

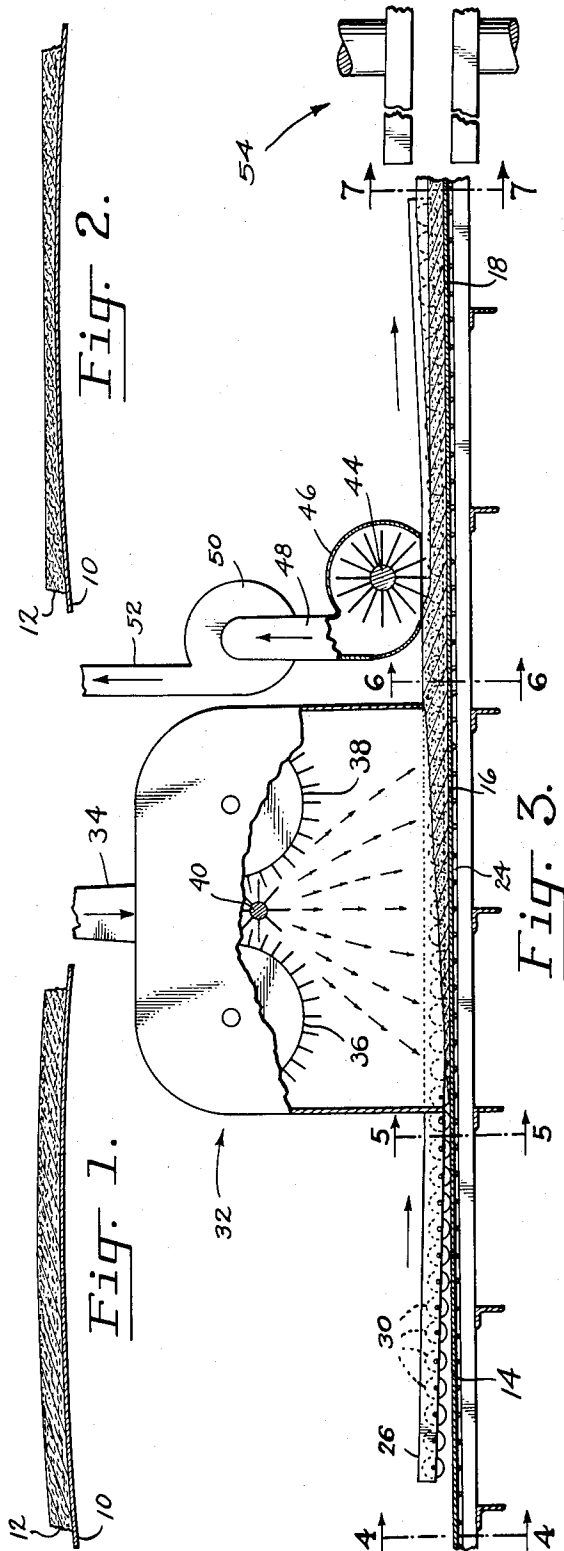
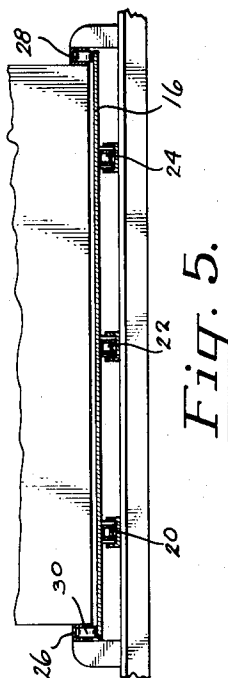
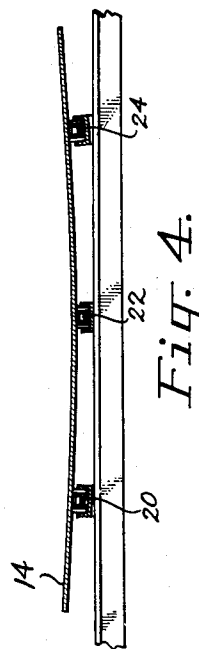
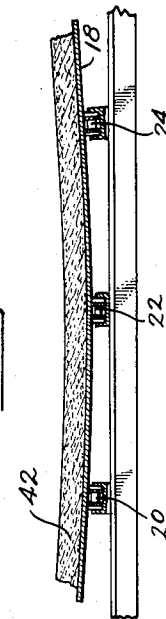
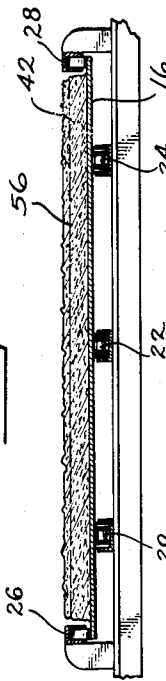
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MAKING FIBERBOARD OF UNIFORM DENSITY AND THICKNESS

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1

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MAKING FIBERBOARD OF UNIFORM DENSITY AND THICKNESS

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This invention relates to a method of making pressed fiberboard and like composite pressed products of uniform density and thickness.

