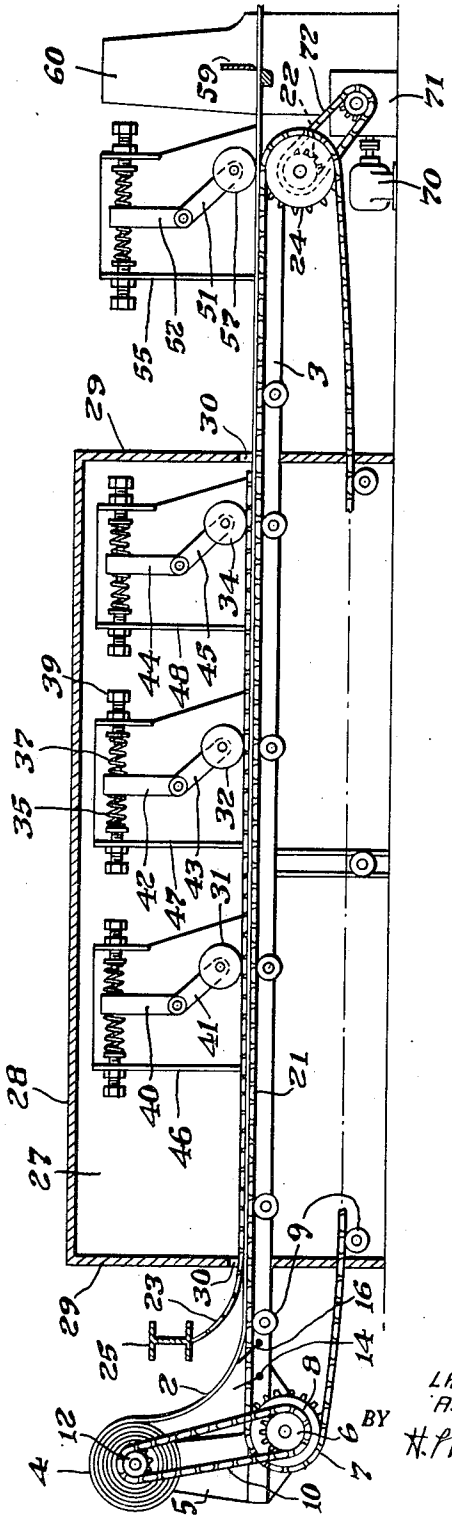
July 15, 1952 L. C. QUIMBY ET AL 2,603,004

METHOD AND APPARATUS FOR MAKING VENEER

Filed April 28, 1949 2 SHEETS—SHEET 1

Fig. 1




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Filed April 28, 1949 2 SHEETS—SHEET 2

