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[54] **METHOD OF MANUFACTURING WAFERBOARD**

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[51] **Int. Cl.** **B29j 5/02**

[58] **Field of Search** .... 156/62.2, 62.4; 161/168, 161/235; 144/324, 326 C, 327; 241/17, 23, 28; 264/109, 115, 122

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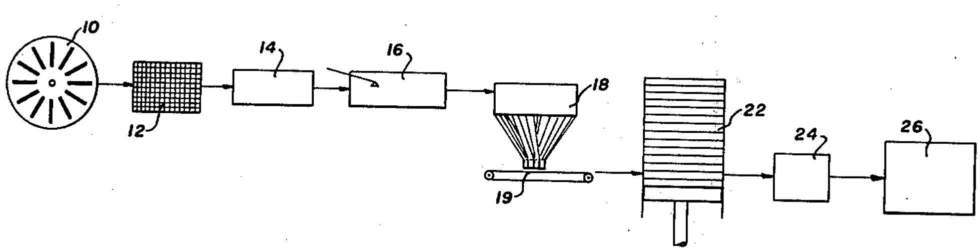
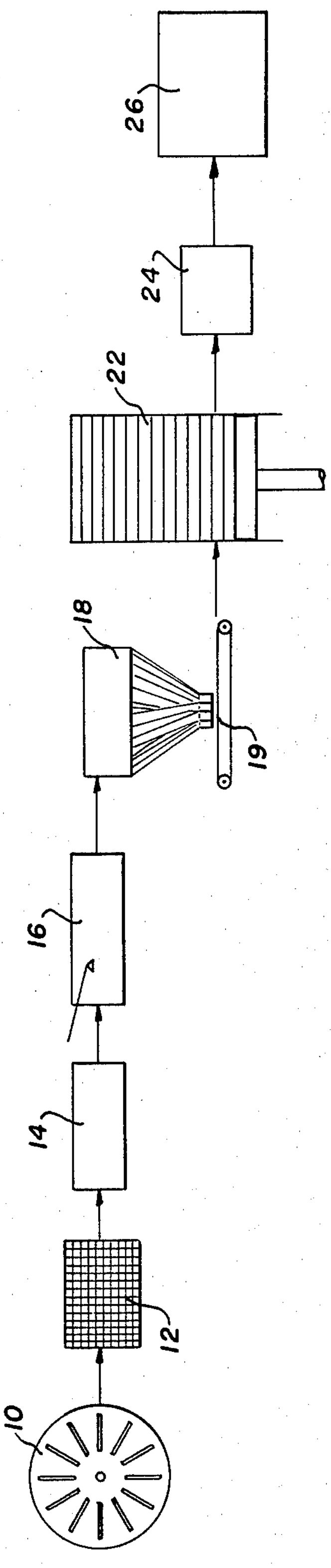
[57] **ABSTRACT**

A method of manufacturing waferboard comprising cutting thin wafers from wood logs, drying the wafers to lower the moisture content thereof, mixing the wafers with powdered binder resin and wax in molten or emulsified form to coat the wafers with wax and resin, forming mats of uniform density and thickness of the wafers, pressing the mats in a hot press at suitable temperature, pressure and time to form waferboards of predetermined thickness and density.

10 Claims, 1 Drawing Figure

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METHOD OF MANUFACTURING WAFERBOARD

This invention relates to methods of manufacturing waferboard from wood wafers.

Waferboard has been manufactured in the past but it has been difficult to produce in an economical manner waferboards that remain dimensionally stable in all climates, and particularly damp climates. The present method involves specified steps which result in waferboards that can be used in exterior locations without undue raising of the wafers at the board surfaces or buckling due to excessive expansion in the plane of the panel when subjected to moisture. These waferboards can be used in interior locations, and are particularly suitable for use in areas where they are subjected to moisture, such as in laundry rooms and the like.

Conventional particleboard or waferboard is made from fine wood particles or flakes and urea-aldehyde resins can be used only in interior locations. Prior to this invention, there had been little success in manufacturing these panels for use in exterior locations, and there is a growing demand for a particleboard or flakeboard with high physical strength properties and low linear expansion for use in exterior locations, such as for sheathing, fences or farm buildings.

This invention relates to production processes incorporating certain variables for the manufacture of a particleboard and flakeboard to meet these conditions. A number of these variables are inter-related, and a change in one variable will affect the resultant product unless compensating changes are made in the other variables.

Many factors are of importance in the control of board properties. Any kind of wood can be used, but for economical purposes, low-density hardwoods, such as poplars, cottonwood or alder, are preferred. In particular, aspen poplar is a desirable species for this purpose.

