layup station like the one disclosed in said companion application.

An additional object of this invention is to provide a vacuum feeder capable of removing the low grade veneer sheets from a stack and conveying the sheets to a layup station at a relatively fast speed without damaging the core sheets.

A further object of this invention is to provide a vacuum sheet feeder that is capable of squaring and centering the core sheets as they are being fed to the layup station.

An additional object of this invention is to provide a vacuum feeder that utilizes the directional strength properties of the cores sheets to provide a simple and efficient conveying means.

These and other objects and advantages of this invention will become apparent upon the reading of the following detailed description of the preferred embodiment.

BRIEF DESCRIPTION OF THE DRAWINGS

A preferred embodiment of this invention is illustrated in the accompanying drawings, in which:

FIG. 1 is a side elevational view of the vacuum feeder for successively picking up core veneer sheets from a stack and conveying the sheets to a layup station;

FIG. 2 is a fragmentary plan view of the vacuum feeder;

FIG. 3 is a vertical cross-sectional view taken along line 3-3 in FIG. 2;

FIG. 4 is a fragmentary detail cross-sectional view taken along line 4-4 in FIG. 2 showing the top sheet of the stack being moved upwardly from the stack;

FIG. 5 is a fragmentary detailed view similar to FIG. 4 only showing the sheet shifted transversely to align one end of the sheet; and

FIG. 6 is a vertical cross-sectional view taken along line 6-6 in FIG. 2.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

Referring now in detail to the drawings, there is shown in FIG. 1 a core sheet feeder 10 for successively picking up core veneer sheets 11 from a stack 12 and conveying the sheets to a downstream layup station. The stack of core veneer sheets is fed to the feeder on a roll case 13.

The core sheet feeder has a support frame 14 with spaced end upright frame members 16 and 17 (FIGS. 2 and 3) at one end thereof. Plate steel guides 18 and 20 are mounted on the upright members 16 and 17 respectively for roughly centering the core stacks 12 crosswise to the feeder 10 and to the direction of travel of the sheets. The spacing between the guides 18 and 20 is slightly greater than the length of the sheets so as the stacks are moved between the guides 18 and 20 the stacks are roughly aligned with the core sheet feeders.

A conventional hydraulically operated scissor lift 32 is mounted at the end of the roll case 13 for successively receiving the individual stacks 12 beneath the vacuum hood assembly and for maintaining the height of the stack at a substantially constant elevation with respect to the normal position of the vacuum hood assembly 25. An upright stack stop 33 is mounted adjacent and alongside the scissor lift 33 to stop the movement of the stack as the stack moves from the roll case onto the scissor lift. A brace 34 is connected between the floor and the upright stop 33 for maintaining the stop in a substantially vertical position to prevent a stack from moving the stop 33. Electric eye elements 35 and 36 (FIGS. 1 and 2) are mounted on the end upright frame members 16 and 17 respectively and are directed in a substantial horizontal direction for sensing when the height of the scissor is below the eye elements. The eye elements control the scissor lift to maintain the height of the stack at a prescribed elevation. The scissor lift is lowered by the operator.

The main support frame 14 also includes support columns 22 and 23 at the other end of the feeder for supporting a vacuum hood assembly 25 elevated from the floor above the height of the stack. The vacuum hood assembly 25 includes a substantial horizontal frame 26 that is pivotally mounted to the columns 22 and 23 through pivot bearings 27. The frame 26 includes side frame members 28 and 29 (FIG. 2) that extend parallel to the direction in which the sheets are to be fed and cross members 20a, 30b and 30c that interconnect the side members to provide a substantially rigid support for the vacuum hood assembly 25.

Actuators 31 are mounted on the frame members 16 and 17 and connected to one end of the frame 26 for raising and lowering the vacuum hood assembly to pickup and remove the top sheet of the stack.

The vacuum hood assembly 25 includes a first vacuum hood 38 that is movably mounted on the frame 26 for transverse movement in a horizontal direction for shifting the veneer sheets endwise to align one end of the sheet along a selected plane Y (FIGS. 4 and 5) that is parallel to the direction in which the sheets are fed to the layup station. The first vacuum hood 38 is mounted to the frame 26 immediately above the scissor lift 32. A second vacuum hood 40 is stationarily mounted to the pivot frame 26 adjacent the hood 38 to receive the sheets from the first vacuum head and convey the sheets thereunder in the direction to the layup station. Each of the vacuum hoods 38 and 40 have large bottom downwardly directed openings 41 and 42 (FIG. 6) respectively for directing vacuum pressure therethrough to hold the sheets to the underside of the vacuum hood assembly.

Spaced plenum chambers 43 and 44 are mounted on the first vacuum hood 38 for directing vacuum pressure into the hood 40. Spaced plenum chambers 45 and 46 are mounted on the first vacuum hood 38 for directing vacuum pressure into the first vacuum hood. A common vacuum duct 47 interconnects the plenum chambers 43-46 to a vacuum source. The vacuum duct may be directly tied to a vacuum fan or may be connected to a common vacuum system located in a plywood plant.

