Oct. 25, 1966 H. E. ERICKSON 3,280,866

IN-LINE VENEER PRODUCTION METHOD

Filed Oct. 10, 1963

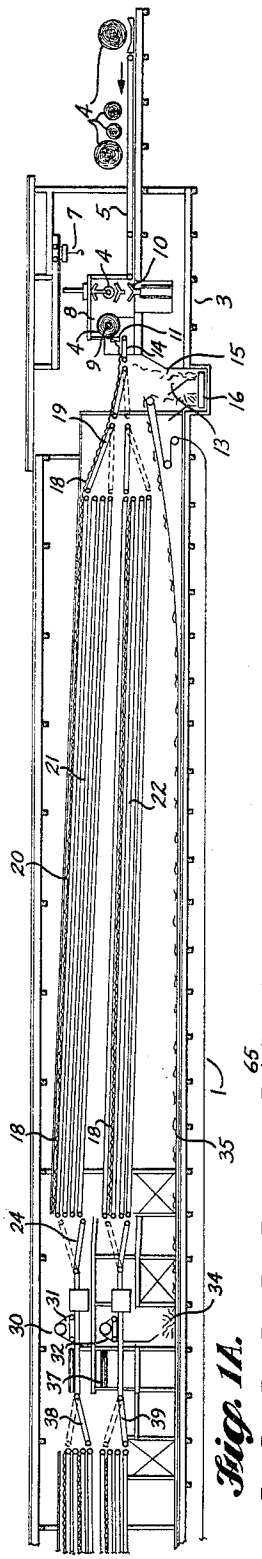

Fig. 1A.

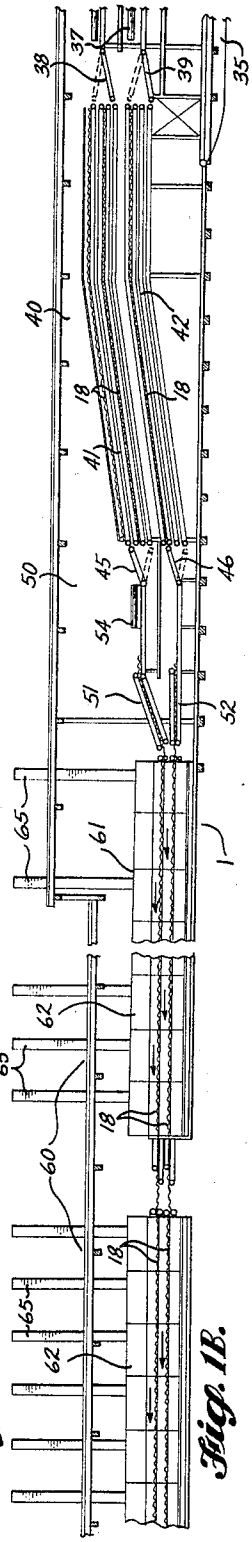

Fig. 1B.

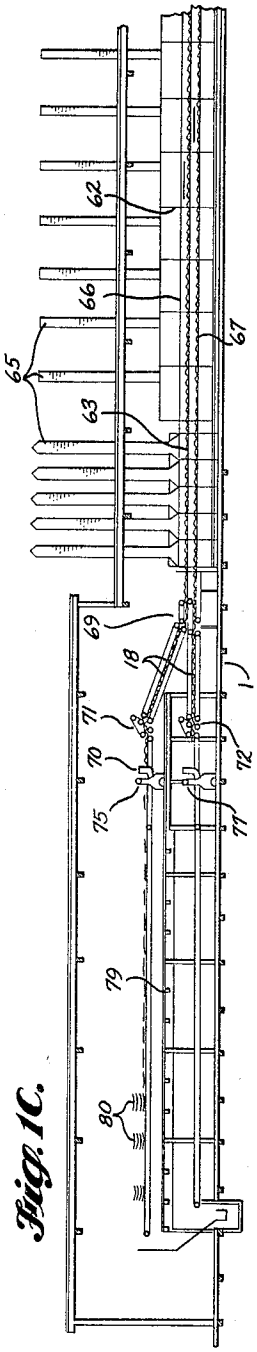

Fig. 1C.

