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PATENT SPECIFICATION

NO DRAWINGS

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1,168,587



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COMPLETE SPECIFICATION

Embossed Fibreboard

We, ABITIBI PAPER COMPANY LIMITED, a Canadian Company, of Toronto Dominion Centre, Toronto 1, CANADA, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a fibreboard having improved surface appearance and to a method for producing such fibreboard. In its broadest aspect this invention relates to pressed fibreboard which comprises both medium density building board and hardboard.

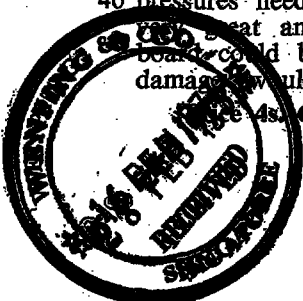
Hardboard has previously been made having a printed paper overlay as described in United States Patent 2,918,398 dated December 22, 1959 for an invention of Rodger Malone Dorland, Maxwell Menuhin Yan and Elliott G. Heslop entitled "Artificial Board". The method described in such patent has been used for producing wood grain and other effects. However, the realism which can be achieved with a printed paper overlay is limited and it is also difficult entirely to eliminate uneven surface areas due to fibre clots in formation which produce an effect referred to as hammer marks. Embossing so as exactly to match the printed pattern would be unduly costly. If the printing and the embossing are done at different stages in the process it would be difficult to obtain registration. There are difficulties in printing and embossing at the same time as it would be impractical to print in the hot press; and if printing and embossing were conducted as post press operations the pressures needed for embossing would be great and the extent to which the board could be embossed without surface damage would be limited due to the

adhesion of the paper to the surface and the limited stretch of dry paper.

It has now been discovered that a realistic effect can be achieved by applying a printed pattern to a sheet of paper, applying such sheet to a partially dewatered mat with the printed surface facing outwardly and pressing in a hot press to combine the sheet with the mat and emboss a pattern which is complementary to (as defined herein) but not in register with the printed pattern. Surprisingly, the product when viewed at a variety of angles, distances and light conditions will have a greatly improved realism and apparent depth of pattern. It will also have a feel which corresponds to its appearance. The fact that the embossing is applied in the hot press makes it possible to apply embossing of sufficient depth to have a significant influence on the appearance of the board. It is not necessary, however, to employ deep draws since the printed pattern carries the visual detail. There is thus an important advantage in comparison with imprinted embossed boards where the embossing must be deep to be effective at a distance. Deep draws are likely to result in damage to the overlay.

It is believed that a contributing factor particularly in the case of medium density building board having a specific gravity in the range 0.45 to 0.8 is that there is an automatic darkening in the valleys of the embossed surface which modifies the printed pattern and gives an appearance of conformity with the printed pattern. An incidental advantage is the masking of any hammer marks.

Considering now a process in accordance with the invention in greater detail, wood chips are defibrated and refined in a conventional manner followed by forming and



dewatering of the wet lap on a Fourdrinier machine. A sheet of paper is applied to the wet lap when it has been dewatered to a consistency of about 25% to 40% solids content by weight. The sheet of paper is preprinted on its exterior surface with a pattern such as a wood grain representation. Preferably a drying oil such as linseed oil, soybean oil, tall oil, tung oil or a blend of drying oils with petroleum polymers is applied to the unprinted surface of the paper in the amount of about 1 to 5 lbs of solids to 1000 sq. ft. of board. The drying oil not only enhances the bond between the paper and the base mat but it also imparts some translucency which increases the shading obtained due to the embossing.

The combined base mat and paper overlay is transferred to a hot press having its hot plates or caul plates which will be in contact with the paper surface shaped to provide an embossing of the surface with a complementary pattern to the printed pattern. A complementary pattern is one which has very approximately the same line spacing and configuration as the printed line pattern. No attempt is made to achieve registration of the printed pattern and the embossed pattern.

The depth of draw which can be achieved without damaging the surface will depend on the contours of the pattern. By way of example: In the 'across' machine direction a strip of wet uncoated paper pulled in a tester in the 'free' state stretches 4.1% in length before breaking. Over a series of small embossed ridges about 1/4" to 1/2" in length on a medium density board with a weathered pattern the stretch was 6-3/4% with no visible tears. If 1/8" of length at a single valley was measured the stretch was 16% without visible failures. There may, however, have been micro-breaks which were healed by the press, and there would also have been some displacement of the paper in relation to the base mat during pressing. It cannot therefore be expected that as much as 16% overall stretch could be achieved on an overall basis. It was, however, evident that the paper would stretch considerably more under restrained pressing conditions

0 p.s.i. ———→ (30 sec.) (15 sec.)
400 p.s.i.

