Oct. 2, 1962 R. DE MELLO 3,056,440

ELECTRONIC PRESS FOR MAKING PLYWOOD IN A CONTINUOUS FLOW

Filed Feb. 10, 1959 2 Sheets-Sheet 1

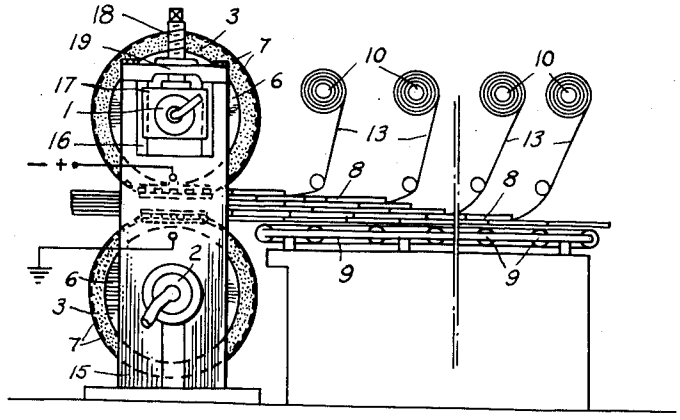


Fig. 1

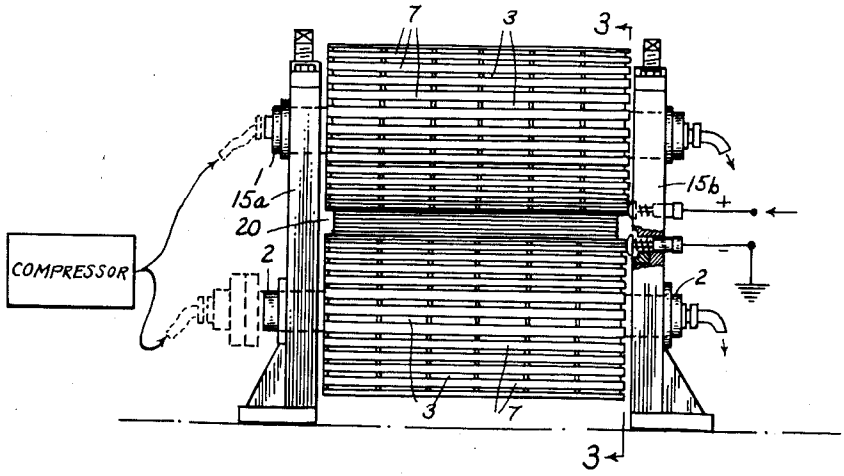


Fig. 2

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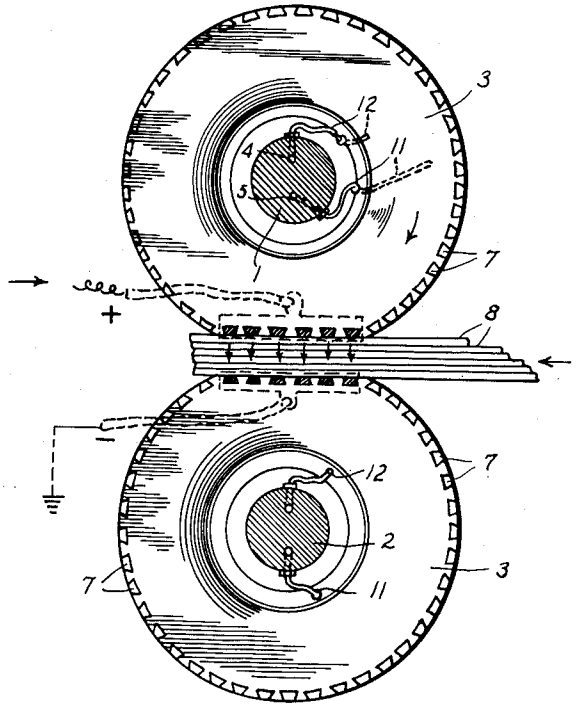


Fig. 3

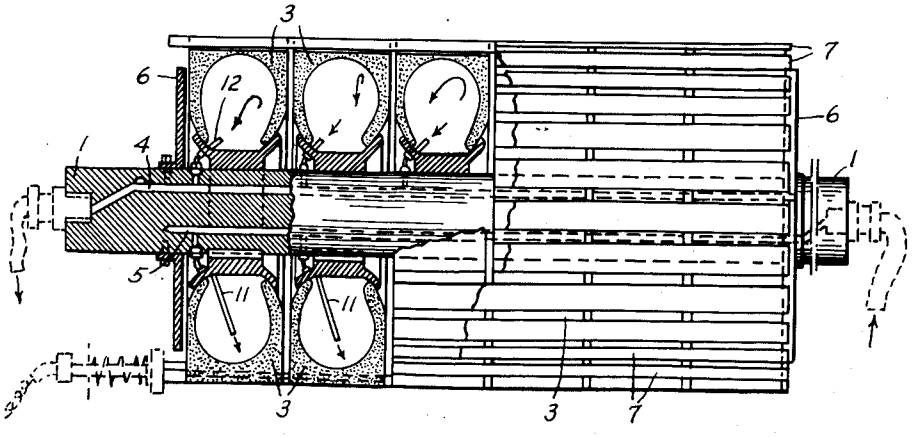


Fig. 4

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ELECTRONIC PRESS FOR MAKING PLYWOOD IN A CONTINUOUS FLOW

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8 Claims. (Cl. 144—282)