The first vacuum head 38 is slidably mounted on guide rods 50 and 51 that extend between the side members 28 and 29 above the scissor lift 32. The vacuum head 38 has bearings 52 and 53 mounted thereon that fit on the guide rods 50 and 51 respectively. A fluid pressure actuator 54 (FIG. 2) is mounted on the side frame 28 parallel with the rods 50 and 51 and is connected to the first vacuum frame 38 for moving the frame

back and forth along the rods 50 and 51 to shift the core sheets received by the vacuum hood 38 to align one end with the reference plane.

The first vacuum hood 38 includes a conveying means mounted within the large opening 41 for conveying the sheet from the first vacuum head to the second vacuum head underneath the first vacuum head after the sheet has been removed from the stack. The conveying means includes a plurality of rollers 56 that are mounted in the opening 41 transversely to the grain of the sheets to move the sheets forward in a direction parallel to the grain of the sheets. The individual rollers are identified by 56a, 56b, 56c and 56d. The ends of the rollers extend through the sides of the vacuum head and are rotatably mounted in bearings 57. Pulleys 58 are mounted on the end of the rollers and are connected by common belts 59. A motor 60 (FIG. 2) is connected to the belts for rotating the rollers 56 when the vacuum hood assembly is raised to the up position to move the sheet received thereby from the first vacuum hood 38 to the second vacuum hood 40. Elongated transverse seals 61 (FIG. 6) are mounted between the top of the vacuum hood 38 to slidably engage the rollers to divide the interior of the vacuum hood into vacuum compartments 62 between the rollers. The individual vacuum compartments are identified as 62a, 62b, and 62c.

Orifice apertures 63 are formed between the hood 38 and the plenum chambers 46 to regulate the flow and pressure of the vacuum pressure in the hood.

Relief valves 65, 66 and 67 (FIG. 2) are mounted in the top of the hood 38 communicating with the compartments 62a, 62b and 62c respectively to prevent pressure in the hood from increasing above a preset vacuum pressure. It has been found that this feeder works exceedingly well when the relief valves are set to open at 0.55 inches of water static vacuum pressure.

Side slots 69 and 70 (FIG. 1) are formed in the side of the vacuum hood 38 communicating with the vacuum compartments 62b and 62c.

Sensing means are mounted on the side frame member 26 in transverse alignment with the slots 69, 70 for sensing when the one end of the sheet has been shifted sufficiently to align the end edge with the prescribed plane. The sensing means are mounted on a bracket 72 (FIGS. 1, 2, 4 and 5) that is fixed to the side member 28. Individual U-shaped brackets 74 and 75 are mounted on the bracket 72 in transverse alignment with the slots 69 and 70. Electric eye elements 76 and 77 (FIGS. 4, 5) are mounted on the bracket 74 and 75 in vertical alignment with the vertical plane for sensing when the end edge of the sheet has been aligned.

The electric eye elements 76 and 77 are operatively connected to the actuator 54 to stop the transverse movement of the vacuum hood 38 when the edge of the plywood sheet is aligned along the vertical plane Y.

In operation the actuators 31 move the hood 38 down against the top sheet on the stack. The hood 38 is then raised. As the hood moves up the actuator 54 is operated to shift the hood as shown in FIG. 4 and 5 to align one end edge in the vertical plane Y. When the light is broken the actuator is stopped and the motor 60 is operated to convey the aligned sheet forward to the second hood 40.

The second vacuum hood 40 also includes a conveying means for moving the plywood along the bottom thereof. The conveying means includes a plurality of rollers 80 (FIG. 6) that are mounted in the large downward directed opening 42 transverse to the grain of the sheets and direction of feed for receiving the sheets of plywood fed from the first vacuum hood 38. The rollers are individually identified as 80a, 80b, 80c, 80d, 80e and 80f. The end of the rollers extend through the side of the hood and are rotatably mounted in bearings 81 (FIG. 1). Small diameter pulleys 82 are mounted on the ends of the rollers 80a, 80b and 80c and large diameter pulleys 83 are mounted on the ends of the rollers 80d, 80e and 80f. The pulleys 82 and 83 are interconnected by belts 84 that are driven from a common motor 85. The motor 85 is continually operated to maintain the rollers 80 in constant motion.

Because of the diameter ratio between the large pulleys 83 and the smaller pulleys 82, the rollers 80d, 80e and 80f rotate at a slower rate than the rollers 80a, 80b and 80c. The rollers 56 and the rollers 80a, 80b, 80c are rotated at the same rate to move the core sheets crossways in the direction of feed at a fast speed and then the rate of feed is slowed as the sheets approach the forward end of the feeder. In one unit the beginning rate is approximately 300 feet per minute and then the rollers 80c, 80d and 80e slow the movement down to a rate of approximately 100 feet per minute.