The pressed, embossed board with glassine paper still on the board surface was then heat treated for 4 hours at 280°F. after which the glassine was stripped off and the printed surface sprayed with a clear, protective coating of 0.7 dry mils varnish in a semi-gloss finish.

The resulting board had a specific gravity of 0.96 and the realistic feel and

than would be possible in the free state. Embossing depths of 0.080 inches were achieved without paper breaks.

It has been found that the appearance can in many cases be enhanced by inserting a cushioning sheet of a parting material such as glassine, parchment, greaseproof or highly calendered bleached kraft papers between the printed overlay and the platen of the press before pressing and embossing.

The press cycle and, if desired post press treatments such as baking, can be those conventionally used for medium density board and hardboard.

The following examples will illustrate the invention:

EXAMPLE #1

Wood chips were steamed and mechanically refined to a good quality free draining fibre, the fibre was slurried with normal phenolic resin and wax size additives, formed into a wet lap of approximately 1100 lb. per 1000 sq. ft. solids on Fourdrinier type wire, and partially dewatered by suction and cold pressing to a solids content of 40% by weight, all in a conventional hardboard manner.

A 40 lb. per ream (3000 sq. ft.) newsprint type paper overlay, coated on one surface with a titanium dioxide-polyvinyl alcohol base coating and printed on the coated surface with a simulated woodgrain (Barnboard) pattern, was applied to the top surface of the partially dewatered wet lap. A mixture of raw linseed oil plus 5% of boron trifluoride by weight of the linseed oil was applied to the unprinted surface of the paper overlay in the amount of 3 lb. per 1000 sq. ft. prior to applying the paper to the surface of the wet lap.

The combined base mat and paper overlay was then consolidated in a hot press at 350°F. using a striated pattern embossed aluminum caul plate with depth of draw of approximately 0.020 inches as the top caul in contact with the printed overlay surface. A sheet of 25 lb. per ream (3000 sq. ft.) glassine paper was inserted between the embossing caul plate and the printed overlay prior to hot pressing. A conventional backing screen was used on the bottom surface of the board mat. The pressure cycle used was as follows:

(5 sec.) (12 min. 40 sec.)
100 p.s.i.

attractive appearance of weathered barn wood.

EXAMPLE #2

A fibrous wet lap was formed as in Example #1 except that the basis weight was 1350 lb. per 1000 sq. ft. (solids), and the wet lap was partially dewatered to 28% solids content by weight.

Overlay was again applied to the top

surface of the base mat but in this case the overlay was a 32 lb. per ream (3000 sq. ft.) uncoated, printed newsprint sheet. Linseed was applied to the underside of the paper overlay as in Example #1.

The combined base mat and paper overlay was consolidated in a hot press fitted with a deep, random weathered embossing top caul having a draw depth of up to 0.080 inches. Caul plate material was mild steel, chromed. No glassine intermediary sheet was used. A conventional backing screen was used on the bottom surface of the mat as in Example #1.

The hot press was fitted along the two side edges of the opening with slotted stop bars of 0.500 inches thickness. Press temperature was 400°F. The press was closed under 100 p.s.i. pressure (on board) and the overlayed wet mat compressed to stop in 30 seconds, at which point the pressure was immediately dropped to 40 p.s.i. (on board). The press was kept closed on the stops for 20 minutes, then opened, the board removed and the backing screen separated from the board.

The pressed, embossed board having an out-of-press moisture content of 15% was then heat treated in a conventional draught oven for 4 hours at 280°F. Finally a 1-1/2 dry mil protective, clear finish was applied by conventional curtain coating.

The resultant board had a thickness of 0.400 inches, a specific gravity of 0.68 and a highly attractive, deep embossed surface, shaded more darkly in the valleys than on the ridges, simulating weathered lumber.

One of the advantages of the invention is that light-weight, cheap, expendable caul plates can be used such as light-gauge embossed aluminum sheeting, plastics, photo-engraving plates, textiles, papers and other textured webs and even natural objects such as leaves.

WHAT WE CLAIM IS:—

1. A method of making pressed fibreboard having an improved surface appearance comprising preparing a partially dewatered wet lap of defibrated and refined wood chips, printing a sheet of paper with a pattern, applying the printed paper to the partially dewatered wet lap with the printed pattern facing outwardly and then simultaneously embossing a complementary (as herein defined) but non-registering pattern on the surface of the wet lap to which the printed paper has been applied and consolidating the printed paper and wet lap under heat and pressure in a press to provide a pressed fibreboard.