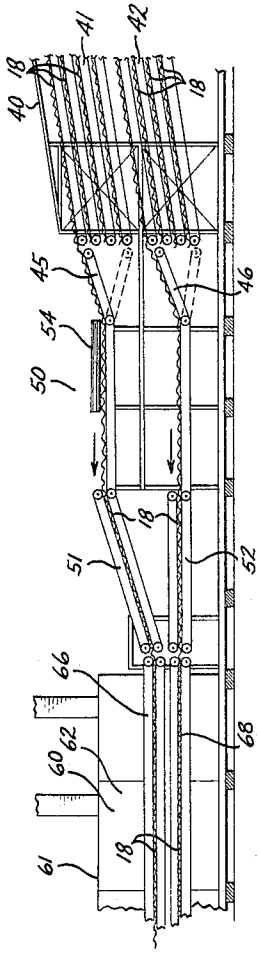

Fig. 2.

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IN-LINE VENEER PRODUCTION METHOD

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8 Claims. (Cl. 144—324)

This invention relates to the production of wood veneers and in particular to an improved process for in-line production of wood veneers.

In conventional prior art systems of soft wood plywood production, veneers are clipped wider than the finished sheet in order to account for an indefinite amount of shrinkage and sorted before they are dried. Sorting is done visually and is determined by the amount and size of knotholes, splits and rough surface and also by rough estimates of moisture content. Such moisture content is difficult to estimate while the veneer is still wet and before it passes through a dryer. Effective instruments for this purpose are not presently available. Thus, several veneer sheets are clipped improperly since they contain both relatively wet and relatively dry portions in one sheet. When such a sheet passes through the dryer at a sufficient speed to dry out the wet portion of the sheet, the dry portion becomes overdry and the resulting damage degrades the veneer and results in a lower commercial grade veneer.

The sheets of veneer are passed through the dryer in the prior art systems with the long axis of the veneer grain lengthwise to its path through the dryer. This is termed lengthwise drying and includes the drying of wood veneers in which the veneer passes through the dryer with its grain lengthwise of its direction of travel. This is in distinction from crosswise drying which includes the drying of wood veneers in which the veneer passes through the dryer with its grain crosswise of its direction of travel.

In the production of hardwood veneers, logs are often peeled and reeled. These reels are then transferred to the dryer and unrolled through the dryer to be clipped after they have been dried. This is done to allow the clipper operators to select matching pieces of the veneer and more carefully clip the veneer as it emerges from the dryer. Since it has passed through the dryer, all the shrinkage has occurred and the clipping of such dried hardwood veneers is to exact size. In both softwood and hardwood veneer production methods there is an intermediate handling step between the peeling of the log and the drying of the veneer.

Thus it is the object of my invention to peel veneers from the logs and convey them without human handling or stacking until they have passed through a series of conveyors and emerge from the system as dry, clipped veneer.

Another object is to produce softwood veneers which are clipped and graded after passing through a dryer without the loss of veneer due to oversized clipping allowing for an indeterminate indefinite amount of shrinkage.

Another object is to provide a veneer production process wherein the veneer which has passed through the dryer is accurately sensed for moisture content such that veneer which requires additional drying is accurately detected and can be separated from veneer which has had sufficient drying.

Another object is to provide a veneer production process which includes a means for peeling a log and storing the peeled veneer in sufficient amounts to feed a dryer for crosswire drying in a continuous manner wherein there is a minimum of gap through the dryer between portions of the peeled veneer.

Another object is to provide a veneer process which saves valuable grades of softwood veneer from overdrying by delaying the grading process until after a drying step.

Other objects and advantages of this invention will be apparent upon consideration of the following detailed description of a preferred embodiment thereof in conjunction with the annexed drawings. Various changes may be made, however, in the construction and arrangement of parts in the apparatus and certain features may be used without the use of other features. All such modifications are intended to be included within the scope of the appended claims.

In the drawings:

FIGURES 1A to 1C are side elevation views of the general arrangement of an in-line veneer production apparatus;

FIGURE 2 is a slightly enlarged view of the center portion of the in-line veneer apparatus.

