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METHOD FOR PRODUCING A VARIEGATED SURFACE ON FIBER BOARD

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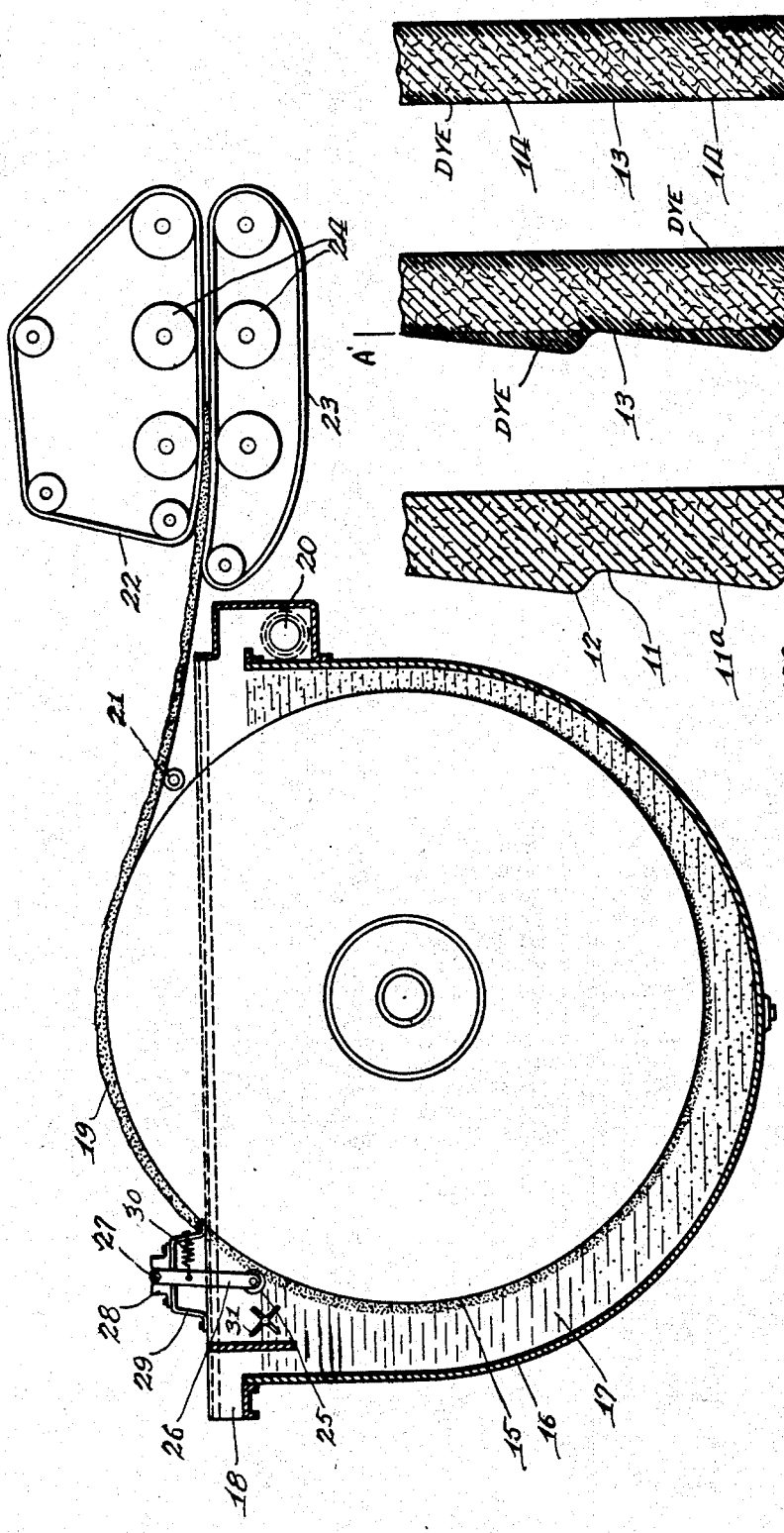


Fig. 3.

Fig. 2.