This invention relates to a press for making plywood, and more particularly to a press that produces plywood in a continuous operation.

The many different uses of plywood and its vast application in modern industrial products and processes are well known.

The plywood manufacturing techniques have long been undergoing thorough research and uninterrupted progress in all technically advanced countries, but one of the dreams of manufacturers and technicians specialized in this field seemed unattainable. This dream is the development of a practical and economical manufacturing process by which large quantities of plywood may be obtained in a continuous operation.

The manufacturing process now developed and herein presented provides a practical solution to the problem involved in making plywood in such a continuous operation.

The greatest difficulty to be overcome in order to make the production of plywood in a continuous operation possible, is caused by the fact that the glueing in the manufacturing of plywood is not instantaneous. To form veneers into plywood it is necessary that all component materials be subjected to heat and pressure for a certain length of time. By way of an example it can be mentioned that the phenolic glues, which are most often used today, need always 30 seconds under a temperature of 130° C. (266° F.) and a pressure of over 15 kilos per square centimeter (213 p.s.i.) to polymerize and produce a perfect glueing.

In the commonly used manufacturing process, heat is transmitted by conduction when the veneers are brought into contact with the heated plates of a press, thus penetrating from the plates to the core of the plywood. Consequently, the thicker the material to be processed, the longer the pressing time necessary for the heat to reach the center line of glueing.

Heating and pressing by means of high frequency roll pressing was tried, but this process did not yield good results and could not be developed into a process of continuous production, and so, high frequency heating had to be restricted to the production of small objects by the commonly used process of pressing. The unpracticability of high frequency roll pressing is due to the fact that it does not allow pressure to be applied during a sufficiently lengthy time period.

As stated above, in the commonly used manufacturing process it is necessary that the wood and glueing agent be brought together and maintained under heat and pressure and for a certain length of time for the solidification, or polymerization, of the glueing material to take place. The types of glue mostly used in manufacturing plywood are the synthetic glues, such as phenol-formol and urea-formol. Both polymerize under heat within approximately 30 seconds.

Thus, the solution to the problem being dealt with requires that any process designed for making plywood in a continuous operation, and using a phenolic glue as glueing agent, must maintain the component materials under specific conditions of heat and pressure during a certain length of time, which would be, in practice: heat at a temperature of 130° C. (266° F.), pressure at

over 15 kilos per square centimeter (213 p.s.i.), and time at a minimum of 30 seconds.

The object of the invention herein described is to provide a new electronic press designed to fabricate plywood in a continuous operation, with virtually no limit to the length of the strip of plywood produced. The plywood thus made is applicable in a great variety of different fields of human activity.

The invention is illustrated in the accompanying drawings in which:

FIG. 1 is a partial schematic side elevational view of the complete press.

FIG. 2 is a partially schematic elevational view of the press.

FIG. 3 is a partially schematic cross-section of the press taken along the line 3—3 of FIG. 2; and

FIG. 4 is a front elevational view of one of the rolls of the press partially broken away.

As shown in the drawings, the roll pressing machine includes a frame **15** rotatably supporting two parallel horizontal axles **1** and **2**, each one in turn supporting a number of hydraulically or pneumatically inflated high pressure tires **3** placed coaxially side by side. These tires **3** are generally of the type used in motor vehicles, but otherwise shaped, their tread being flat and not rounded as on car or truck tires so that they have flat side surfaces. In cross-section as seen in FIG. 4, the peripheral surface of the tread of each tire **3** appears as a straight line. Placed side by side, the tires form a cylinder or tubular mantle of resilient material without depressions between one tire and the other.

Each one of the axles **1**, **2** is provided with two longitudinal channels **4** and **5**, which are connected with the inside chambers of the tires **3** to allow injection and withdrawal of the liquid or gas used to inflate the tires. The injection or withdrawal operation is made through removable parts **11** and **12** connected with the channels in the axles **1**, **2**.

The heat produced by the electrical current passing through the wood **8**, as discussed in greater detail below, transmits itself to the tires by conduction, which may cause the rubber to deteriorate. To prevent this, it is necessary that the tires be provided with a refrigerating system by means of which there is provided inside the chambers of the tires **3** a continually renewed liquid which is circulated at a low temperature.