Referring now to FIGURE 1 and following it from right to left and from top to bottom, the in-line veneer production apparatus **1** is shown which comprises a peeling station **3**, ribbon storage trays **20**, waste clipper section **30**, dryer storage trays **40**, dryer feeder **50**, dryer **60**, and grading-clipping section **70**. In detail, the peeling station **3** provides the means for bringing logs **4** by feed conveyor **5** and log handling equipment **7** to the lathe **8**. Logs **4** are positioned vertically in line with axis of the chucks **9** by charger calipers **10** or other suitable positioning means. Logs **4** are then grasped by charger arms (not shown) which carry the log **4** forward to align the log axis with the chuck axis. Lathe **8** supports the logs **4** by means of chucks **9** which grasp the ends of the log when it is centered in the lathe **8**. Once placed in the lathe **8** logs **4** are rotated at a varying speed so that as the peeling knife **11** is placed against the surface of the log **4**, the cut material which will be taken off by the peeling knife **11** in the form of veneer, often referred to as the ribbon, can leave the lathe area at a constant speed. In this way, as the log **4** is reduced in diameter as it rotates past peeling knife **11**, the speed of its rotation is increased to maintain the same veneer speed.

During the first phase of cutting when the log surface is not symmetrical to the center of the lathe chucks, the cuts which are taken by the peeling knife **11** are not continuous and are generally too rough and broken to be used as veneer. Such rough-cut waste **13** is conveyed by means of conveyor gate **14** to a waste chute **15** where it is further conveyed by means of chipper conveyor **16** to be made into wood chips. Once the log **4** is cut into its smallest practical diameter for veneer, the rotation is stopped and the remaining portion of the log, referred to as the core, is released from the grasp of the lathe chucks **9**, drops into a core discharge conveyor (not shown) to be further processed.

The desired product of the peeling process is the veneer **18** which is conveyed over conveyor gate **14** to tipples **19** which directs the ribbon of veneer **18** into the ribbon storage trays **20**. The ribbon storage trays consist of an upper and lower section **21**, **22** of four of conveyor belts for each section, which can convey the ribbon of veneer **18** from the peeling station **3** such that as the first level of the upper section **21** becomes full from end to end, the tipples **19** drop down to a lower level until that level of the conveyor belts also becomes full from end to end and this process continues from the upper section **21** to the lower section **22**. The conveyor belts at each of these levels travel until that length of conveyor is completely filled from end to end with a ribbon of veneer or until the storage tray level is emptied into the next station in the in-line veneer apparatus. The storage trays **20** provide a means for carrying the ribbon of

veneer **18** as it is cut from the logs **4** and to have it in an abundant supply ready for the next step in the processing of the veneer, yet not requiring any handling equipment, such as fork-lift trucks or bins or other means for carrying the ribbon from one part of a veneering plant to another.

As required the veneer **18** is discharged from the ribbon storage trays **20** by means of ribbon storage discharge conveyor **24** which passes the veneer **18** from the ribbon storage trays **20** to the waste clipper section **30**. Waste clipper operators inspect the ribbon **18** as it is conveyed from the storage trays **20** and use the clippers, the upper clipper **31** and the lower clipper **32**, depending on the path of the veneer, to cut away large unusable sections of the peeled veneer which are not worth passing through the drying process. The usable veneer is conveyed from the clippers **31**, **32** by an overhead vacuum conveyor. The clipped unusable veneer **34** is separated from the vacuum conveyor by a scraping or other suitable means dropping it to the waste conveyor **35** which carries it to a chipper feed conveyor **16**. With the arrangement as shown, it is possible to be discharging from the ribbon storage trays **20** from the upper section **21** through ribbon storage discharge conveyor **24** to the upper waste clipper **31** at the same time as discharging from the ribbon storage trays lower section **22** through ribbon storage discharge conveyor **24** to the lower waste clipper **32**. For the most part it is anticipated that the waste clippers will not be cutting the veneer while it is in the ribbon form and it will merely pass from the ribbon storage trays **20** on to the dryer storage trays **40** and will only need to be clipped to cut away the obviously unusable portions of the peeled material so that they will not be introduced into the dryer and take up valuable dryer space.