Fig. 3

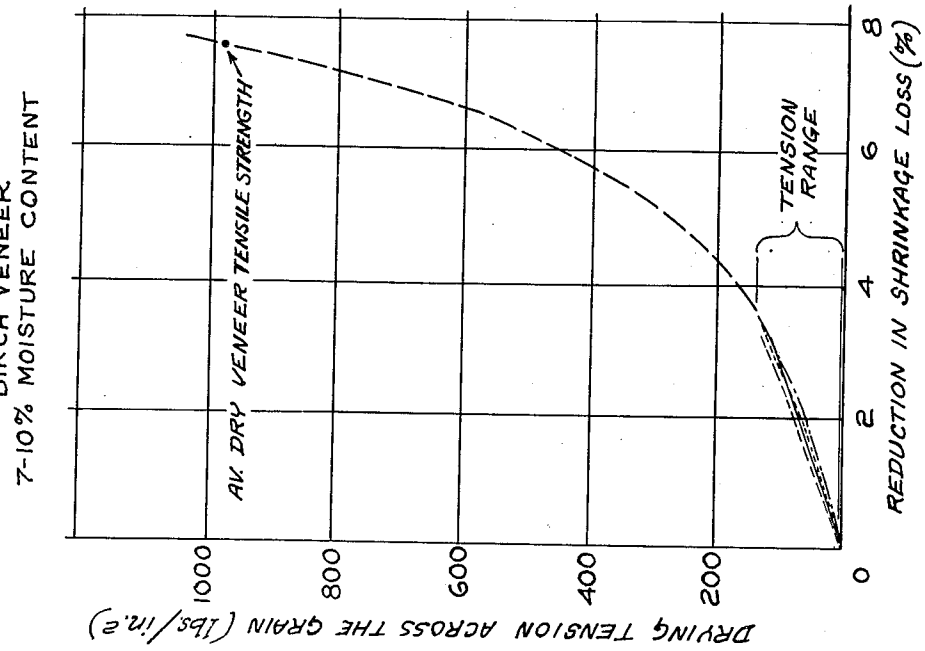
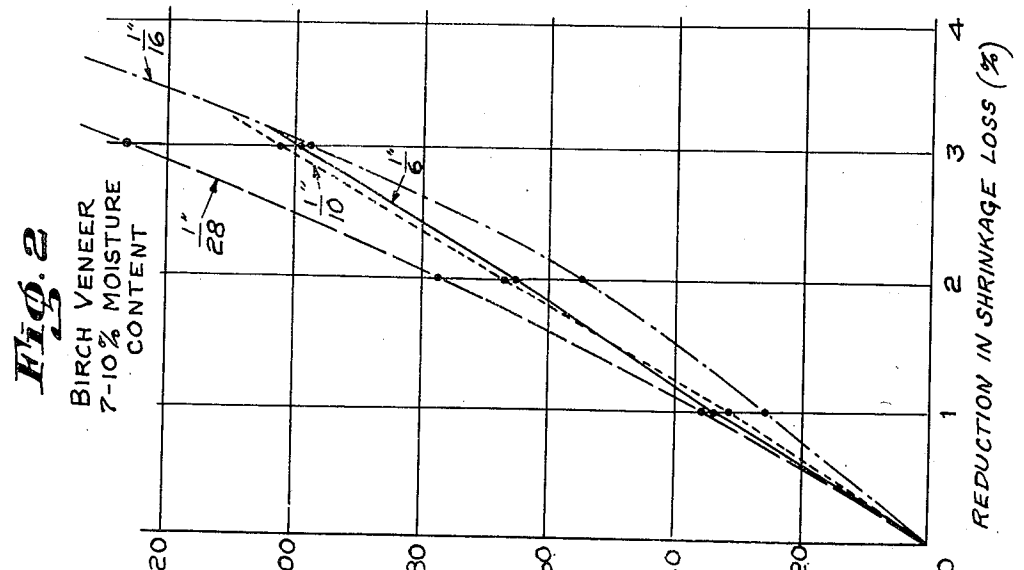



Fig. 2




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2,603,004

## METHOD AND APPARATUS FOR MAKING VENEER

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15 Claims. (Cl. 34—13)

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This invention relates to the production of wood veneer and specifically to the drying thereof by continuously feeding a green veneer strip cut tangentially (widthwise of the grain) from a log and fed from a reel through a drying device in a direction widthwise of the grain and clipping the resulting dry veneer ribbon into individual dried sheets.

When veneer is cut from the log it is in a state in which the moisture content is above what is known as the fibre saturation point. As soon as the moisture content drops below the saturation point in the drying of the veneer, contraction at right angles to the grain begins. The green veneer as cut from the log and wound onto a reel has a low degree of tensile strength since its grain is at right angles to the length of the strip, so that it is important in drying the strip to avoid any destructive tensile stress lengthwise of the green veneer strip or ribbon.