The method according to the present invention of manufacturing waferboard and the like comprises cutting thin wafers from wood logs, screening the cut wafers to remove therefrom any fine wood particles, drying the wafers to reduce the moisture content thereof, mixing the wafers with fine powdered binder resin and wax in molten or emulsified form to coat each wafer with wax covered by powdered resin, forming a mat of wafers of uniform density and thickness on supporting plates, pressing the mat on the plates in a hot press for a suitable time and at a suitable temperature and pressure to form waferboards of predetermined thickness and density, and cooling the boards sufficiently to enable them to be stored in hot stacks without thermal degradation.

The logs from which the wafers are to be cut are cut into suitable lengths such as, for example, two foot lengths. The bark is removed by a standard barker before the logs are cut into these lengths. To produce the optimum wafers with smooth surfaces and with a minimum of fines, the wood logs should be heated. Usually this heating is with hot water at about 100° to 150°F. If the logs are frozen, it is preferable to heat them before barking and before they are cut into the desired lengths. If the logs are not thawed out in the winter time, the wafers tend to break up into splinters during the following wafer cutting operation. For best results, the moisture content of the logs should be about 40 to 70% based upon dry weight of the wood. The preheating of the logs in water is beneficial in the summer time since moisture is restored to the dried out surface layers of the logs. Without this restoration of moisture, there is a tendency to splinter the wafers during the cutting thereof.

The logs are cut into wafers by standard cutters, such as disk or drum cutters. The cutting blades move downwardly through the wood at the side thereof. In other words, the cutter blades are substantially parallel with the grain of the wood and move downwardly through the latter. In order to obtain the maximum physical properties, the wafers are cut so that the length thereof in the direction of the grain is approximately 40 to 100 times their thickness, and the width which is perpendicular to the grain of the wafers should be in the range of about 5 to 60 times the thickness. It has been found that these wafers can be anywhere from 0.010 to 0.060 inch in thickness, and the best average is about 0.025 inch. The ideal length in the direction of grain is 1 to 2.5 inches, and width from about ⅛ to about 1.5 inches.

The cut wafers are screened to remove therefrom any fine wood particles. The screens can be from 2-mesh to 8-mesh, and preferably are about 4-mesh.

Following the screening operation, the wafers are dried at surface temperatures not exceeding 240°F, but the recommended temperature range is from about 200° to 240°F. Temperatures higher than this tend to degrade the cellulose portion of the wood. The final moisture content of the wafers is important for the subsequent bonding and pressing operations. The moisture content depends on the thickness of the boards to be manufactured. In general, a moisture content range of about 2 to 10% produces satisfactory panels. However, the preferred moisture content is about 3% for ¾ inch panels, increasing to about 6% for ¼ inch panels.

The use of powdered phenol formaldehyde or melamine formaldehyde resin is preferred for exterior panels, while urea formaldehyde can be used for interior panels. To hold the powdered resin on the wafers, molten or emulsified wax is applied to the wafers either before the powdered resin addition or immediately afterwards. Liquid resins can be used, in which case wax is required only to control the water absorption properties of the finished boards. The wax coats the wafers while the powdered resin adheres to the wax coating on the wafers. The amount of wax can be from about 1 to 6% by weight based on the dry wood, and the best results are attained with 2 to 4%, and the amount of resin is from about 1.5 to 4% by weight, and preferably 2%.

The wafers are uniformly deposited on supporting plates over a wide area parallel to the direction of movement of the plates to maintain uniform density in mats formed by these wafers. The wafers can be applied at the rate of about 100 pounds per minute, but preferably no more than 50 pounds per minute to maintain a low angle of deposition.

The wafers are felted into mats of uniform thickness and density on supporting or caul plates which are preferably made of cold rolled steel in order to minimize dimensional changes in the plates during the following pressing operation.

The plates with the mats thereon are inserted into a standard hot press where they are subjected to heat and pressure for sufficient time to produce waferboards of desired thicknesses. The preferred temperature in the press is about 410°F although panels can be made at temperatures of from about 390° to 430°F. The pressure in the press ranges from about 300 to about 500 pounds per square inch, and is controlled to obtain the required density in the finished boards. The press time at these temperatures is about 45 seconds per 1/16 of an inch of panel thickness. Boards can be made with a press time as low as 40 seconds, but these have lower physical strength than those made at the preferred times. Press time of over 55 seconds per 1/16 inch can result in thermal degradation of the panels and a very brittle product, with lowered impact strength and discoloration of the surface. The press time is controlled so that the press closes in 40 to 60 seconds and is held at a pressure less than 100 psi for the final minute of press time.