The dryer storage trays **40** are similar in construction to the ribbon storage trays **20** and comprise an upper section **41** and a lower section **42**, each section consisting of four levels of conveyor belts, which are fed by means of the waste clipper upper discharge conveyor **38** and the waste clipper lower discharge conveyor **39** from the waste clipper section **30**. This second set of storage trays is provided so that an abundant source of peeled material can be stored prior to conveying it to the dryer system. By having this abundant supply of ribbon veneer **18** there is no need for handling equipment such as fork-lift trucks, carts or other means of carrying the ribbon from the waste clipper section **30** to the dryer section **60**.

From the dryer storage trays **40** the ribbon veneer **18** is fed by means of dryer storage upper discharge conveyor **45** and dryer storage lower discharge conveyor **46** to dryer feed conveyor **50**, best seen in FIGURE 2. The upper dryer feeder conveyor **51** receives the ribbon from the dryer storage upper discharge conveyor **45** and conveys it to the upper dryer conveyor run **66**. The lower dryer feeder conveyor **52** receives the ribbon of veneer **18** from the dryer storage lower discharge conveyor **46** and conveys it to the lower dryer conveyor run **68**.

Since it is anticipated that some material which passes through the dryer **60** will not be sufficiently dry in one pass to be used as plywood veneer and must be recycled through the dryer **60** to reach the desired moisture content; there is provided a means for reintroducing such semidry veneer into the dryer **60**. For convenience there is provided a lower redry feeder **37** which introduces the semidry veneer to the waste clipper lower discharge conveyor **39** so that it will pass through the lower section of the dryer storage trays **42**. The semidry veneer will then pass through the lower dryer feed conveyor **52** onto the dryer **60**. A second redry feeder, the upper redry feeder **54**, is located at the upper dryer feed conveyor **51** and provides a means for introducing another quantity of semidry veneer to the dryer.

The dryer feeder **50** is operated so that there is a constant unbroken line of veneer material supplied to the dryer **60** so that none of the dryer volume is wasted by gaps in the material which is to pass through it. This is accomplished by feeding the dryer **60** from the dryer storage trays **40** in such a way that even if there are gaps in the storage trays, the storage tray conveyors can be accelerated in speed in relation to the speed of the dryer and thus fill in any gaps that otherwise might occur in the dryer line. Also, since there are several layers of storage in the dryer storage trays **40** in relation to the two layers of dryer conveyor line, it is possible to keep the dryer **60** completely filled at all times. It is also noteworthy that since the veneer is introduced into the dryer **60** with its grain crosswise to its direction of travel through the dryer, there are no gaps which occur in the "lengthwise drying" known in the prior art wherein the wood veneers pass through the dryer with their grain lengthwise to the direction of travel.

The dryer **60** consists of a long, low, self-enclosed dryer housing **61** which contains conveyors running from one end to the other which carry the peeled veneer through the dryer heating sections **62** to the dryer cooling section **63**. Extending from above the dryer housing **61** are dryer exhaust stacks **65** for carrying away the excess moisture from the dryer housing. The conveyors for the veneer consist of an upper dryer conveyor **66** and a lower dryer conveyor **68**. The lower dryer conveyor **68** is fed veneer **18** from the lower dryer feed conveyor **52** and the upper dryer conveyor **66** is fed veneer **18** from the upper dryer feed conveyor **51**. The dryer **60** has an air handling system for directing heated air onto the surfaces of the veneer **18** and thus dries the veneer as it transits the dryer. At the end of the dryer **60** the cooling section **63** directs cool air onto the surfaces of the veneer **18** in order to cool the surfaces of the veneer for later handling.