If gas is used as inflating medium, it can be injected into the internal chambers of the tires **3** under a pressure higher than that existing inside the tires, and the gas injected expands upon reaching the lower pressure inside the tires, losing heat during its expansion and absorbing heat from the tires in this process. The circulation of fluid through the chambers of the tires is preferably carried out in such a way that the pressure in the chambers remains constant. The tires **3** are thus kept at a lower temperature than that of the wood **8** being processed, which may be pre-heated in a separate heating chamber before reaching the rolls of the press.

The side tires **3** on both ends of the axles are held by discs **6** to prevent them from deforming by side expansion.

Metal bars **7** are embedded in the tread of the tires **3**, joining together the entire set of tires **3** on each axle **1**, **2**. These metal bars **7** are connected to a high frequency and high voltage electrical generator, the connection being arranged in such a way that contact of the bars with the generator is established only at given moments, when the bars come into contact with the wood undergoing processing, the bars being disconnected from the generator the moment they break contact with the wood.

Passing from the metal bars **7** of one roll through the wood and glueing agent being processed to the metal bars

7 on the other roll, the high frequency and high voltage electrical current generated by the generator is transformed into heat and raises the temperature of the wood and glueing agent passing between the rolls to the heat level necessary for the glueing agent to polymerize. It is understood that the generator must have the capacity necessary to produce the amount of calories required for raising the temperature of the material undergoing processing to the heat level needed.

The functioning of the roll pressing machine as a whole is as follows: the veneer sheets or laminations **8** are arranged in a continuous sequence on a conveyor. A glueing agent **13**, liquid or solid, but preferably solid and in the form of a film, is spread between the veneer sheets **8**. In the preferred form as shown in FIG. 1, the films or glueing agent **13** unroll from rolls **10** placed above the conveyor **9** to be introduced between the veneer sheets **8** as they move along on the conveyor **9**. This way, a number of veener sheets **8** with glueing agent **13** between them is piled up on the conveyor **9**, which conveys its cargo into the space or gap **20** between the two rolling rolls. This piling up is made in such a manner that the nearer the veneers are to the rolls, the greater the number of veneer sheets piled up, and therefore, the thicker the material. Thus, when the material reaches the moving rolls, its thickness is of the size desired, which is greater than the space between the rolls. The veneers **8** are introduced into the space between the rolling rolls, causing the tires **3** inside the rolls to flatten in the area in contact with the wood, as shown in FIGS. 1 and 3. By this device a predetermined area of contact between the rolls and the veneers is secured. To obtain, for example, an area of contact 50 centimeters (20 inches) long in a roll or tire 2 meters (80 inches) in diameter, it is necessary to produce in the same a flattening of 3 centimeters (1¼ inches).

The rotating speed of the rolls, the internal pressure of the tires, and the high frequency and high voltage electrical current travelling through the veneers between the two rolls, as explained above, all conveniently calculated and combined, serve to maintain the veneer sheets with the glueing agent in between under pressure and heat during a space of time sufficiently long for the polymerization of the glueing agent to take place, transforming the veneers into plywood as a final result.

The manual work necessary for making plywood with the apparatus described herein is greatly reduced, fabrication being made automatically. By this manufacturing means plywood may be obtained in an unending continuous strip of the width of the roll pressing machine, to be cut into boards of virtually any desired length.

The rolls of the machine must rotate uniformly between each other, traction being supplied by one of the rolls, which must be provided with traction power by means of any known way. The other roll may move freely or may be coupled to the roll provided with traction power by means of gears, chains, or any other means, according to convenience or necessity, which will be determined by experience.

Referring back to FIGS. 1 and 2, the frame **15** comprises two spaced upright supports **15***a*, **15***b*, and each support is provided with a cut-out bounded by vertical ways **16** for slidably guiding a pair of blocks **17** which are secured to the longitudinal ends of the shaft **1** of the upper roll. Each block **17** is secured to a spindle **18** which is threaded into and extends beyond a cross-head **19** forming part of the respective support **15***a*, **15***b*. The upper end portions of the spindles **18** are of polygonal cross-section or contour so that they may be engaged by a wrench or other suitable tool so that they may be turned in order to vary the distance between the upper and lower rolls to accommodate different numbers of veneers.

It is obvious that the machine will be provided with all necessary parts for its perfect functioning. It must also be noted that secondary details may be modified to adapt the machine to practical requirements.

