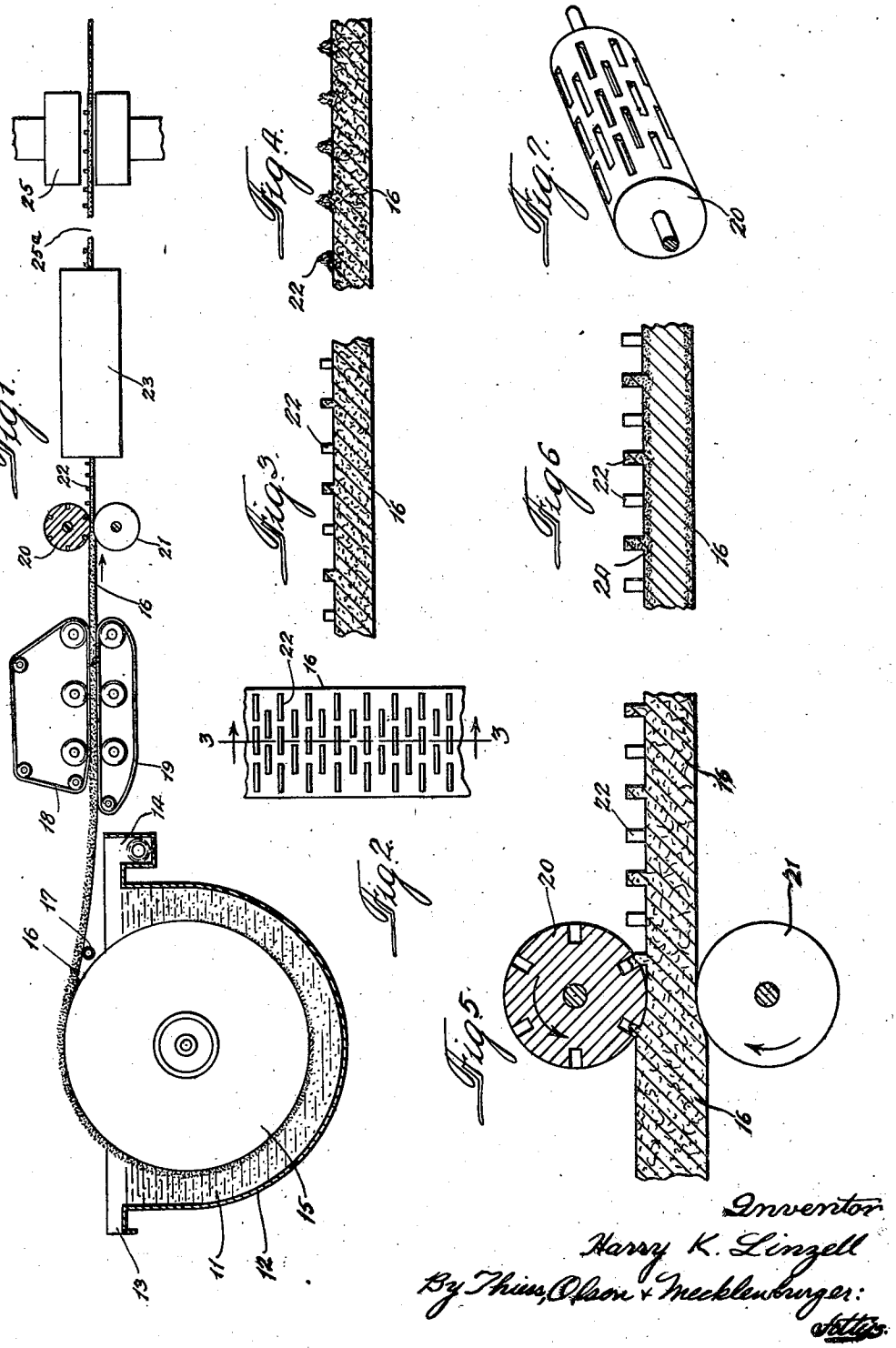
July 2, 1946. H. K. LINZELL 2,402,966

PROCESS OF PRODUCING VARIEGATED PRESSED FIBERBOARD

Filed July 11, 1942



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Patented July 2, 1946

2,402,966

UNITED STATES PATENT OFFICE

2,402,966

PROCESS OF PRODUCING VARIEGATED PRESSED FIBERBOARD

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Application July 11, 1942, Serial No. 450,643

3 Claims. (Cl. 92—38)

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This invention relates to fiber board, and more particularly to a board which may be produced by the compaction of vegetable fibers at elevated temperatures.