The presently described invention and its relationship to the prior art is described herein with particular reference to the drawings, wherein:

Figures 1 and 2 are views in end elevation of fibrous mats deposited upon a warped caul plate before and after levelling, respectively;

Figure 3 is a view in side elevation partly in section, illustrating the presently described method and apparatus used in executing the same;

Figure 4 is a sectional view taken along the line 4—4 of Figure 3;

Figure 5 is a sectional view taken along the line 5—5 of Figure 3;

Figure 6 is a sectional view taken along the line 6—6 of Figure 3;

Figure 7 is a sectional view taken along the line 7—7 of Figure 3.

In the manufacture of pressed fiberboard by moist or dry felting techniques it is conventional practice to reduce lignocellulose to the form of particles. These then are formed into a mat or felt upon a surface which conveniently may be the caul plate employed for introducing the felt into the hot press and for pressing the mats therein. The surfaces of the mats are levelled to secure a mat of uniform dimensions which will form a pressed product of uniform density and thickness. The levelled mat then is introduced into the hot press and consolidated to the predetermined degree.

Where the mats are formed directly on the caul plates as described above, it is essential that the plates be maintained flat and smooth during the felting and levelling operations. If they are not, the difficulty illustrated in Figures 1 and 2 is encountered.

As is shown in these figures, the mat 12 is formed on caul plate 10. If the felting operation is properly effectuated, the mat will be deposited in a uniform thickness as illustrated in Figure 1. However, if the caul plate upon which the mat is formed is not maintained flat during the levelling operation, the latter will shave off the top of the mat until it is level as illustrated in Figure 2.

Because of the warped contour of the caul plate, however, this results in the production of a mat of unequal thickness which, in the illustration, is thicker on the edges than it is in the center. As a consequence, when the mat is pressed, the resulting board will be of uneven thickness, or uneven density, or both, as for example, with a low density weak center and over-dense edges.

Also, when warped or uneven caul plates are employed there is a tendency for the lignocellulose particles to be deposited non-uniformly, the mat being thicker on the depressed portions of the caul than on the raised portions. Still further, it is difficult to convey the warped or deformed cauls through the mat forming apparatus. For example, if the trailing edge of a caul plate is depressed or the leading edge of the following caul plate is raised,

2

the following caul plate may overlap the caul plate immediately preceding and thus destroy the end-to-end caul plate relationship required to form a continuous mat. The caul plate also may be warped so seriously as to become jammed in the conveying system.

Warping or deformation of the caul plates is a difficult factor to control. In the first place, the plates are of substantial size, being of the order of 4 to 6 feet in width and from 8 to 16 feet in length. It is difficult to manufacture metal sheets of this size which are completely planar and manufacturers of such products as a result are unwilling to supply them on purchase specifications limiting warp to a maximum of as little as $\frac{1}{4}$ inch deflection.

Moreover, even if the sheets originally are warp free, they quickly develop substantial warp during the fiberboard manufacturing operation because of the alternate heating and cooling to which they are subjected. During these temperature cycles internal strains develop which are sufficient to upset the metal and cause a permanent warp. In addition, where the mats are laid on the caul plates when the plates are still warm, the mat on the upper face of the caul substantially stops further cooling of that face while the lower face continues to cool. The difference in thermal contraction of the two faces results in a tendency toward warping in the form of a substantial downward cup as is illustrated in Figures 1 and 2.

I now have discovered that the foregoing difficulty may be overcome by using the combination of transversely arcuate caul plates, which are in effect segments of cylinders, together with flexing means and holding means for flexing the plates until they are substantially flat and for holding them in that position during the mat forming and mat shaving operations.