Heretofore, to prevent tearing or splitting of the veneer strip, veneer drying methods have provided for drying without tensioning the veneer strip widthwise of the grain by cutting the green veneer strip into relatively small sheets that may be fed through a dryer. This drying procedure requires cutting of the veneer strip before drying (say into sheets about 3' to 8' lengthwise of the grain and a maximum of about 8' wide), and, since the warping and shrinkage will vary considerably from sheet to sheet of apparently identical green veneer, it has been found necessary to provide considerable excess in the width of the green veneer sheet to allow clipping the dry veneer sheets to a predetermined size. This results in considerable waste. Furthermore, since green veneer is quite fragile, the necessary handling of the individual veneer sheets causes considerable breakage and consequent waste, as they must be manually fed to the dryer from the green veneer clipper and then again manually fed to the final clipper before sorting and grading of the dry sheets.

The object of our invention is to permit the economical drying of the rolled strip of green veneer as it comes from the veneer lathe by continuously passing the green veneer strip in a direction widthwise of its grain through the drying device while applying a controlled longitudinal tension uniformly across the entire width of the veneer strip, and preferably a progressively increasing tension to the veneer strip to reduce the amount of shrinkage, but still avoiding destructive tensile stress in veneer strips of considerable length, that is, twenty feet or more.

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A further object of our invention is to reduce warping and produce flatter individual sheets of dry veneer by both drying and cooling the veneer strip while under tension on a substantially continuous underlying moving support, and then removing the defects by clipping such defective portions from the veneer strip immediately upon the release of tension so that such defects will not cause warping of the accepted clipped veneer sheets during their further cooling in the untensioned state, and also to obtain the required grade in the most desired size.

The advantages of our invention include a considerable increase in output by reducing the shrinkage of the veneer strip, allowing approximately 1% more dry veneer to be produced from the same amount of green veneer as cut from the log, and, in addition, a reduction in the waste caused by the prior conventional handling of the individual green veneer sheets and the necessary allowance for shrinkage and warping in conventional drying methods requiring the cutting of the veneer strip into relatively small (though still oversize) sheets before drying instead of cutting the continuous dry veneer strip to final finished size according to our invention.

Another advantage of our invention results from the ready matching of the veneer sheets after clipping to size, since the grain pattern of the veneer strip will repeat at frequent intervals determined by the circumference of the log (at the particular stage of cutting) and may be matched by picking up closely adjacent sheets of veneer as they emerge from the clipper knife, thus again reducing the necessary handling and consequent breakage of the thin veneer sheets.

Other advantages of our invention include a flatter product less subject to warping, and a decrease in the manufacturing costs by permitting continuous drying, cutting to final size, and ready matching of pieces cut from the veneer strip as it comes from the log.

For the purpose of further explaining our invention, reference is made to the following drawings showing a preferred apparatus, in which:

Fig. 1 illustrates one form of apparatus suitable for use in carrying out the method of our invention;

Fig. 2 illustrates in graphical form the reduction in shrinkage loss resulting from drying typical birch veneer strips under varying tensions, and

Fig. 3 illustrates the curves of Fig. 2 as extended to include the average dry birch veneer tensile strength.

Referring to Fig. 1, the continuous strip of veneer 2 as it comes from the log has been wound on a reel 4 at the cutting lathe, not shown. The reel 4, placed on suitable supports 5, is driven through a sprocket 6 on the conveyor belt roll 8, a chain drive 10, and another sprocket 12 on the reel 4. The speed of the reel 4 is controlled by limit switches 14 and 16 or their equivalent, through a magnetic clutch and brake, not shown, interposed between the sprocket 12 and the reel 4, in order that the veneer strip 2 may be automatically fed to the conveyor belt 21 without undue tensioning or piling up of the veneer. Although the veneer strip is shown as unwinding from the forward side of the reel 4, it may be unwound from the other side in opposite direction by reversing the reel drive and relocating the limit switches 14 and 16.

The conveyor belt 21, which carries the veneer strip through the drying chamber 27, is an endless wire mesh belt and is driven by a sprocket 22 mounted on head shaft 24 which is supported in suitable bearings (not shown) carried by the frame 3. Power is supplied to head shaft 24 from motor 70, through speed variator 71 and chain drive 72. At the infeed end of the drying chamber, the conveyor belt is supported by sprockets 7 while the top and bottom flights of the conveyor belt are supported by a series of idler rolls 9 attached to the frame 3 of the conveyor.