The production of dense fibrous products from vegetable fibers by compaction at high temperatures is well known in the art. The process has recently been applied particularly to the production of hard pressed board having a density in general somewhat greater than the original material from which the product is formed. In order to produce a hard fibrous product of this character, without the use of substantial amounts of binding agents, from vegetable fibers and particularly wood fibers, pressures upwards of 500 pounds per square inch and temperatures upwards of 400° F. are required in order that a product of the desired density and strength be produced. It has been found, however, that at such high temperatures and pressures the vegetable material becomes colored or browned to a greater or less degree, depending upon the degree of temperature and pressure employed and upon the type of vegetable material being subjected to such treatment. Thus, when a hard dense board is produced from cottonwood fibers and when the fibrous material is subjected to a pressure of about 2500 pounds per square inch and to a temperature of about 420° F. for a period of about 5 to 10 minutes, the resulting product may become browned or colored to a marked extent. This browning lends a pleasing appearance to the resulting board and for this reason has been found to be quite desirable.

A dense fiber board that is produced by the general method indicated above usually presents, when completed, a uniformly colored surface. It is desirable, however, to produce textured fiber boards which present variegated surfaces without the necessity of applying paints or varnishes to produce the desired effect. Boards having such surfaces are often more readily salable than plain uniformly colored products, particularly if the board is to be used in interior decorative work.

It has been found that, if certain color-inducing chemicals such as salts are incorporated into the fiber board prior to the pressing operation, the coloration due to the heat and temperature may be markedly increased in certain instances; and it has been further found that, if the concentration of such salts be localized on the surface of different portions of the board prior to the pressing, increased coloration will occur during the pressing in those portions of the surface wherein the salt is most concentrated.

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A further object of this invention is to provide a method for the production of fiber board whose surface color may be regulated to some extent by incorporating certain catalytic color-inducing chemicals into the fibrous material prior to the pressing operation.

A further object of this invention is to provide a fiber board with a variegated surface by varying the concentration of color-inducing chemicals which tend to increase the coloration of the fibers on the surfaces of the board.

A further object of this invention is to provide means for concentrating the said color-inducing chemicals in various portions of the fibrous material preliminary to pressing.

Further and additional objects will appear from the following description and the appended claims.

As has been previously mentioned, it has been found that certain salts and other materials incorporated into fibrous products preliminary to heating and pressing cause an increased tendency of the fibers to become colorized. Suitable color-inducing chemicals have been found to be ammonium carbonate, aluminum sulfate, calcium carbonate, calcium phosphate, ferric chloride, and the like. If these color-inducing chemicals are incorporated with or added to a fibrous board or sheet preliminary to the hot pressing treatment, it will be found that the degree of browning or coloration due to the carbonization of the fibers or the polymerization of the resinous material in the product will in general be roughly proportional to the concentration of the chemical present. In general, the present invention contemplates the localization of the chemical in the material to be pressed in order that the surface of the resulting product will be colorized to different degrees, although uniform heat and pressure are employed during the compaction of the product. The distribution of the chemical throughout or over the material to be pressed may be effected in a variety of ways. The chemical may be sprinkled in varying amounts on the surface of the product preliminary to pressing either in the dry or wet form. This has been found advantageous when water-insoluble compounds are used, such as calcium carbonate, magnesium carbonate, or calcium phosphate.

According to one preferred form of this invention, however, solutions of the chemical may be employed to impregnate the fibrous material. The chemical may then become concentrated on or near the surface of the fibrous mat during the drying thereof, since the soluble chemical has a

tendency to migrate through the fibrous product to the surface when the fibrous product is being dried. When soluble chemicals are employed, such as ammonium carbonate, oxalic acid, or ferric sulfate, they may be more or less uniformly distributed through a wet fibrous product into which they have been incorporated. When the fibrous product is dried preliminary to the heating and pressing treatment, the soluble chemical will tend to migrate to the surface with the water that is being evaporated and to precipitate adjacent said surface. The migrating chemical may be localized or concentrated on various portions of the surface of the drying product by increasing the rate of evaporation from the various surface areas of the fibrous material. This may be effectively accomplished by the production of raised portions or wick-like structures on the wet material, with subsequent drying of the same. The water evaporates more rapidly from those areas which have the greatest surface exposure, and consequently the migrating chemical will be concentrated in those regions when the board has dried. Consequently, when the fibrous product is pressed in accordance with any of the methods well known in the art, a fibrous board having a variegated surface is produced, the darker portions in general being located in the region of the surface where the concentration of the chemical was the greatest.