What I claim is:

1. A press, particularly for the continuous manufacture of plywood and like laminated products, said press comprising, in combination, a frame; a pair of parallel axles rotatably mounted in said frame; a compressing roll mounted on each of said axles, each compressing roll comprising a plurality of coaxial fluid-filled tires of resilient material placed side by side, said tires having peripheral portions forming a continuous mantle and the mantles of said compressing rolls defining therebetween a gap for the passage of the laminated product, said axles formed with channels communicating with the respective tires; means operatively connected with said axles for circulating a compressed fluid in said channels and said tires whereby the mantles of said compressing rolls subject the laminated product to a given pressure while the product passes through said gap; means for rotating at least one of said compressing rolls whereby the laminated product is advanced through said gap and is continuously compressed by said mantles while passing through said gap; and means for heating the laminated product during its passage through said gap.

2. A press, particularly for the continuous manufacture of plywood and like laminated products, said press comprising, in combination, a frame; a pair of parallel axles rotatably mounted in said frame; a compressing roll mounted on each of said axles, each compressing roll comprising a plurality of coaxial fluid-filled tires of resilient material placed side by side, said tires having peripheral portions forming a continuous mantle and the mantles of said compressing rolls defining therebetween a gap for the passage of the laminated product, said axles formed with channels communicating with the respective tires; means operatively connected with said axles for circulating a compressed fluid at a constant pressure through said tires whereby the mantles of said compressing rolls subject the laminated product to constant pressure while the product passes through said gap; means for rotating at least one of said compressing rolls whereby the laminated product is advanced through said gap and is continuously compressed by said mantles while passing through said gap; and means for heating the laminated product during its passage through said gap.

3. A press, particularly for the continuous manufacture of plywood and like laminated products, said press comprising, in combination, a frame; a pair of compressing rolls mounted in said frame for rotation about two parallel axes, each of said compressing rolls comprising a fluid-filled coaxial tubular mantle of resilient material and said mantles defining therebetween a gap for the passage of the laminated product; means for rotating at least one of said compressing rolls whereby the laminated product is advanced through said gap and is continuously compressed by said mantles while passing through said gap; and means for heating the laminated product during its passage through said gap, said heating means comprising a plurality of axially parallel elongated electrodes embedded in each of said mantles, a source of high frequency electric current, and means for consecutively connecting said source with selected electrodes of one of said compressing rolls.

4. A press, particularly for the continuous manufacture of plywood and like laminated products, said press comprising, in combination, a frame; a pair of compressing rolls mounted in said frame for rotation about two parallel axes, each of said compressing rolls comprising a fluid-filled coaxial tubular mantle of resilient material and said mantles defining therebetween a gap for the passage of the laminated product; means for rotating at least one of said compressing rolls whereby the laminated product is advanced through said gap and is continuously compressed by said mantles while passing through said gap; and means for heating the laminated product during

its passage through said gap, said heating means comprising a plurality of axially parallel elongated electrodes embedded in each of said mantles, a source of high frequency electric current, means for consecutively connecting said source with such selected electrodes of one of said compressing rolls which are located in the proximity of said gap and means for grounding such selected electrodes of the other compressing roll which are adjacent to said gap whereby said selected electrodes heat the laminated product passing through said gap.

5. A press, particularly for the continuous manufacture of plywood and like laminated products, said press comprising, in combination, a frame; a pair of compressing rolls mounted in said frame for rotation about two parallel axes, each of said compressing rolls comprising a coaxial fluid-fllled tubular mantle of resilient material and said mantles defining therebetween a gap for the passage of the laminated product; means for circulating a cooling fluid in said compressing rolls; means for rotating at least one of said compressing rolls whereby the laminated product is advanced through said gap and is continuously compressed by said mantles while passing through said gap; and means for heating the laminated product during its passage through said gap.

6. As a novel article of manufacture, a roll for resiliently compressing one side of a laminated product, said roll comprising, in combination, a plurality of coaxial fluid-filled tires of resilient material placed side by side, said tires having peripheral portions forming a product-engaging mantle; means comprising an axle for coaxially supporting said tires, said axle formed with channels communicating with said tires; and means connected with said channels for circulating a compressed fluid through said tires.

7. As a novel article of manufacture, a roll for resiliently compressing one side of a laminated product, said roll comprising, in combination, a plurality of coaxial fluid-filled tires of resilient material, said tires located side by side and having peripheral portions forming a product-engaging mantle; means comprising an axle for coaxially supporting said tires; and means for heating the side of the laminated product, said heating means comprising a plurality of elongated axially parallel electrodes embedded in said mantle, a source of electric current, and means for consecutively connecting said source with selected electrodes.

8. As a novel article of manufacture, a roll for resiliently compressing one side of a laminated product, said roll comprising, in combination, a plurality of coaxial fluid-filled tires of resilient material, said tires located side by side and having peripheral portions forming a product-engaging mantle; means comprising an axle for coaxially supporting said tires; and means for heating the side of the laminated product, said heating means comprising a plurality of elongated axially parallel electrodes embedded in said mantle, and means for consecutively grounding selected electrodes.

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