The drying chamber 27 is formed by insulated walls 29 and roof 28 with apertures 30 provided in each end wall through which the conveyor belt 21 can enter and leave the chamber with the ribbon of veneer supported and carried on its top flight. Hot air is circulated through the chamber and is directed against the top and bottom surfaces of the ribbon of veneer.

In the preferred form of apparatus, controlled longitudinal tension uniformly across the entire width of the continuous moving strip of veneer is caused to develop during drying by providing an open mesh apron 23, which lies on top of the continuously moving strip of veneer, said apron being attached to a transversely extending member 25 at the infeed end of the dryer chamber and extending substantially the entire length of the dryer chamber. For some operations, particularly with thick veneer, it may be desirable to operate the conveyor intermittently. Hold-down rolls 31, 32, 34 and 57 are provided to permit adjustment of the resistance of the apron to the transverse-grain shrinkage of the veneer. The hold-down rolls are journalled in pairs of arms 41, 43, 45 and 51 supported on pairs of supports 46, 47, 48 and 55 attached to the frame 3 of the apparatus. An extension 40, 42, 44 and 52 of roll-carrying arms 41, 43, 45 and 51 is positioned between pairs of opposed springs 35 and 37, each backed up by an adjusting screw 39. By means of said adjusting screws 39 through springs 35 and 37 the pressure exerted by rolls 31, 32 and 34 on the apron 23 and by roll 57 on the veneer strip 2 is individually adjustable to provide for progressively increasing tension in the veneer strip, as is preferred. Another method of adjusting the pressure on the veneer strip 2 is by the use of an overlying apron of adjustable length, or by varying the effective weight of such overlying apron.

Though an overlying apron is used in the preferred form of apparatus to increase the ease of feeding the forward edge of a veneer strip through the dryer chamber and to provide increased restraint on the thin veneer, particularly in view of the high air velocities commonly used in the dryer chamber, it will be appreciated that hold-down rolls alone (though preferably more in number than shown), or other overlying means providing frictional resistance to the forward movement of the veneer strip, can be employed to provide the necessary tensioning of the veneer strip in accordance with our invention.



After the veneer strip has been dried to the desired moisture content, for example 5 to 10% (by weight on a dry basis), it passes out of the dryer chamber 27 and well beyond the end thereof, meanwhile cooling to a substantial extent while still under tension due to hold-down roll 57 and its associated adjusting mechanism. It is preferred to adjust the pressure of the final hold-down roll 57 so that there is little or no slippage between the conveyor belt 21 and the veneer strip 2 at this point, thus maintaining tension of the veneer strip during such cooling thereof. A considerable distance, which may be as long as twenty to thirty feet, is provided between the dryer chamber 27 and the final hold-down roll 57 for the dual purpose of permitting the veneer strip to cool and of allowing the operator to observe the continuously moving strip of dry veneer after it leaves the drying chamber, regulate its speed to maintain the optimum dryness, and to make decisions as to where the continuously moving veneer strip should be severed to yield the maximum value in finished sheets of random or predetermined sizes in view of the defects such as knots which are commonly present in a ribbon of veneer.

Preferably, immediately after the dry veneer strip passes under the final tensioning roll 57, the operator cuts the continuously moving veneer strip into individual parallel-edged sheets with the drop-knife 59 and associated apparatus, indicated generally at 60, in order to remove the defective portions from the dry veneer strip by clipping before further cooling of the veneer in the untensioned state causes warping because of such defects, and at the same time provide means for continuously disposing of the output of the dryer.

The drop-knife apparatus 60 may be provided with a control device, which in synchronism with the rate of discharge from the dryer will permit the operator to implement his decision and cause the clipper knife to descend and sever the dry veneer strip into individual sheets of predetermined sizes of maximum value.

The individual dry veneer sheets are then removed by a conveyor, not shown, to grading and final inspection stations.