Referring now to the drawing,

Fig. 1 is a diagrammatic representation of an apparatus that may be employed for the preparation of a product in accordance with this invention;

Fig. 2 is a plan view of a section of an unpressed board having raised surface portions after having passed through an embossing roll;

Fig. 3 is a section of the unpressed board taken along line 3'—3' of Fig. 2;

Fig. 4 is a section of an unpressed board having wick-like structures pulled up from the surface of the board;

Fig. 5 is a diagrammatic sectional view of an apparatus suitable for producing the embossings on the fibrous material of this invention, preliminary to the pressing, and wherein is indicated the distribution of the chemical previous to the drying process;

Fig. 6 is a diagrammatic section of the dried embossed material of Fig. 5 wherein the localization of the chemical has been indicated; and

Fig. 7 is a perspective view of a roller that may be employed for embossing the fibrous material indicated in Figs. 2 and 3.

Referring now more particularly to Fig. 1, wherein one means is shown diagrammatically for making a product in accordance with this invention, a 5% suspension of fibrous material 11, such as finely comminuted cottonwood fibers, is introduced into a suitable tank 12 through an inlet 13. The tank is equipped with an overflow 14 from which the suspension may be recirculated into the tank 12 if desired. A perforated drum 15 is provided, partially submerged in the fibrous suspension 11, within which suction is maintained in order that the fibers of the suspension 11 may accumulate on the surface thereof in a manner that is well known in the art. A soluble salt such as ammonium carbonate, aluminum sulfate, cobalt sulfate, or nickel chloride, is introduced directly into the fibrous suspension in any desired amount, such for example as 1%.

A fibrous mat 16 is formed on the continuously rotating drum 15 by virtue of the suction applied to the interior of the drum and the subsequent deposition of the fibers on the perforated portions thereof. The fibrous mat 16 is then continuously removed from the drum, aided by a small roller 17. The mat 16, being in the wet condition and containing a substantial proportion of the soluble migrating chemical, is passed through the felt rollers 18 and 19 in order to remove a proportion of the water solution therefrom. The wet mat 16 is then passed between suitable embossing rolls 20 and 21. The embossing rolls emboss figures of any desired shape and size upon the mat 16, such as are indicated in Figs. 2 and 3. If desired, each of the embossing rolls 20 and 21 may produce a pattern on each side of the fibrous mat. The mat 16, after having been subjected to the embossing treatment, has at least one surface which has a plurality of raised portions 22. The wet embossed mat is then subjected to a drying treatment in a suitable drying chamber 23. The water within the mat evaporates from the surfaces of the board during this treatment, and the migrating chemical concentrates on or adjacent the surfaces from which the water is evaporated. It will be observed (Fig. 6) that the chemical will become more concentrated in those portions 24 of the board which have the raised projections or wicks 22, since the drying will occur more rapidly at these points due to the greater surface exposure of that portion of the surface.

The board thus made, having its surface covered with localized areas of color-inducing chemical, is then subjected to heat and pressure in a hydraulic press 25 wherein a finished board of the desired density may be produced. A break in the sheet is indicated at 25a, at which position a looper or other device may be positioned for compensating for the continuous feeding of the sheet into the discontinuously operating press. It is clear that a continuously operating roller press may be used if desired. In order to produce a hard, dense, fibrous board, it is preferable to employ pressures on the order of about 2500 pounds per square inch and temperatures on the press platens of from between 350° and 500° F., say about 420° F. The board may be subjected to this treatment for a total period of from, say, three to ten minutes. The degree or severity of the treatment given to the product, however, will depend in a large measure on the density desired in the resulting product and the amount of browning or coloration that is desired. It will be observed that, due to the fact that the chemical is concentrated in distinctly different areas of the dried surface mat previous to the hot pressing operation, a higher degree of coloration occurs in those areas. The resulting product consequently has a variegated surface which presents a very pleasing appearance.

The completed fiber board produced in accordance with the above-described method has a substantially uniform density and is substantially uniformly porous throughout its entire surface, since it has been produced from a fibrous mat which was of substantially uniform thickness previous to the embossing process. In certain instances it may be desirable to form the raised portions on the wet material by addition or removal of portions of the material from various areas of the surface. A product that is so produced is contemplated as being within the scope of this invention. Such products may not have

uniform densities and porosities, however, because of the variable amount of material pressed in the various portions between the press platens. If the product is produced as described hereinabove however, a uniformly dense and porous product results, since the embossing roll or other pattern-producing means does not disturb the amount of material in the various portions of the unpressed board. It is desirable that the surface of the product be of uniform porosity in order that the product may be readily and evenly painted without the production of undesired mottled effects on the painted surface. If the board is not of uniform porosity, it often happens that moisture will be absorbed by the more porous surfaces, thus causing the board to become wrinkled or warped.

