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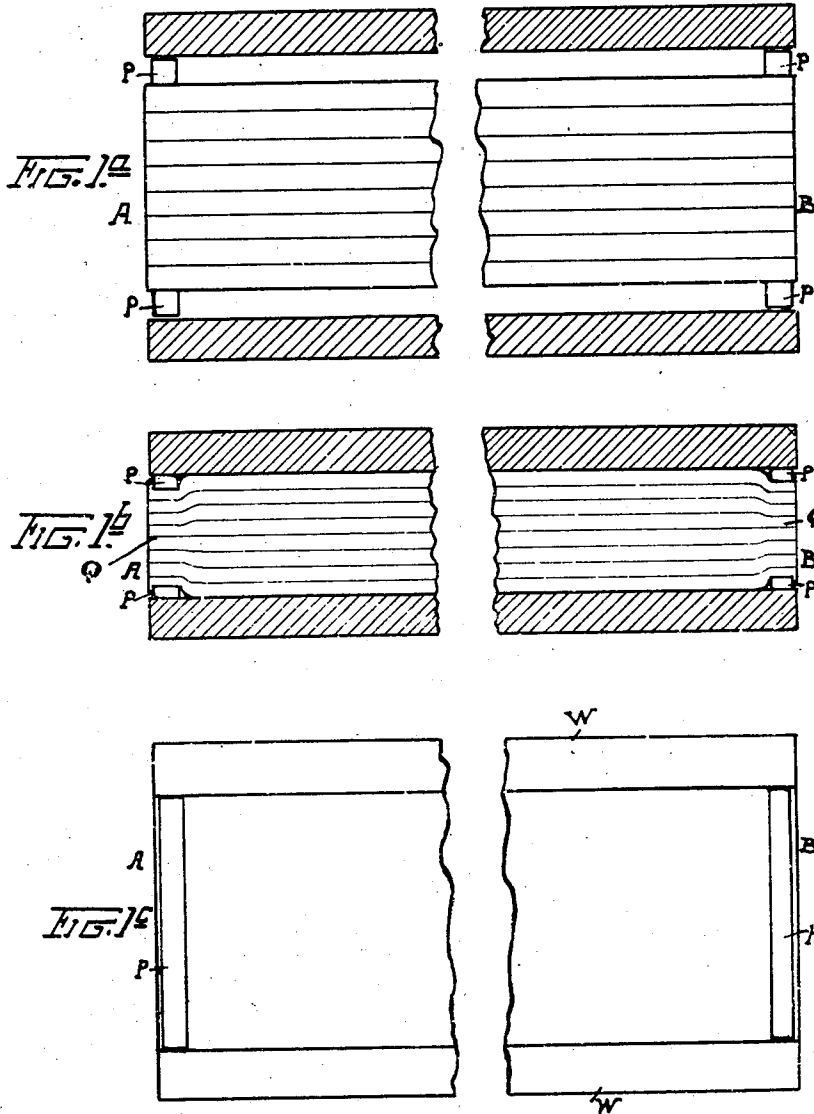
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2,089,644

PROCESS FOR THE PRODUCTION OF COMPRESSED WOOD OR PLYWOOD

Filed Aug. 3, 1935

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

FIG. 2^a

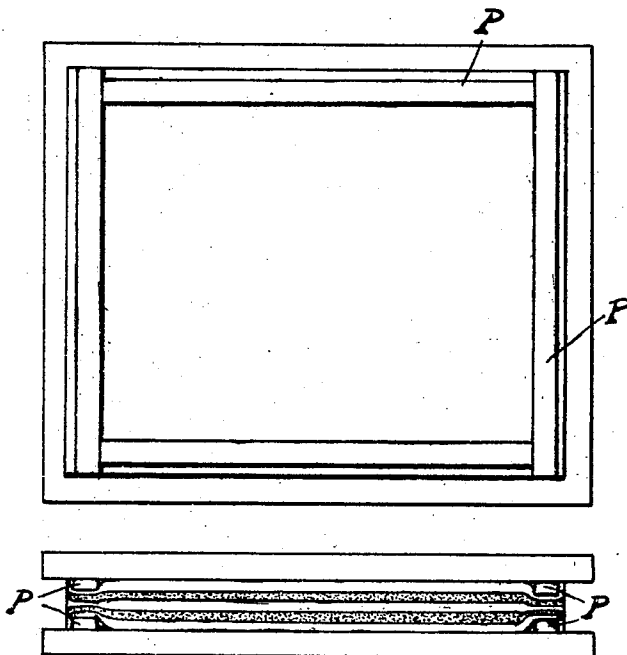


FIG. 2^b

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PROCESS FOR THE PRODUCTION OF COMPRESSED WOOD OR PLYWOOD

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1 Claim. (Cl. 144—309)

This invention relates to a process for the production of plywood and compressed laminated wood.

It is known to compress wood, in the form of thin sheets (wood veneer) into slabs and planks, at high temperatures and with high pressure with the use of a small quantity of hardenable binding material, whereby the fibrous material is brought into a new and stable condition with reduction of its volume and a closing up of the pores and cells.

In this connection it is important to retain the natural amount of humidity in the wood, which corresponds to that contained in the wood in dwelling and factory rooms. The finished product should itself be "air-dry" and thereby shall be free from the danger of distortion and warping when in use. Moreover a certain content of hygroscopic water is necessary for the above mentioned stabilizing process.

The compressing of the above mentioned laminated wood has hitherto taken place in a suitable mould closed on all sides, which prevented the drying out of the material during the compressing process. The use of closed moulds has however a certain disadvantage as this apparatus is much dearer to work compared with presses with open moulds. The use of moulds partly open or open on all sides for this purpose has had however up to now to remain out of consideration because the laminated wood dried out too quickly during the compressing.

Also during the normal production of plywood by means of the hot compression of veneers in presses open on all sides, with the use of artificial resins as binding material the disadvantage that the wood dried out too thoroughly has been found to be very disturbing.

Therefore, for example, if the veneers are so laid one on top of each other with all the fibres lying in the same direction, it is possible to use in a mould open on two sides even if one works with such high pressure that the cell cavities are completely closed up and the smallest possible volume is achieved thereby. In this process the butt ends of the vegetable fibres are directed towards the open sides of the mould. It has been shown also that during compression the fibre bundles are only slightly deformed in the direction of the butt ends so that a destruction of the structure and disturbance of the natural clinging together of the fibres under the action of the compression do not take place.

However the disadvantage also arises that during this otherwise advantageous procedure, that

when heated and compressed, a substantial drying out of the fibres occurs at the butt-ends. This drying out does not penetrate very deeply into the interior of the material when compression takes place quickly and to the degree of attaining the least possible volume. In this case the structure of the wood closes up so quickly that the drying out has no time to penetrate very far. Deterioration in the finished product is however always the consequence of this drying out. From the moment when the structure is completely closed there is practically no further drying out. Although the vapour pressure of the water in the interior of the wood is in this case 3-5 atms. at the temperatures employed, then this wood is surrounded by a completely compressed material without pores which is itself under a pressure of a few hundred kgms. per sq. cm. The hygroscopic water and that water which eventually has been freed by pressure is therefore located in the interior of the wood and cannot therefore vaporize.

The lower, however, the pressure used and the higher the temperature used, the greater is the drying out and so much the deeper does the drying out penetrate into the wood.

If the wood is not completely compressed a far reaching drying out of the materials occurs. It can stretch from the butt end to 10 cms. or more and at the pressing surface can go from one end of the mould to the other to a depth of several mms. Such a drying out can even put the use of the compression process out of the question for part of the material obtained remains absolutely useless and the other part is not uniform in its properties and is much reduced in value.

This is also true to the same extent for the production of plywood by means of hot pressing and with the use of hardenable resin, for here also there takes place as already mentioned an objectionable drying out of the veneers especially at the edges which leads in consequence to a non-uniform finished product, distortion and the like.

It has been found that the disadvantages described can be avoided if compression strips are applied to the marginal surfaces above and below a pile of veneer layers and if the mass is more completely compressed between the compression strips than intermediate the same and if the said portion of the pile is finally separated from the marginal portion. Sheets of wood are taken and are covered on both surfaces with a thin layer of artificial resin capable of being hardened at elevated temperatures. The sheets are superimposed and transverse laths of wood

or compressed wood are overlaid at the parts which are enclosed by the press, the thickness of which being so calculated that the fibrous material between the laths is forcibly completely compressed. Because of the irregular resistance to pressure on the surfaces, the distribution of the specific pressure at the beginning of the pressing operation is irregular and the pressure under the laths especially high so that a compression of the material at the butt-ends is achieved quickly and completely.

From now on the above material is enclosed between the plates and the thick strips of completely compressed material. Compression takes place as though it were taking place in an absolutely tight mould completely closed on all sides and this is accomplished without drying out and with the production of a material which is homogeneous throughout the whole mass.

According to the invention the gluing of the sheets of ply can take place between hot plates or the usual press in which connection it must be remembered that the hot plates must be able to withstand the 100-200 kgms. per sq. cm. required at the edges. By trimming off the edges the compressed parts are removed.

The same method can also be used for the production of more or less compressed sheets of plywood or sheets from laminated wood in which the direction of the fibres is the same in all the sheets and in which the wood is somewhat compressed.

The process of the invention will now be described by way of example with reference to the accompanying drawings and the following examples.

In the drawings Figures 1a, 1b and 1c correspond with Example 1 and Figures 2a and 2b refer to Example 2.

Figure 1a is a longitudinal cross-section through the two plates of the press and the veneer pile placed between the said plates.

Figure 1b is the same cross-section after compression. The strips *p* have been completely compressed and a dense zone *Q* has been produced at both ends.

Figure 1c is pile viewed from above after the pressing plate has been removed. The upper sheet of the load, the transverse strips *p* and the sides *W* of the mold are only represented.

Figure 2a is the veneer pile viewed from above and arranged on one of the plates of the press.

Figure 2b is a longitudinal cross-section showing the veneer pile after guing under pressure. The bars *p* and the edges of the pile have been compressed.

Example 1

A pressed wood sheet is to be produced of 40 mms. thickness, of specific weight 1.2 from air dry veneers whose wood has a specific weight of 0.7. The veneers shall be laid in the same direction for compression. If the wood were to be completely compressed a specific weight of 1.4 would be obtained and veneers of a total thickness of 80 mms. would have to be used. For sheets with a specific weight of 1.2 veneers are sufficient with a total thickness of 69 mms. Compression takes place in a box-press (Fig. 1) with a two-

sided open box and so that the butt-ends of the veneers lie against the open ends of the box A—B. Wooden strips of about 1 cm. width and about 5.5 mm. thickness are now laid above and below a few millimetres from the butt ends, or pressed wood strips of about 3 mm. thickness. Compression takes place in known manner with high pressure and at high temperature. The interior of the wood acquired by this pressure a specific weight of 1.2. At both ends of the sheet there is produced a zone *Q* (Fig. 2b) the specific weight of which is 1.4 and which protects the interior of the plate during the pressing and heating from drying out, because the latter is completely closed in on the outside.

The product obtained is quite homogeneous with the exception of the compact strips which must be considered as waste.

Example 2

A plywood sheet which shall have a specific gravity of 0.5 is to be produced out of veneers, coated by a hardenable artificial resin at a temperature of about 140° C. The thickness of the sheet is to be 10 mms. It is not to be compressed. Before gluing bars *p* of the same wood are laid at the edge of the sheet above and below on the four edges (Fig. 2a) the thickness of the bars is to be about 9 mms. A compression is exerted with the usual pressure for plywood, but at a high temperature, the pressing plates being distanced apart approximately 10 mms. The bars or strips *p* have been compressed and the mass has been compressed more completely between the compression strips than intermediate the same.

Example 3

A compressed laminated wood is to be produced of specific gravity 1 from air dry veneers of specific gravity 0.5 with the use of hardenable resin as binding material. The thickness of the sheets is to be 20 mms. Veneers of a total thickness of 40 mms. are therefore to be used. The veneers shall be laid in between the plates of an ordinary plywood press, the plates of which are capable of standing a very high temperature. Bars of about 8 mms. thickness are laid above and below at the edges as in Example 2.

A high pressure and temperature are applied, the distance between the plates being kept at 20 mms. and the result is a plywood sheet of moderate thickness and uniform dryness and structure which can be used in the place of plywood made from hard woods.

What I claim is:

The herein described process of producing compressed wood or plywood from wood veneers, which consists in superimposing layers of wood veneer coated with a binding agent hardenable at high temperatures, applying compression strips marginally above and below the pile of veneer layers, thereafter applying pressure of approximately 100 to 200 kgs. per sq. cm. to compress the mass more completely between the compression strips than intermediate the same, and finally separating the midportion of the pile from the marginal portion.

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