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[54] **IN-LINE VENEER PRODUCTION SYSTEM**
9 Claims, 4 Drawing Figs.

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[50] **Field of Search** 144/327, 324, 314, 317, 309, 209, 3, 1

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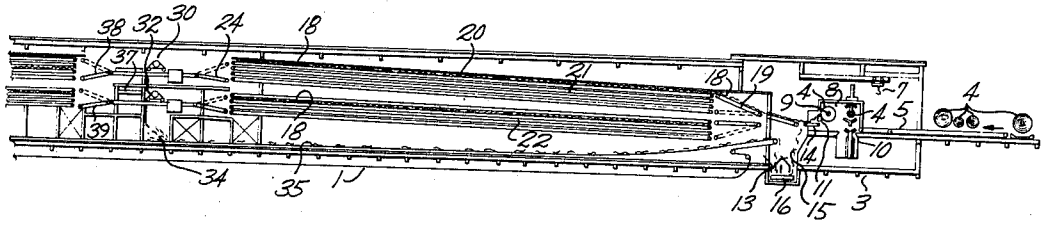
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ABSTRACT: A system for efficiently utilizing a wood veneer peeling lathe and dryer by installing a number of horizontally disposed and vertically spaced veneer storage and conveying trays spanning from the peeling lathe to the dryer. More levels of trays are provided than levels of conveyors in the dryer to insure a ready source of veneer to keep the dryer supplied with no gaps between pieces of veneer. A waste removal clipper may be positioned between the ends of the trays for removal of defective portions of veneer. The wetter portions of veneer can be conveyed to a slower dryer conveyor while the drier portions can be conveyed on a faster dryer conveyor without overdrying.



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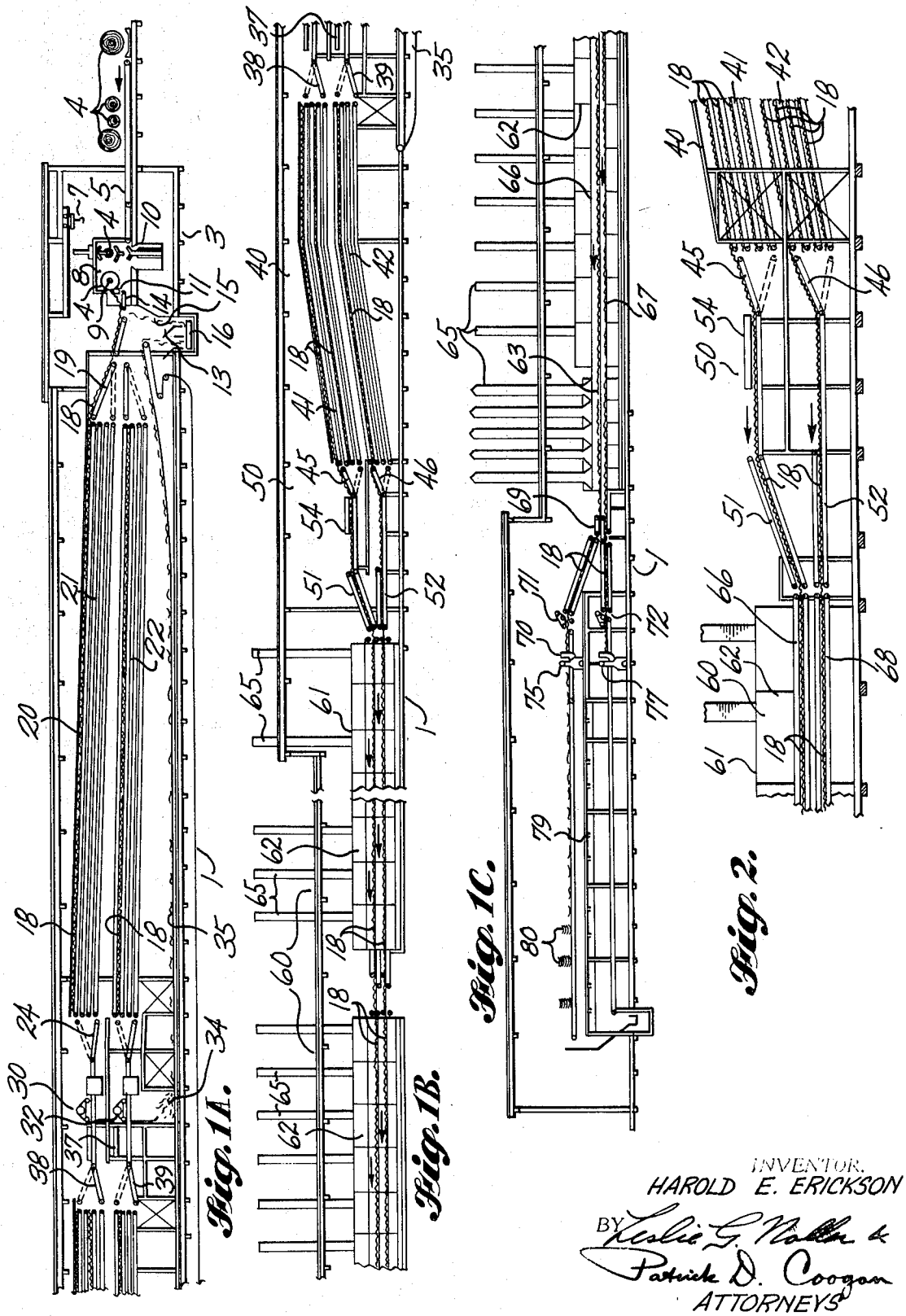


Fig. 1A.