As has been previously indicated, a great variety of color-inducing chemicals may be employed in this process in any suitable concentrations. In general, any chemical may be employed which will tend to increase or even decrease the degree of browning or coloration imparted to the fibrous material during the hot pressing operation. In the method that has been described hereinabove, it is preferable to use a chemical that is soluble in water in the concentration used or which will migrate to the surface of the board in the manner described above. It may be desirable in certain instances to use a relatively volatile chemical, such as ammonium carbonate, in order that it will volatilize away from the surface of the board when the heat and pressure are removed after the pressing treatment. Certain colored salts may also be employed, which will in themselves lend a color to the resulting product, suitable examples being a cobalt salt such as the sulfate and a nickel salt such as the chloride. Other chemicals that have been found satisfactory for use in practicing this invention are ferric salts, aluminum salts, sulfuric acid, aluminum chloride, oxalic acid, ammonium oxalate, and the like. If desired, silver nitrate or other photosensitive materials may be employed.

It is not contemplated that this invention be restricted to the use of an embossing roll such as is shown in the above example. Any type of roll or wet press may be provided which will impart the desired design to the wet mat. It has also been found practicable to form the mat containing the chemical and, by means of a suitable mechanism, raise portions of the formed mat by picking or brushing, preliminary to drying. Wicks produced on a wet mat by picking of the fibers from the mat are indicated in Fig. 4. Effectively the same migration of the chemical during drying is obtained as if the mat were passed through an embossing roll as previously described.

It is also contemplated in this invention that a fiber board having different colors on each side may be produced without the employment of platens heated to different temperatures. Consequently, if a wet mat containing the chemical is dried from only one side, the chemical will be concentrated on that side and a different color will be produced on that surface when the product is finally pressed. Obviously the chemical might be applied to only one side.

It is not contemplated that this invention be restricted to a hard dense board or method for producing it. The process may be likewise applied to a fibrous mat which is subjected to a sufficient temperature and pressure to cause the coloration of the surface but insufficient to compact the inner portions of the board to a hard dense mass. The process may also be applicable to the compaction of sheets of undefibrated wood.

The chemical need not be incorporated and distributed within the mat as described in the above given example. If desired, the chemical may be sprinkled or splotched onto the surface of the formed mat in a regular pattern or in a haphazard fashion. If the chemical is applied in this manner, it may be done at any time previous to the final pressing of the board, whether the mat be in the wet or dry condition. In accordance with one preferred method, the chemical may be introduced onto the surface of the freshly formed fibrous mat as it emerges from the suspension. The chemical may be here applied in the form of a spray of solution at a point where suction of the revolving cylinder 15 is still being applied to the mat and the chemical will be sucked into the mat and become distributed throughout.

While several particular embodiments of this invention are described above, it will be understood, of course, that the invention is not to be limited thereto, since many modifications may be made, and it is contemplated, therefore, by the appended claims, to cover any such modifications as fall within the true spirit and scope of this invention.

I claim:

1. A process for the production of a hard pressed board which comprises forming a mat from a suspension of vegetable fibers in an acidic aqueous solution of a color-inducing compound selected from the group consisting of acids and acidic metal salts which increase the rate of coloration of said fiber under heat and pressure, compacting said mat to remove a portion of said solution therefrom, embossing said mat to produce a plurality of raised portions on the surfaces thereof, drying the mat to remove water therefrom whereby said color-inducing compound is deposited adjacent the surface of said mat and concentrated around said portions, and further compacting said mat at a temperature within the range of about 350° to about 500° F. in order to form said board, whereby the surface of said board assumes a color proportional to the amount of color-inducing compound present adjacent said surface.

2. Process of producing hardboard having a variegated irregularly colored surface which comprises the steps of mixing a water-soluble color-inducing chemical with an aqueous suspension of woody fibers, forming said suspension into a mat, compacting said mat to squeeze water therefrom, forming raised portions on a surface of said compacted mat to serve as wicks for selectively drawing the said color-inducing chemical to the raised areas during the drying of said mat, drying said mat to remove substantially all of the water therefrom whereby said color-inducing chemical is deposited adjacent the surface of said mat and concentrated around said raised portions, and thereafter subjecting said mat to consolidation by means of a pressure of about 2500 pounds per square inch at a temperature of about 420° F. for a period of about 5 minutes.

3. A process for the production of a hard pressed board which comprises forming a mat from a suspension of vegetable fibers in an aqueous solution of a color-inducing chemical, compacting said mat to remove a portion of said solution therefrom, forming raised portions on a surface of said mat to serve as wicks for selec-

tively drawing the said chemical to the raised areas during the drying of said mat, drying said mat to remove substantially all of the water therefrom whereby said chemical is deposited adjacent the surface of said mat and concentrated around said raised portions, and further compacting said mat by a pressure of at least 500 pounds

per square inch and a temperature within the range of from about 350° to about 500° F. for a period of at least 3 minutes whereby the surface of said board assumes a color proportional to the amount of color-inducing chemical present adjacent said surface.

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