The conveying means for the second vacuum hood 40 moves the leading edge (side edge) into a horizontal elongated stop 88 (FIG. 6) for accurately aligning the leading edge perpendicular to the movement of the sheet. Stop 88 is connected to an intermittent drive means 90 (FIG. 1) that moves the stop out of the way at precise intervals in coordination with the layup process at a downstream layup station. From the stop 88 the sheets move to a drive roller 91 (FIG. 6) that is rotated by a motor 92 (FIG. 1). A biasing or nip roller 93 is mounted immediately above the drive roller for biasing the sheet firmly against the drive roller to transmit the rotation of the drive roller to the sheets to convey the sheets at a prescribed rate to the downstream layup station. An example of such a downstream layup station is described in the companion application previously mentioned.

The vacuum source is a low pressure, high volume source. It has been found that for low grade core sheets a static vacuum pressure in the hood 38 of between 0.5 and 3.0 inches of water is sufficient to pick off the top sheet from the stack without picking up the second sheet.

I claim:

1. In plywood layup equipment, a core sheet feeder for successively removing core sheets from a stack and moving the sheets crosswise in a horizontal direction with one end edge of the sheets aligned in a vertical reference plane parallel with the horizontal direction, said core sheet feeder comprising:
 - a. a frame positioned along the horizontal direction;
 - b. a vacuum hood mounted on the frame overlying the core stack for vertical movement and for shifting transversely to the horizontal direction, said hood having an underside downward directed opening therein;
 - c. a source of vacuum pressure directed downward through the opening to hold the sheet to the underside of the hood;
 - d. a first drive means mounted on the frame for moving the hood down to the stack to receive the top sheet of the stack on the underside of the hood, for moving the hood upward to remove the received sheet from the stack and position the sheet crosswise to the horizontal direction;
 - e. a second drive means mounted on the frame for shifting the hood transversely to the horizontal direction to shift the sheet endwise;
 - f. control means operatively connected to the second drive means for controlling the second drive means to align one end edge of the sheet in said reference plane; and
 - g. a conveying means mounted on the hood that is responsive to the alignment of the end edge of the sheet for moving the sheet beneath the hood in the horizontal direction.
2. A core sheet feeder as defined in claim 1 wherein said conveying means includes a plurality of spaced rollers mounted in the underside opening transversely to the horizontal direction for receiving the sheets and moving the sheets beneath the hood in the horizontal direction.
3. A core sheet feeder as described in claim 1 wherein the control means includes one or more electric eye sensing devices mounted on the frame for sensing the alignment of the end edge in the reference plane.
4. A core sheet feeder as defined in claim 1 wherein the second drive means is operated in cooperation with the first drive means to align the end edge as the vacuum hood is moved upward.
5. A core sheet feeder as defined in claim 1 further comprising a second vacuum hood horizontally stationarily mounted

on the frame for receiving the sheets from the first vacuum hood and wherein the second vacuum hood has a conveying means mounted thereon for moving the sheets forward in the horizontal direction.

6. A core sheet feeder as defined in claim 5 wherein the conveying means of the second vacuum hood includes a plurality of spaced rollers rotatably mounted to the second hood transversely to the horizontal direction and a motor means connected to the rollers for rotating the rollers to move the sheets beneath the hood in the horizontal direction.

7. A core sheet feeder as defined in claim 5 further comprising a releasable stop means mounted on the frame transversely to the horizontal direction for stopping the forward movement of the sheets beneath the second vacuum hood and for releasing the sheets at intermittent intervals to permit the continued forward movement of the sheets.

8. In plywood layup equipment, a vacuum feeder for successively removing core veneer sheets from a stack and moving the sheets crosswise in a horizontal direction parallel with the grain of the core veneer sheets, said vacuum feeder comprising:

- a. a frame positioned along the horizontal direction;
- b. a vacuum hood assembly mounted on the frame with a first vacuum hood overlying the stack and an adjacent second vacuum hood extending in the horizontal direction; each of said hoods having underside downward openings therein, said first vacuum hood being movably mounted for vertical movement and for shifting transversely to the horizontal direction;
- c. a first set of spaced conveying rollers rotatably mounted

in the opening of the first vacuum hood transversely to the horizontal direction;

d. a second set of spaced conveying rollers rotatably mounted in the opening of the second vacuum hood transversely to the horizontal direction;

e. a source of vacuum pressure connected to the first and second vacuum hoods for directing vacuum pressure downward through the openings to hold the core veneer sheets against the conveying rollers;

f. a first drive means mounted on the frame for moving the first vacuum hood down to the stack to receive the top core veneer sheet and for moving the first vacuum hood upward to move the received sheet from the stack;

g. a second drive means mounted on the frame for shifting the first vacuum hood transversely to the horizontal direction to move the received sheet transversely;

h. an edge sensing device mounted on the frame and operatively connected to the second drive means for stopping the transverse shifting of the received sheet when one end edge of the sheet reaches a preset vertical reference plane;

i. a third drive means mounted on the frame operatively connected to the first set of rollers for rotating said rollers to move the sheet in the horizontal direction from the first vacuum hood to the second vacuum hood; and

j. a fourth drive means mounted on the frame and operatively connected to the second set of conveying rollers for rotating said rollers to move the sheet in the horizontal direction beneath the second hood.

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