In a typical commercial installation, the distance between the first hold-down roll 31 and the last hold-down roll 57 may be sixty feet or more. Commercial rotary-cut birch veneer shrinks across the grain an average of 6.0% of the length of the strip of ribbon when dried to 5–10% moisture content, which in sixty feet of veneer strip length would be approximately 43 inches. If the pressure of the hold-down rolls 31, 32, 34 and 57 is such that there is no slippage of the veneer strip in respect to the conveyor belt, then the ribbon of veneer when dried would have to stretch approximately 43 inches or the tension created by the shrinkage will tear or split the ribbon of veneer apart in one or more places. The usual species of wood cut into commercial rotary veneer will not, under normal conditions, stretch transversely of the grain 6.0% without tearing. Hence, the hold-down rolls 31, 32 and

34 are adjusted to provide such a degree of tension that will not tear the veneer but will still reduce the shrinkage of the veneer strip to a considerable extent. For example, green birch veneer of 1/28" thickness has an average tensile strength across the grain of 20 lbs. per inch of width of strip; birch veneer of 1/18" thickness averages 32 lbs.; birch veneer of 1/16" thickness average 46 lbs., and birch veneer of 1/8" thickness averages 81 lbs. Accordingly, these thicknesses of green birch veneer can be dried under a maximum tension which does not exceed these values.

Fig. 2 illustrates the reduction in shrinkage loss obtained by drying individual sheets of such green veneer under tension in a test apparatus, and indicates the increase in output of veneer that can be obtained in the commercial dryer by tensioning the veneer strip and thus reducing its shrinkage. Since a green veneer strip being dried by the method of our invention is constantly moving, it is difficult accurately to measure directly the tension developed in the veneer strip during drying and cooling. However, we believe the tension to be of the order of 100 lbs. in the case, for example, of a continuous strip of veneer of 1/28" thickness and measuring 8' lengthwise of the grain, i. e., widthwise of the strip. As wood veneer is a natural product, it is not uniform, and hence the drying tension, as a practical matter, must be substantially less than the tensile strength of the veneer strip. We prefer to adjust the weight of the apron overlying the veneer strip to permit a reduction in shrinkage loss of approximately 1%. Comparison of such a reduction in shrinkage loss value to the curve of Fig. 2 indicates a tension of approximately 30 lbs. per sq. inch, or approximately 100 lbs. total tension in a continuous 8' veneer strip.

Fig. 3 illustrates the curves of Fig. 2 as extended to includes the average tensile strength of dry birch veneer. Though we prefer to use a tension in the veneer strip of approximately 30 lbs. per sq. inch across the grain, tension between a few pounds and approximately 150 pounds per sq. inch across the grain will serve for birch veneer. Since an average tensile strength across the grain of dry birch is 980 lbs. per sq. inch, the above tension values indicate that a veneer strip may be tensioned advantageously from as low as 0.33% to even as high as 15% of the average tensile strength across the grain of the veneer being dried. It is believed desirable, however, to operate in the range of 0.75–4.5%, and preferably in the range of 2.0–3.0%.

Although our invention has been described in connection with birch veneer as an example, other species of veneer may be dried by the method and apparatus of our invention by the use of tensions of the percentages of those above set forth.

This application is a continuation-in-part of our co-pending application, Ser. No. 526,730, filed March 16, 1944, for Apparatus for Making Veneer, now abandoned, the subject matter of said prior application being incorporated in this application together with additional subject matter.

We claim:

1. A method for drying wood veneer, including continuously conveying transversely to the grain of said veneer a strip of green veneer of considerable length, drying said strip and while drying maintaining it under controlled tension sufficient to prevent substantial warping of the strip as it is being dried and insufficient to cause destructive stress as the strip shrinks during drying and progressively increasing the tension of the strip as it is being dried while conveying and directly supporting said strip from underneath substantially throughout its length during drying.