From the cooling section **63** the veneer **18** passes to the grading-clipping section **70** with the discharge from the upper dryer conveyor **66** being conveyed to the upper moisture meter and marker **71** which automatically senses the moisture content of the veneer **18** and if it exceeds a predetermined moisture content, marks the edge of the veneer so that the grading-clipper operator has an indication of what veneer is acceptable for immediate use and what veneer will require a further pass through the dryer. In the same manner the veneer which is discharged from the lower dryer conveyor **68** is conveyed to the lower moisture meter and marker **72**. Once the moisture content has been determined a grading-clipper operator looks over the veneer to give it an over-all grade. Once this has been determined, the upper and lower grading clippers **75** and **77** respectively are actuated to cut the ribbon of veneer **18** into the exact sizes needed according to the grade given by the grading-clipper operator. If the edge of the veneer is marked indicating that the moisture content is excessive, the grading-clipper operator may cut the ribbon as close as possible to the beginning of the marked area and in this way salvage as much dry veneer as possible. Since the wetter sections which must be redried may continue to shrink as they pass again through the dryer, the grading-clipper operator has a delay switch which adds a percentage to the standard size to allow for shrinkage. From the grading station **70** the veneer which has been cut to size by the upper or lower grading clippers **75**, **77**, is conveyed to sorting table **79** and placed in sorted stacks **80** for further processing.

Operation

The key to efficient utilization of the in-line veneer production apparatus herein disclosed is in the correct balance of operating speeds and capacities of the various subcomponents with the optimum reached when the dryer is continuously filled with veneer ribbons placed edge to edge. For this reason the storage trays are capable of variable speeds and can be loaded at one level and unloaded at another level at the same time, to accomplish the desired result of keeping the dryer full.

For example, the first storage trays **20** may be loaded at one level of the conveyors of the upper section **21** at a speed of veneer travel of 8000 feet per minute. Tray loading may stop entirely during the loading of a new log **4** onto the lathe **8**, then loading speed may increase after the rough-cut waste **13** has been removed from the log. At the same time another level of the upper section **21** and one level conveyor of the lower section **22** of the storage trays **20** may be off-loading through the waste clipper section **30** at up to 300 feet per minute which may slow down as the waste clipper operator clips away unusable sections of peeled veneer. Thus it follows that as the veneer passes through the waste clipper section **30** from the storage trays **20** it can feed the upper or lower sections **41**, **42** of the dryer storage trays **40** at a speed as high as 300 feet per minute. At the same time the other conveyor levels of the dryer storage trays **40** may be feeding veneer to the dryer feed conveyors **50** so that the dryer can be continuously operated at drying speed.

Thus, the time lag occurring during the loading of the lathe and the clipping away of waste material does not affect the continuous full operation of the dryer. With this in-line mill in operation, the usual handling of veneers after they are peeled from the lathe is completely eliminated, therefore resulting in a considerable saving of time, personnel and money.

With this equipment it is possible to use two methods of drying. The first method of drying is to pass all veneers **18**, from one log whether from the outer portion, i.e., the sap portion of the log, or from the inner portion, i.e., the heart portion of the log, through whichever line of the dryer is convenient. That portion of the veneer which is not completely dry as it passes through the moisture meters **71**, **72** is indicated before final clipping. The grading-clipper operator may then clip with respect to moisture content as well as grade. Those sheets of veneer which have not been adequately dried can be recirculated by means of the lower redry feeder **37** and the upper redry feeder **54** or through another dryer.

The second alternate method of operation would pass all of the veneers from the sap portion of one log to one-half of the dryer storage trays **40**, thence into one line of the dryer for drying at one rate. The balance of the veneer would be sent to the other half of the dryer storage trays and to the other line of the dryer for drying at another rate. In either case the veneers are clipped after the majority of the shrinkage has taken place.

Summary

In summary, the process includes the following basic steps:

The logs **4** are first hauled into the peeling station **3** and peeled by a lathe **8**, the resulting veneers **18** are fed into upper and lower sections **21** and **22** of ribbon storage trays **20**, the veneers **18** pass from the storage trays **20** to a waste clipper section **30** that eliminates unusable veneer and from there the veneers **18** are reassembled in dryer storage trays **40**. From the dryer storage trays **40** the veneers **18** are fed directly into a conveyor-type dryer **60** where it is dried and conveyed through moisture meters **71**, **72** and through grading clippers **75**, **77** where the veneers **18** are clipped according to their moisture content and veneer grade. The veneers are then sorted at sorting table **79** and those which are sufficiently dry are used to make plywood or other lumber products and those which are too set for immediate use are recirculated through the redry conveyors **37**, **54**, or to another dryer.