Considering the foregoing in greater detail and with particular reference to Figures 3—7 of the drawings:

The lignocellulose employed in the presently described process may be derived from any suitable source as from straw, cane, bagasse or wood. Preferably, it is derived from the wood of various species of trees, either coniferous or deciduous. The lignocellulose first is reduced to the form of particles, such as sawdust, shavings, chips, fibers or the like. Preferably it is in defiberized form, produced by defiberizing wood in conventional defiberizers such as the Bauer, the Allis-Chalmers, the MacMillan, or the Asplund. The resulting particles then may be mixed with whatever quantities of extraneous materials, such as size or binder, as may be required.

The resulting mixture then is felted on the caul plates. As has been indicated above, these are formed of metal, for example, of aluminum or stainless steel. They are of substantial size, those in a typical commercial hardboard installation measuring $\frac{3}{16}$ inch in thickness by 54 inches in width by 102 inches in length.

The caul plates are formed as narrow segments of a cylinder, in any suitable manner, as by pressing them through sheet metal rollers. These iron out the plate to produce therein a substantially uniform upward cup, disposed lengthwise of the plate.

The amount of cup characterizing the cylinder segments thus produced is variable but should be controlled within limits for best results. Thus when using $\frac{3}{16}$ x 54 x 102 inch aluminum caul plates a deflection of at least one-eighth inch from flat, as measured when the plate is lying in an upwardly concave position on a flat surface, is sufficient to impart enough rigidity to the plate so that it retains its cup regardless of the transient warping that is superimposed upon it during the normal heating and cooling operations encountered during the fiberboard manufacturing process.

On the other hand, if too much cup is imparted to the plates, the difficulties of jamming the conveying system and of overlapped edges of adjacent caul plates may be

3

encountered as discussed above. Consequently in the case of a caul plate of the stipulated dimensions, a maximum deflection of $\frac{5}{8}$ inch from flat is all that can be tolerated. A preferred deflection lies in the range of from $\frac{1}{8}$ inch to $\frac{3}{8}$ inch from flat for caul plates of the stated size.

Stated otherwise and more generally, the degree of cupping of the plates should be such as to impart to the plates a radius of curvature of from 48 to 240 feet, preferably from 80 to 240 feet.

The caul plates 14, 16, 18 of the indicated configuration are placed on suitable conveying means in such a position as to be cupped upwardly longitudinally. Although various styles of conveying means may be employed, in the indicated embodiment a plurality of drive chains 20, 22, 24 are employed. These are spaced apart and driven at a suitable rate. They engage the underside of the caul plates and drive them through the apparatus at a corresponding rate.

Flexing means and holding means are provided for flexing the plates until they are substantially flat and for holding them in such a position during the felting and levelling operations. To this end the apparatus is fitted with a pair of longitudinal guides 26, 28. These extend the length of the apparatus on both sides and project inwardly sufficiently to engage the upper longitudinal margins of the caul plates.

The under surfaces of guides 26, 28 are provided with anti-friction means such as a durable, smooth plastic material or, preferably ball or roller bearings 30 spaced apart at suitable intervals.

The infeed and outfeed sections of guides 26, 28 taper upwardly to a sufficient degree to accommodate the caul plates in unflexed condition. However, the central section of the guides is spaced apart from the conveying means 20—24 to provide a limited clearance sufficient to pass the caul plates only when the latter are substantially flat. Accordingly the infeed sections provide means for flexing the caul plates until they are flat, the central sections provide means for holding the caul plates flat during the felting and levelling operations, and the outfeed sections provide means for gradually releasing the tension of the caul plates permitting them to reassume their original cupped positions without disturbing the arrangement of the mats which they carry.

Although various forms of felting means may be employed in conjunction with the presently described apparatus, a suitable form is illustrated in Figure 3. It comprises a felting head 32 which communicates with a feed conduit 34. Defiberized lignocellulose, or a mixture of the same with size and binder is fed through conduit 34, into the felting head 32, and between compression rollers 36, 38. The latter extend the full width of the felting head, are spiked, and are driven in the indicated direction at a selected feed rate.

They serve to compress the lignocellulose and to deliver it to a disintegrating roller 40. The latter is driven at a rate substantially greater than are compression rollers 36, 38. It is mounted rotatably between and somewhat below the latter two rollers and serves to separate the fibrous particles between the same so that the individualized fibrous components of the mat are distributed upon the surface of the caul plates passing slowly beneath the felting head. In this manner there is built up a mat 42 which passes out from beneath the felting head to the right as viewed in Figure 3.