2. A method as in Claim 1 in which a

coating of drying oil is applied to the unprinted surface of the sheet of paper before the printed paper is applied to the partially dewatered wet lap.

3. A method as in Claim 2 in which a pattern is formed resulting from darkening in the valleys of the embossed surface auxiliary to the printed pattern.

4. A method as in Claims 1, 2 or 3 in which the board is medium density board.

5. A method as in Claims 1, 2 or 3 in which the wet lap is watered to a solids content of about 25% to 40%.

6. A method as in Claims 1, 2 or 3 in which a cushioning sheet is interposed between a hot plate or caul plate of the press and the printed paper before consolidating under heat and pressure.

7. A method as in Claims 1, 2 or 3 in which contours embossed in the surface of the board involve stretching portions of the printed paper more than the maximum stretch of such paper in its free state but insufficiently to cause visible failure.

8. A method as in Claims 1, 2 or 3 in which the embossing is applied by a light weight expendable caul plate.

9. A pressed fibreboard comprising a base mat of defibrated and refined wood chips, a sheet of paper combined with the base mat, a pattern printed on the exterior surface of such paper and contours complementary to (as herein defined) but not in registration with the printed pattern embossed in the surface of such paper.

10. A board as in Claim 9 in which the contours provide a stretch to portions of the paper greater than the maximum stretch of the paper in its free state but insufficient to provide visible surface failure.

11. A medium density board as in Claim 9.

12. A board as in Claims 9, 10 or 11 in which the contours embossed in the paper have valleys darkened by the embossing to provide an auxiliary pattern and in which a layer of drying oil between the paper and the base mat has given translucency to develop such auxiliary pattern.

13. A method of making pressed fibreboard as herein described.

14. Pressed fibreboard in accordance with any of the examples herein described.

15. Pressed fibreboard when produced by the method claimed in any one of claims 1 to 8.

For the Applicants:

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surface of the base mat but in this case the overlay was a 32 lb. per ream (3000 sq. ft.) uncoated, printed newsprint sheet. Linseed was applied to the underside of the

5 paper overlay as in Example #1.

The combined base mat and paper overlay was consolidated in a hot press fitted with a deep, random weathered embossing top caul having a draw depth of up to
10 0.080 inches. Caul plate material was mild steel, chromed. No glassine intermediary sheet was used. A conventional backing screen was used on the bottom surface of the mat as in Example #1.

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20 the overlayed wet mat compressed to stop in 30 seconds, at which point the pressure was immediately dropped to 40 p.s.i. (on board). The press was kept closed on the stops for 20 minutes, then opened, the
25 board removed and the backing screen separated from the board.

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30 draught oven for 4 hours at 280°F. Finally a 1-1/2 dry mil protective, clear finish was applied by conventional curtain coating.

The resultant board had a thickness of
35 0.400 inches, a specific gravity of 0.68 and a highly attractive, deep embossed surface, shaded more darkly in the valleys than on the ridges, simulating weathered lumber.

One of the advantages of the invention
40 is that light-weight, cheap, expendable caul plates can be used such as light-gauge embossed aluminum sheeting, plastics, photo-engraving plates, textiles, papers and other textured webs and even natural
45 objects such as leaves.

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50 dewatered wet lap of defibrated and refined wood chips, printing a sheet of paper with a pattern, applying the printed paper to the partially dewatered wet lap with the printed pattern facing outwardly and then
55 simultaneously embossing a complementary (as herein defined) but non-registering pattern on the surface of the wet lap to which the printed paper has been applied and consolidating the printed paper and
60 wet lap under heat and pressure in a press to provide a pressed fibreboard.

2. A method as in Claim 1 in which a

coating of drying oil is applied to the unprinted surface of the sheet of paper before the printed paper is applied to the partially
65 dewatered wet lap.

3. A method as in Claim 2 in which a pattern is formed resulting from darkening in the valleys of the embossed surface auxiliary to the printed pattern.

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4. A method as in Claims 1, 2 or 3 in which the board is medium density board.

5. A method as in Claims 1, 2 or 3 in which the wet lap is watered to a solids content of about 25% to 40%.

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85 insufficiently to cause visible failure.

8. A method as in Claims 1, 2 or 3 in which the embossing is applied by a light weight expendable caul plate.

9. A pressed fibreboard comprising a
90 base mat of defibrated and refined wood chips, a sheet of paper combined with the base mat, a pattern printed on the exterior surface of such paper and contours complementary to (as herein defined) but
95 not in registration with the printed pattern embossed in the surface of such paper.

10. A board as in Claim 9 in which the contours provide a stretch to portions, of the paper greater than the maximum
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11. A medium density board as in Claim 9.

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