Fig. 1B.

Fig. 1C.

Fig. 2.

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IN-LINE VENEER PRODUCTION SYSTEM

This is a division of application Ser. No. 315,248, filed Oct. 10, 1963, now U.S. Pat. No. 3,280,866 issued Oct. 25, 1966. This invention relates to the production of wood veneers and in particular to an improved process and apparatus for inline production of wood veneers.

In conventional prior art systems of softwood 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 to 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 to 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 apparatus which includes a means for peeling a log and storing the peeled veneer in sufficient amounts to feed a dryer for crosswise 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:

FIGS. 1A to 1C are side elevation views of the general arrangement of an inline veneer production apparatus;

FIG. 2 is a slightly enlarged view of the center portion of the inline veneer apparatus.

Referring now to FIG. 1 and following it from right to left and from top to bottom, the inline 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 and 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 direct 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 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 inline 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 forklift 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 onto 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 forklift 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 feed by means of dryer storage upper discharge conveyor 45 and dryer storage lower discharge conveyor 46 to dryer feed conveyor 50, best seen in FIG. 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 overall 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 inline 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 conveyors of the upper section 21 at a speed of veneer travel of 800 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 inline 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 they are 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.

I claim:

1. A process of producing veneer comprising the following steps:
   a. peeling logs in a peeling means to produce veneer;
   b. conveying said veneer from said peeling means in sequence to more than one level of storage tray means;
   c. conveying said veneer in sequence from more than one level of said storage tray means in a continuous edge-to-edge supply directly to one level of a dryer; and
   d. drying said veneer in said dryer.

2. A process of producing veneer comprising the following steps:
   a. peeling logs in a peeling means to produce veneer;
   b. conveying said veneer from said peeling means to storage tray means;
   c. conveying said veneer from said storage tray means in a continuous edge-to-edge supply directly to a dryer; and
   d. drying said veneer in said dryer, wherein; said dryer has at least two levels of conveyors transmitting its length, the veneer peeled from the sap portion of the logs is conveyed to one set of said storage trays to supply one level of said dryer, and the veneer peeled from the heart portion of the logs is conveyed to a second set of said storage trays to supply a second level of said dryer.

3. A process of producing veneer comprising the following steps:
   a. peeling logs in a peeling means to produce veneer;
   b. conveying said veneer from said peeling means to storage tray means;
   c. conveying said veneer from said storage tray means in a continuous edge-to-edge supply directly to a dryer; and
   d. drying said veneer in said dryer, wherein; said dryer has at least two levels of conveyors transmitting its length, with one level of said dryer operating at a lower speed than another level.

4. A process of producing veneer comprising the following steps:
   a. peeling logs in a peeling means to produce veneer;
   b. conveying said veneer from said peeling means directly to storage tray means; including
      1. conveying said veneer from said peeling means directly to ribbon storage trays,
      2. conveying said veneer from said ribbon storage trays directly to a waste removal station,
      3. removing unusable sections from said veneer, and
      4. conveying the remaining veneer from said waste removal station directly to dryer storage trays,
   c. conveying said veneer from said dryer storage trays in a continuous edge-to-edge supply directly to a dryer; and
   d. drying said veneer in said dryer.

5. An inline veneer production apparatus comprising in combination:
   veneer drying means including at least one layer of dryer conveyors running from one end to the other which carry peeled veneer through said drying means;
   peeling means for peeling logs into veneer;
   storage trays positioned between said drying and peeling means installed inline in the direction of travel of said veneer, including at least two layers of storage trays for each layer of dryer conveyors with each of said trays being provided with means for conveying said veneer along its length;
   dryer feeder conveyor means having one end adjacent each layer of said dryer conveyors and including means to position the other end at each level of said storage trays provided and means to convey veneer from said other end to said one end for feeding the layer of dryer conveyor adjacent said one end; and
   storage feeder conveyor means having one end adjacent said peeling means for receiving said peeled veneer and including means to position the other end at each level of said storage trays and means to convey veneer from said one end to said other end for feeding said storage trays with said peeled veneer.

6. The apparatus of claim 5 wherein; there are four storage tray levels provided for each layer of dryer conveyors.

7. The apparatus of claim 5 wherein:
   said storage trays include two sets of storage trays installed inline in the direction of travel of said veneer; and
   clipper means positioned between said sets of storage trays for removing unusable sections of said peeled veneer as it is conveyed from one set of storage trays through said clipper means to the other set of storage trays.

8. The apparatus of claim 7 wherein; two layers of dryer conveyors are provided in said dryer and eight levels of storage trays are provided in each set of said storage trays.

9. The apparatus of claim 5 wherein; said veneer is fed into said dryer from said storage trays with the grain of said veneer crosswise to its direction of travel.