Spaced apart from the felting head and downstream from the same is a scalping or levelling means having for its function removing from the surface of the mat a sufficient quantity of its component particles to reduce it to the desired thickness and to level it so that its thickness is uniform across its width. Accordingly, a scalping or levelling roll 44 is rotatably mounted across the mat co-extensive with its width. This roll is driven clockwise as viewed in Figure 3 and may be provided with jack screws

4

or other suitable means for adjusting its height relative to the mat. As it rotates it shaves from the surface of the mat an amount of material determined by its setting.

This material is evacuated by suitable means, for example, the vacuum system including the hood 46, conduit 48, fan 50 and conduit 52. The material removed in this system may be separated from the entraining air and recycled to the felting head.

After being levelled, the mat leaves the apparatus passing through the outfeed section in which the hold down pressure on the margins of the caul plates is released. The caul plates then are removed from the supporting conveying means. This operation separates the mat into sections having lengths determined by the length of the caul plates. These sections then are placed between the platens of a press indicated schematically at 54 where they are subjected to heat and pressure sufficient to dry them out, set any binder which may be present, and consolidate them to the predetermined density.

Referring now to Figures 4—7 it will be observed that as the caul plates on conveying chains 20—24 enter the apparatus they are flexed until the arcuate configuration which characterizes them (Figure 4) is temporarily lost and they are held by guides 26, 28 in the central sections of the apparatus in a substantially flat position (Figure 5).

In this position the felt is laid down by felting head 32. Because the caul is held flat, the felt may be deposited with relative uniformity and built up to a relatively uniform depth.

The felt then passes beneath the scalping or shaving roll 44 which shaves it down to the desired height, for example, to the dotted line 56 of Figure 6. During this operation the caul plate is maintained flat by guide 26 so that the mat is shaved down uniformly.

The mat then traverses the outfeed sections of guides 26, 28 where the pressure on the caul plates is released gradually, permitting them to reassume their normally arcuate positions without disturbing the felt (Figure 7). As a result there is formed a uniform felt section ready for introduction into the press.

From the foregoing it will be apparent that the presently described apparatus and method provides a means for forming moist or dry process felts directly on the caul plates without danger of non-uniformity in thickness and density being introduced into the felt, and hence into the pressed product, through irregularities present in the caul plate. Also, the caul plates pass smoothly and regularly through the apparatus without interference with each other or with other elements of the apparatus.

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 composite pressed products of uniform density and thickness which comprises providing an arcuate resilient plate, depositing particles of material on the plate to form a mat thereon, flexing the plate until it is substantially flat, removing particles from the surface of the mat until the mat has a predetermined thickness while holding the plate substantially flat, releasing the plate whereupon because of its resiliency it reassumes its arcuate configuration, and pressing the mat to a predetermined density.

2. The method of making composite pressed products of uniform density and thickness which comprises providing an arcuate resilient plate, flexing the plate until it is substantially flat, depositing particles of material on the plate to form a mat thereon while holding the plate substantially flat, removing particles from the surface of the mat until the same has a predetermined thickness, releasing the plate whereupon because of its resiliency

5

it reassumes its arcuate configuration, and pressing the mat to a predetermined density.

3. The method of making fiberboard of uniform density and thickness which comprises providing a resilient caul plate in the form of a segment of a cylinder, flexing the plate until it is substantially flat, felting lignocel-
lulose particles on the plate to form a mat thereon while holding the plate substantially flat, scalping the mat sur-
face until it is substantially level, while still holding the plate substantially flat, releasing the plate, whereupon
because of its resiliency it reassumes its arcuate configura-
tion, and pressing the mat to a predetermined density.

4. The method of making fiberboard of uniform density and thickness which comprises providing a resilient metal plate in the form of a segment of a cylinder, the segment having a radius of curvature of from 48 to 240 feet, placing the same in an upwardly concave position on a supporting surface, flexing the plate until it is sub-

6

stantially flat, felting lignocellulose particles on the plate to form a mat thereon while holding the plate substantially flat, scalping the mat surface until it is substantially level while still holding the plate substantially flat, releasing the plate, and hot pressing the mat to a pre-
determined density while still supported on the plate.

References Cited in the file of this patent

UNITED STATES PATENTS

10	1,399,485	Johnson.....	Dec. 6, 1921
	1,541,206	Bruce	June 9, 1925
	1,767,539	Mason	June 24, 1930
	2,371,124	Austin et al.	Mar. 3, 1945
15	2,601,349	Welsh	June 24, 1952
	2,668,322	Weyerhouser	Feb. 9, 1954

FOREIGN PATENTS

445,056	Great Britain	Apr. 2, 1936
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