Following the pressing operation, the formed panels are cooled to about 270°F and maintained at this temperature for about 3 to 12 hours. Satisfactory panels have been produced with storage temperatures in the range of 210°F to 300°F. However, storage above this temperature results in lowered impact resistance in the panels and thermal degradation of the surface layers thereof. Temperatures below this will result in the panels having reduced water absorption properties. The storage time is adjusted in accordance with the temperatures of the panels in storage. When the panels are held at 300°F the storage time should be limited to under 2 hours. At a more normal storage temperature of about 270°F, storage times of 3 to 12 hours are generally satisfactory. If the temperature is in the range of 230° to 250°F, panels can be held in storage up to one week without affecting the physical properties thereof.

The panels are trimmed to size for shipment immediately after the pressing operation or after the storage.

A production line for carrying out this invention is illustrated in the accompanying FIG. 1.

Referring to the drawing, logs of a desired length and having a moisture content of about 40 to 70% based on the dry weight of the wood are fed to a waferizer 10 which cuts wafers therefrom having a thickness of about 0.010 to about 0.060 inch, and a length 40 to 100 times this thickness in the direction of the grain thereof, and a width of 5 to 60 times the thickness across the grain. The wafers are passed through screening apparatus **12** to remove the fine particles of wood. From here the wafers are placed in a dryer **14** where the moisture content thereof is reduced to about 2 to 10% based on the dry weight of the wood. The wafers are then directed into a blender **16** in which they are coated with wax in molten or emulsified form and covered with fine powdered bonding resin.

The coated wafers are directed to a felter **18** in which they are felted into mats of uniform thickness and density on caul plates **19**. These plates are directed into a standard hot press **22** where they are subjected to sufficient heat and pressure and for sufficient time to produce waferboards of desired thicknesses and having desired physical properties. These boards are then cooled in suitable cooling apparatus, after which they are stored in stacks **26** at temperatures from about 210° to 300°F. These boards are cut into the desired dimensions after emerging from the hot press, or after they are taken out of the hot stack **26**.

We claim:

1. A method of manufacturing waferboard, which comprises cutting thin wafers from wood logs having a moisture content of about 40 to about 70% based on dry weight of the wood, screening the cut wafers to remove therefrom any fine wood particles, drying the wafers at surface temperatures ranging from about 200° to about 240°F to reduce the moisture content thereof to about 2 to about 10% based on the dry weight of the wood, mixing the wafers with about 1.5% to about 4% by weight fine powdered binder resin and from 1 to 6% by weight wax in molten or emulsified form to coat each wafer with a coat of wax covered by powdered resin, depositing the coated wafers uniformly on supporting plates to form thereon mats of wafers of uniform density and thickness, pressing the mats of wafers on the plates in a hot press at temperatures ranging from about 390° to about 430°F for a suitable time to form waferboards of predetermined thickness and density, and cooling said boards and storing the boards in hot stacks at temperatures from about 210° to about 300°F to prevent thermal degradation.

2. The method as claimed in claim **1** in which the wood wafers are from about 0.010 to 0.060 inch thick, about 40 to 100 times said thickness in length in direction of the wood grains, to about 5 to 60 times said thickness in width across the grain.

3. The method as claimed in claim **2** in which the time in the press is from about 40 to 55 seconds for each sixteenth inch in waferboard thickness.

4. The method as claimed in claim **2** in which the waferboards from the press are cooled to about 270°F, and are stored at temperatures from about 210° to 250°F.

5. The method as claimed in claim **2** in which the time in the press is from about 40 to 55 seconds for each sixteenth inch in waferboard thickness, and the waferboards from the press are cooled to about 270°F, and are stored at temperatures from about 210° to 250°F.

6. The method as claimed in claim **2** in which the logs, prior to the cutting of the wafers, are heated in water at a temperature of from about 100° to 150°F.

7. The method as claimed in claim **1** in which the time in the press is from about 40 to 55 seconds for each sixteenth inch in waferboard thickness.

8. The method as claimed in claim **1** in which the waferboards from the press are cooled to about 270°F, and are stored at temperatures from about 210° to 250°F.

9. The method as claimed in claim **1** in which the time in the press is from about 40 to 55 seconds for each sixteenth inch in waferboard thickness, and the waferboards from the press are cooled to about 270°F, and are stored at temperatures from about 210° to 250°F.

10. The method as claimed in claim **1** in which the logs, prior to the cutting of the wafers, are heated in water at a temperature of from about 100° to 150°F.

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