2. A method for drying wood veneer, including continuously conveying transversely to the grain of said veneer a strip of green veneer of considerable length, drying said strip and while drying maintaining it under controlled tension sufficient to prevent substantial warping of the strip as it is being dried and insufficient to cause destructive stress as the strip shrinks during drying while conveying and directly supporting said strip from underneath substantially throughout its length during drying, and cooling said strip while maintaining tension thereon.

3. A method for drying wood veneer, including continuously conveying transversely to the grain of said veneer a strip of green veneer of considerable length, drying said strip and while drying maintaining it under controlled tension sufficient to prevent substantial warping of the strip as it is being dried and insufficient to cause destructive stress as the strip shrinks during drying and progressively increasing the tension of the strip as it is being dried while conveying and directly supporting said strip from underneath substantially throughout its length during drying, cooling said strip while maintaining tension thereon, releasing the tension on said strip and thereafter cutting said strip into individual dried sheets.

4. The method of continuously making finished wood veneer from an axially supported roll of green veneer which comprises directly and positively but slackly unwinding and downwardly leading therefrom a strip of green veneer without exerting destructive tension on the strip as it leaves the roll and with the grain thereof at right angles to its lead from said roll, continuously conveying, drying and cooling as a flat sheet the strip thus unwound while carrying and directly supporting said sheet substantially throughout its length, exerting pressure on the surfaces thereof to maintain the veneer as a smooth flat sheet during said conveying, drying and cooling, controlling the unwinding of the strip from the roll in timed relation to the feeding of the strip through the dryer, and then immediately following completion of the cooling operation clipping to finished dimensions dry veneer elements from the continuously moving flat strip.

5. Apparatus for use in making wood veneer comprising a dryer, conveyor means to support substantially throughout its length and to continuously carry through said dryer veneer in strip form with the grain thereof at right angles to the conveyor movement, means for driving said conveyor, means for controlling tension on the veneer as it is conveyed through said dryer to exert sufficient tension thereon to prevent substantial warping thereof and insufficient tension to cause destructive stress, said means including veneer overlying means providing flexible discontinuous veneer contacting portions in frictional contact with said veneer and means for varying the frictional resistance of said contacting portions on said veneer.

6. Apparatus for use in making wood veneer comprising a dryer, conveyor means to support substantially throughout its length and to continuously carry through said dryer veneer in strip form with the grain thereof at right angles to the conveyor movement, means for driving said conveyor, means for controlling tension on the veneer as it is conveyed through said dryer to exert

sufficient tension thereon to prevent warping thereof and insufficient tension to cause destructive stress, said means including an overlying apron in frictional contact with said veneer and means for varying the frictional resistance of said apron on said veneer.

7. Apparatus for use in making veneer comprising a dryer, belt conveyor means to support substantially throughout its length and to continuously carry through said dryer veneer in strip form with the grain thereof at right angles to the conveyor movement, means for driving said belt conveyor means, means for holding said veneer down upon said belt conveyor means to maintain the veneer as a smooth sheet thereon during drying thereof, dryer feeding means, roll supporting means adjacent the infeed end of said dryer to support vertically spaced from said dryer feeding means a roll of green veneer so that it may unwind slackly upon said dryer feeding means and be carried through said dryer in sheet form by said conveyor means, and power means arranged and controlled to rotate directly the roll of green veneer when positioned in said roll supporting means to unwind and feed the green veneer strip without exerting destructive tension thereon to said belt conveyor means in timed relation thereto to provide a substantially uniform and continuous feed of the strip through said dryer.

8. Apparatus for use in making veneer comprising a dryer, belt conveyor means to support substantially throughout its length and continuously carry veneer through said dryer as a flat sheet veneer in strip form with the grain thereof at right angles to the conveyor movement, means for driving said belt conveyor means, means for holding said veneer down upon said belt conveyor means to maintain the veneer as a smooth flat sheet thereon during drying thereof, dryer feeding means, roll supporting means adjacent the infeed end of said dryer to support a roll of green veneer vertically spaced from said dryer feeding means so that it may unwind in a catenary upon said dryer feeding means and be carried through said dryer in flat sheet form by said conveyor means, and power means arranged and controlled to rotate directly the roll of green veneer when positioned in said roll supporting means to unwind and feed the green veneer strip without exerting destructive tension thereon to said belt conveyor means in timed relation thereto to provide a substantially uniform and continuous feed of the strip through said dryer.