Having now described my invention and in what manner the same may be used, what I claim is new and desire to protect by Letters Patent is:

1. An in-line veneer production process comprising the following steps:

(a) peeling logs into veneer,

(b) conveying said veneer directly to storage trays,

(c) conveying said veneer directly from said storage trays into a veneer dryer,

(d) drying said veneer in said dryer,

(e) conveying said veneer from said dryer to a moisture meter,

(f) sensing the moisture content of said veneer and marking that veneer which contains moisture in a predetermined range,

(g) conveying said veneer from said moisture meter to a clipper station,

(h) clipping said veneer into veneer sheets according to grade and moisture content.

2. The in-line veneer production process of claim **1** wherein:

said veneer is conveyed through said dryer with the veneer's grain crosswire to its direction of travel.

3. The in-line veneer production process of claim **1** wherein at least two of the steps are performed at the same time on different parts of said veneer.

4. An in-line veneer production process comprising the following steps:

(a) peeling a log into veneer at a peeling station,

(b) conveying said veneer directly from said peeling station to a first set of storage trays,

(c) conveying said veneer directly from said first trays to a waste removal station,

(d) removing unusable sections from said veneer at said waste removal station,

(e) conveying said veneer directly from said waste removal station to a second set of storage trays,

(f) conveying said veneer directly from said second trays into a veneer dryer,

(g) drying said veneer in said dryer,

(h) conveying said veneer from said dryer to a moisture meter,

(i) sensing the moisture content of said veener and marking that veneer which contains moisture in a predetermined range,

(j) conveying said veneer from said moisture meter to a clipper station,

(k) clipping said veneer into veneer sheets according to grade and moisture content.

5. The in-line veneer production process of claim **4** wherein:

the clipping step (k) is to exact size for those sheets of veneer which have a moisture content below a predetermined range as indicated by the marking which was performed in step (i).

6. The in-line veneer production process of claim **4** wherein at least two of the steps are performed at the same time on different parts of the veneer.

7. An in-line veneer production process comprising the following steps:

(a) peeling a log into veneer at a peeling station,

(b) conveying said veneer directly from said peeling station to a first set of storage trays,

(c) conveying said veneer directly from said first trays to a waste removal station,

(d) removing unusable sections from said veneer at said waste removal station,

(e) conveying said veneer directly from said waste removal station to a second set of storage trays,

(f) conveying said veneer directly from said second trays into a veneer dryer,

(g) drying said veneer in said dryer,

(h) conveying said veneer from said dryer to a moisture meter,

(i) sensing the moisture content of said veneer and marking that veneer which contains moisture in a predetermined range,

(j) conveying said veneer from said moisture meter to a clipper station,

(k) clipping said veneer into veneer sheets according to grade and moisture content,

(l) sorting said graded sheets by grade and moisture content.

8. An in-line veneer production process comprising the following steps:

(a) peeling a log into veneer at a peeling station,
(b) conveying said veneer directly from said peeling station to a first set of storage trays,
(c) conveying said veneer directly from said first trays to a waste removal station,
(d) removing defective sections from said veneer at said waste removal station,
(e) conveying said veneer directly from said waste removal station to a second set of storage trays,
(f) conveying said veneer directly from said second trays into a veneer dryer,
(g) drying said veneer in said dryer,
(h) conveying said veneer from said dryer to a moisture meter,
(i) sensing the moisture content of said veneer and marking that veneer which contains moisture in a predetermined range,
(j) conveying said veener from said moisture meter to a clipper station,
(k) clipping said veneer into veneer sheets according to grade and moisture content,
(l) sorting said graded sheets by grade and moisture content,

(m) recycling said sheets which moisture content is in excess of a predetermined range through said dryer.

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HAROLD D. WHITEHEAD, *Primary Examiner.*

WILLIAM W. DYER, JR., *Examiner.*

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,280,866 October 25, 1966

Harold E. Erickson

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 5, line 3, for "8000" read -- 800 --; line 67, for "set" read -- wet --.

Signed and sealed this 5th day of September 1967.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents