Jan. 25, 1955 A. L. MOTTET 2,700,177

METHOD AND APPARATUS FOR MAKING FIBERBOARD WITH PREPRESSED MARGINS

Filed March 29, 1954

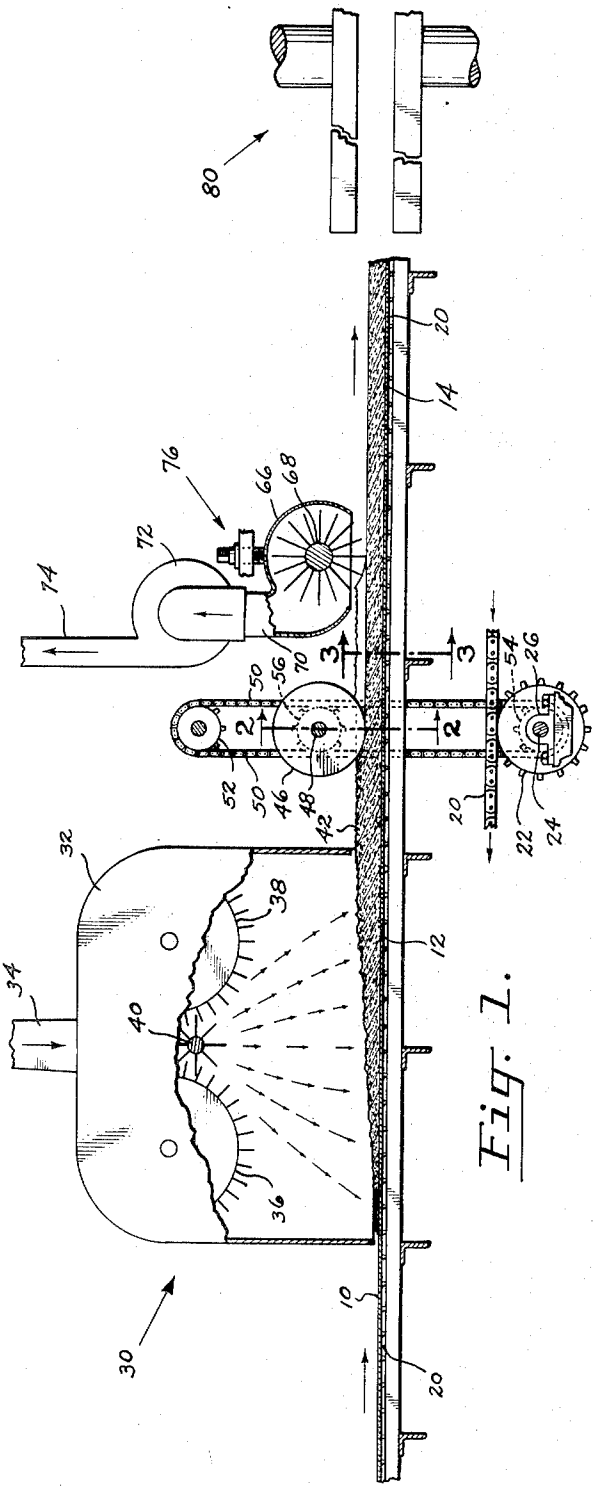

Fig. 1.

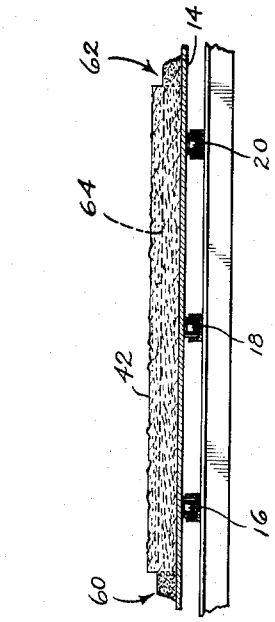

Fig. 3.

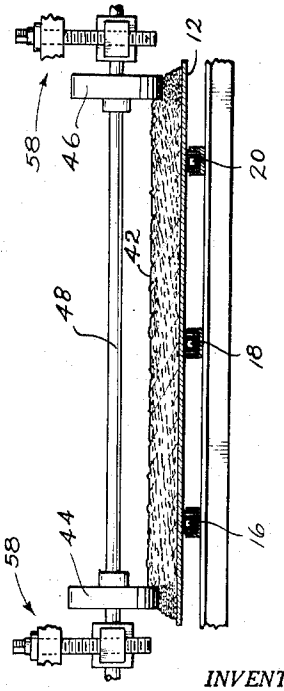

Fig. 2.

INVENTOR.

Arthur L. Mottet

BY Eugene D. Farley

Atty.

United States Patent Office 2,700,177 Patented Jan. 25, 1955

2,700,177

METHOD AND APPARATUS FOR MAKING FIBERBOARD WITH PREPRESSED MARGINS

Arthur L. Mottet, Longview, Wash., assignor to The Long-Bell Lumber Company, Longview, Wash., a corporation of Missouri

Application March 29, 1954, Serial No. 419,450

9 Claims. (Cl. 18—4)

This invention relates to method and apparatus for making fiberboard, particularly hardboard, with prepressed margins.

In making consolidated fibrous products such as hardboard, it is conventional practice to reduce wood or other lignocellulose to particle form. The particles then are formed into a mat, with or without having first been mixed with added size and binder. The mat may be formed by either wet felting or dry felting procedures. In the former, lignocellulose particles are suspended in water to form a thin slurry, the slurry then being run onto a Fourdrinier wire where the lignocellulose is separated from most of the water by the application of pressure and vacuum. In the dry-forming process the particles are sifted or spread on a suitable conveyor under conditions calculated to form a mat of uniform thickness and density. Whether formed by the wet process or dry process, the mats are conveyed to a press where they are consolidated to the desired density by the application of heat and pressure.

One of the problems present in carrying out the foregoing methods is caused by the tendency of the fiber mats to extrude around the edges of the press plates during the hot pressing operation. In large scale operation it is not practical to overcome this difficulty by providing retaining walls around the edges of the mat as by placing the mat in molds. Molds required for such a procedure are large and cumbersome and difficult to manipulate while loading and unloading the press after each press cycle. Furthermore, it is difficult to leave the molds in the press because of the inconvenience and difficulty of placing the mat in them when they are thus situated.

As a consequence, it is common practice to press the mat without the use of retaining sidewalls. The pressed product then has ragged, irregular margins of non-uniform density. In addition, the margins usually have a density less than that required to meet commercial specifications because of the extruding action occurring during pressing. To overcome this difficulty it is the usual practice to trim the board back to the region where it is of the required density. This makes it necessary to trim it farther back than is required merely to produce smooth edges and the resulting excessively wide trim causes excessive waste of wood as well as of any resin binder and other additives that may be present in the board. Also, it materially reduces the plant capacity.

I now have discovered that the foregoing difficulty may be overcome by a method which comprises first forming comminuted lignocellulose into a mat. The longitudinal margins of the mat then are prepressed to a predetermined degree. Next the material between the prepressed margins is removed, preferably until the intermediate surface is substantially coplanar with the surfaces of the prepressed margins. The resulting mat then is consolidated to the selected density in the hot-press.

The foregoing method and the apparatus which may be employed in practicing it are illustrated in the accompanying drawings, wherein:

Figure 1 is a schematic view in side elevation of apparatus which may be employed in making fiberboard with pre-compressed margins in accordance with the present invention;

Figure 2 is a transverse sectional view taken along the line 2—2 of Figure 1; and

Figure 3 is a transverse sectional view taken along the line 3—3 of Figure 1.

The lignocellulose material which may be employed in the presently described method may be derived from any suitable source, as from cane, straw, bagasse or wood. Preferably it comprises wood of various species of trees, either coniferous or deciduous.

The wood may be reduced or comminuted in any suitable type of apparatus. Preferably it is defiberized in the conventional machines available for this purpose, such as the Bauer, the MacMillan, the Allis-Chalmers, or the Asplund defibrators, or in cross cutting defiberizers such as that disclosed in Mottet, Serial No. 361,480.

The lignocellulose after comminution may be formed into a mat by any suitable felting apparatus which has for its function the separation of the fibers from each other and spreading them or depositing them on a suitable supporting surface in the form of a mat or felt having a substantially uniform thickness and density. Suitable apparatus for accomplishing this is disclosed in Heppenstall and Mottet, Serial No. 361,688, illustrated fragmentarily in the drawings.

As is indicated in Figure 1, the mat is formed on caul plates 10, 12, 14. The caul plates are made of metal, for example, from stainless steel of suitable dimensions. They are supported and conveyed by conveying means which in the illustrated form comprise drive chains 16, 18, 20. The drive chains are driven at a selected speed by appropriate drive means, for example, by sprocket 22 mounted on shaft 24, journalled in bearings 26, which in turn are attached to the frame of the apparatus.

Stationed above the conveying system is a felting head indicated generally at 30. This may assume a diversity of forms, but in the illustrated form comprises a hood 32 with which communicates a conduit 34. The fibrous feed enters the hood through the conduit and passes between a pair of rotatably mounted, driven, toothed compression rolls 36, 38. These feed the material downwardly while compressing it. The compressed feed is disintegrated and dispersed by a rapidly driven picker roll 40 rotatably mounted between and somewhat below the compression rollers 36, 38. The dispersed fiber then falls down on the caul plates where it is built up into a mat 42.

Spaced apart from the felting head are a pair of compression rollers 44, 46. These have a width determined by the width of the margin it is desired to pre-compress and are separated by a distance which is commensurate with the thickness of the mat.

Rollers 44, 46 are keyed to a drive shaft 48 which is rotatably mounted on the frame of the apparatus. The shaft and the rollers which it carries are driven at a suitable rate which preferably is such as to impart a peripheral speed to the rollers which is substantially equal to the lineal rate of movement of the mat. In this manner the mat margins may be compressed without substantial disarrangement of the component particles of which the mat is composed.

Although the compression rollers 44, 46 may be driven independently of the conveyor drive, they conveniently may be driven from the latter, as by means of chain 50, interconnecting sprockets 52, 54 and engaging sprocket 56 on shaft 48.

Although rollers 44, 46 may be preset to a fixed position relative to mat 42, it may be desirable to mount them adjustably vertically, or normal to the surface of the mat, so that the degree of precompression of the mat's margins may be adjusted to accommodate mats of various thicknesses or to achieve various degrees of modular compression in mats of a fixed thickness. Accordingly shaft 48 which supports and drives the rollers may be provided with suitable means of adjustment, for example, jack screws indicated schematically at 28.

The operation of rollers 44, 46 accomplishes the precompression of the margins of mat 42, the compressed areas being indicated at 60, 62 in Figure 3. The mat then passes means for removing or scalping material from the surface between the compressed margins. Although the amount of material thus removed may be varied to suit a contemplated purpose, in the usual case sufficient will be removed to reduce the level of the intermediate surface until it is approximately coplanar with the surface of the compressed areas. In plant operation, this may involve some scalping of the precompressed margins as

well, because of the difficulty of setting the scalping roll to the precise position desired. The mat will, however, have substantially the surface configuration indicated by the dotted line **64** of Figure 3.

The scalping means employed to achieve this function may be designed in diverse manners. In the illustrated form it comprises a hood **66** which is open at the bottom and houses a driven scalping roll **68**. The hood communicates with a conduit **70** and is evacuated by a fan **72** communicating with an exhaust conduit **74**. The drive of the scalping roll is clockwise as viewed in Figure 1 so that material removed by it is exhausted via fan **72** and conduits **70, 74**.

The scalping roll **68**, like the pressing rollers **44, 46**, may be made adjustable vertically, or normal to the upper surface of mat **42** in order to provide flexibility in the amount of material removed from that surface. Such an adjustment may be made in any suitable manner, as for example, by means of the jack screws **76** supporting the shaft of the scalping roll.

After passing beneath the scalping means, the mat progresses along the conveying assembly until it reaches a station at which the caul plates supporting it may be separated from each other. This in turn achieves a transverse separation of the mat, forming mat sections each of which is supported by its own caul plate. These assemblies then may be introduced into a hot-press **80** and pressed to the desired density in the usual manner.

It will be apparent that during pressing the difficulty which heretofore has characterized this operation, namely, extrusion of the mat around the edges to form soft, weak areas of non-uniform density along the margins of the finished board, has been overcome. This is for the reason that the greater compactness of the mat along its longitudinal edges reduces the tendency toward extrusion during pressing.

Also, whatever extrusion occurs is compensated for by the original higher mat density along these edges so that the final pressed board after trimming has the same density at the very edge as farther back toward the center of the board. Still further, the density of the longitudinal margins of the finished board may be controlled to within desired limits by varying the vertical displacement of either press roll **44, 46**, or scalping roll **68**, or both.

It is to be understood that the form of my invention herewith shown and described, is to be taken as a preferred example of the same, and that various changes in the shape, size and arrangement of parts may be resorted to, without departing from the spirit of my invention, or the scope of the subjoined claims.

Having thus described my invention, I claim:

1. The method of making fiberboard which comprises forming comminuted lignocellulose into a mat, compressing the longitudinal margins of the mat to a predetermined degree, removing lignocellulose from the surface of the mat between the compressed margins and consolidating the mat to a predetermined density.

2. The method of making hardboard which comprises forming defiberized wood into a mat, compressing the longitudinal margins of the mat to a predetermined degree, scalping material from the surface of the mat between the compressed margins until said surface is substantially coplanar with the compressed margins, and hot consolidating the mat to a predetermined density.

3. Apparatus for making fiberboard which comprises in combination, felting means for forming comminuted lignocellulose into a mat, conveying means adjacent the felting means for supporting the mat and conveying it away from the same, press means positioned along the longitudinal margins of the mat for compressing the said margins selectively to a predetermined degree, and mat scalping means spaced from the press means for scalping material from the surface of the mat between the compressed margins thereof.

4. Apparatus for making fiberboard which comprises in combination, felting means for forming comminuted lignocellulose into a mat, conveying means adjacent the felting means for supporting the mat and conveying it away from the same, press means positioned along the longitudinal margins of the mat for compressing the said margins selectively to a predetermined degree, mat scalping means spaced from the press means for scalping material from the surface of the mat between the compressed margins thereof, and adjusting means connected to the scalping means for adjusting the position of the same in a direction normal to the mat surface.

5. Apparatus for making fiberboard which comprises in combination, felting means for forming comminuted lignocellulose into a mat, conveying means adjacent the felting means for supporting the mat and conveying it away from the same, press means positioned along the longitudinal margins of the mat for compressing the said margins selectively to a predetermined degree, mat scalping means spaced from the press means for scalping material from the surface of the mat between the compressed margins thereof, drive means connected to the conveying means for driving the same at a predetermined rate, and drive means connected to the press means for driving the pressing surfaces thereof in the direction of movement of the mat but at a lineal rate substantially equal thereto.

6. The method of making fiberboard which comprises forming comminuted lignocellulose into a mat, compressing opposite margins of the mat to a predetermined degree, removing lignocellulose from the surface of the mat between the compressed margins and consolidating the mat to a predetermined density.

7. Apparatus for making fiberboard which comprises in combination, felting means for forming comminuted lignocellulose into a mat, conveying means adjacent the felting means for supporting the mat and conveying it away from the same, press means positioned along opposite margins of the mat for compressing the said margins selectively to a predetermined degree, and mat scalping means spaced from the press means for scalping material from the surface of the mat between the compressed margins thereof.

8. The method of making fiberboard which comprises forming comminuted lignocellulose into a mat, compressing at least one margin of the mat to a predetermined degree with respect to the major portion of the mat, removing lignocellulose from the surface of the mat adjacent the compressed margin, and consolidating the mat to a predetermined density.

9. Apparatus for making fiberboard which comprises in combination, felting means for forming comminuted lignocellulose into a mat, conveying means adjacent the felting means for supporting the mat and conveying it away from the same, press means positioned along at least one margin of the mat for compressing the said margin selectively to a predetermined degree with respect to the major portion of the mat, and mat scalping means for scalping material from the surface of the mat adjacent the compressed margin thereof.

References Cited in the file of this patent

UNITED STATES PATENTS

1,452,742	Johnson	Apr. 24, 1923
2,154,201	Frost	Apr. 11, 1939
2,165,280	Lannan	July 11, 1939
2,199,660	Eichhorn	May 7, 1940
2,574,915	Fuller	Nov. 13, 1951
2,601,349	Welsh	June 24, 1952
2,668,322	Weyerhaeuser	Feb. 9, 1954