9. Apparatus for use in making veneer comprising a dryer, belt conveyor means to support substantially throughout its length and to continuously carry through said dryer as a flat sheet veneer in strip form with the grain thereof at right angles to the conveyor movement, means for driving said belt conveyor means, means for holding said veneer down upon said belt conveyor means to maintain the veneer as a smooth flat sheet thereon during drying thereof, roll supporting means adjacent the infeed end of said dryer to support above the infeed end of said conveyor means a roll of green veneer so that it may unwind in a catenary and be carried through said dryer in flat sheet form, and power means arranged and controlled to rotate directly the roll of green veneer when positioned in said roll supporting means to unwind and feed the green veneer strip without exerting destructive tension thereon to said belt conveyor means in timed relation thereto to provide a substantially uniform and continuous feed of the strip through said dryer.

10. Apparatus for use in making wood veneer comprising a dryer, conveyor means to support substantially throughout its length and to continuously carry through said dryer veneer in strip form with the grain thereof at right angles to the conveyor movement, means for driving said conveyor means, means for holding said veneer down upon said conveyor, dryer feeding means, roll supporting means adjacent the infeed end of said dryer to support a roll of green veneer vertically spaced from an underlying conveyor so that it may unwind in a catenary upon said underlying conveyor and be carried through said dryer in flat sheet form by said conveyor means, power means arranged and controlled to rotate the roll of green veneer when positioned in said roll supporting means to unwind and feed the green veneer strip without exerting destructive tension thereon to said belt conveyor means in timed relation thereto to provide a substantially uniform and continuous feed of the strip through said dryer, veneer cooling means including conveyor means to support substantially throughout its length and to continuously carry said veneer in strip form, means to maintain tension in the veneer strip during cooling thereof, and cutting means arranged and controlled to cut said veneer strip into dried individual sheets immediately upon release of tension on said veneer strip.

11. The method of continuously making finished wood veneer from an axially supported roll of green veneer which includes the steps of slackly unwinding and leading therefrom a strip of green veneer without exerting destructive tension on the strip as it leaves the roll and with the grain thereof at right angles to its lead from the roll, drying said strip and while drying maintaining it under controlled longitudinal tension uniformly across the entire width of the strip sufficient to prevent substantial warping of the strip as it is being dried and insufficient to cause destructive stress as the strip shrinks during drying while conveying and directly supporting the strip from underneath substantially throughout its length during drying.

12. An apparatus as set forth in claim 6 further including means for cooling said veneer while it is under controlled tension.

13. An apparatus as set forth in claim 6 further including cutting means arranged and controlled to cut said dried veneer strip into dried individual sheets.

14. A method for drying wood veneer, including continuously conveying transversely to the grain of said veneer a strip of green veneer of considerable length, drying said strip and while drying maintaining it under controlled longitudinal tension uniformly across the entire width of the strip sufficient to prevent substantial warping of the strip as it is being dried and insufficient to cause destructive stress as the strip shrinks during drying while conveying and directly supporting said strip from underneath substantially throughout its length during drying.

15. A method for drying wood veneer, including continuously conveying transversely to the grain of said veneer a strip of green veneer of considerable length, drying said strip and while drying maintaining it under controlled longitudinal tension uniformly across the entire width of the strip sufficient to prevent substantial warping of the strip as it is being dried and in-

sufficient to cause destructive stress as the strip shrinks during drying while conveying and directly supporting said strip from underneath substantially throughout its length during drying, releasing the tension on the dried strip and thereafter cutting the strip into individual dried sheets.

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