Fig. 1.

Fig. 4.

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METHOD FOR PRODUCING A VARIEGATED SURFACE ON FIBERBOARD

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10 Claims. (Cl. 92—41)

This invention relates to composition boards and more particularly to fiber boards having variegated surfaces.

Several methods have been proposed in the past for the production of composition boards such as insulating board and compressed fiber board known as hardboard. These methods in general comprise the collection of vegetable fiber or other comminuted material in any suitable manner to form a mat or slab which is subsequently dried and pressed to form the desired product, the characteristics of the resultant product depending to a great extent upon the materials incorporated within the mat and the manner in which they are compounded and subsequently pressed. Products thus produced present in general a more or less uniformly colored and textured surface. It is desirable in certain cases to produce a product which has a variegated surface and presents a pleasing appearance. A product of this character is also desirable since the variegated surface will tend to mask certain blemishes that often occur in a product manufactured or prepared by the usual methods.

In order to produce a variegated surface on fibrous products, it has been the custom in the past to apply the coloring matter in the form of paint or lacquer to the surface after the product has been formed. Attempts to incorporate a dye into the surface of the finished product have not been entirely satisfactory because of variations in the material treated and variable characteristics of the particular dye employed.

In the manufacture of hard pressed board it has been particularly difficult to secure a product which will present a pleasantly appearing variegated surface. However, pressed board having a variegated surface has been prepared as described in James N. Devereux Patent No. 2,225,585. The process for the preparation of pressed board as disclosed in this patent discloses a process of pressing a dry mat whose surface contains a plurality of ridges and hollows. Consequently, when the mat is subjected to the final pressing, the thicker portions of the mat are compressed to correspondingly greater density than the thinner portions, and the color and texture of the surface adjacent the denser portions have an appearance different than adjacent portions that are not so dense. In this manner a hard pressed board product which has a variegated surface may be produced. However, pressed board that is prepared in this manner is objectionable since the density and porosity of the surface varies to a considerable extent throughout a single piece. Consequently, if a paint or lacquer is applied thereon, the more porous portions will absorb the coating material to a greater extent than the denser portions; and the resulting surface will present an undesirable mottled effect.

It is consequently one object of this invention to provide a composition board presenting a pleasing surface effect in which small surface defects are rendered unnoticeable.

A further object of this invention is to provide a composition board of uniform density and porosity and having a variegated surface.

A further object of this invention is to provide a hard, uniformly dense fiber board presenting a pleasing surface effect of variegated colors.

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

One of the methods for producing the product of this invention contemplates the use of a "bleeding dye" which may be incorporated into the material preliminarily to the formation of the mat or slab. The "bleeding" dyes that may be used in this invention are those which are soluble or will readily migrate through the material with the liquid that was contained therein preliminarily to the removal of said liquid. Consequently, if the mat is saturated with a solution of the bleeding dye and subsequently dried, the bleeding dye will have a tendency to be drawn with the liquid to the surface of the material and there become concentrated and dry when the liquid evaporates. The surface will take on the color of the dye, and only small amounts of the dye will remain within the core of the mat or slab.

According to one embodiment of this invention, a fibrous mat may be prepared from a suspension of fibers in a dilute solution of the dye. The fibrous mat during formation may be treated according to the methods described in the above-referred-to patent to Devereux. The resulting mat is then dried, and during the drying process the water migrates from the center of the fiber board to the surface, carrying the dye with it. The water then evaporates, and the dye is precipitated onto or concentrated near the surface of the fibrous mat. The resulting product is a fiber board having a substantially uniformly colored surface, one side of which bears a series of hollows and ridges. The uneven surface of this board may then be sanded or ground down in any desired manner to produce a board of uni-

form thickness, the grinding being only to such an extent that the ridge portions are removed, leaving intact the surfaces of the hollow portions. The resulting uniformly thick fiber board will thus be variegated, the undyed portions being located in the zones where the ridges were and the dyed portions being located where the hollows were. If desired, the product may then be pressed at high temperatures and pressures in order to form a hard, dense board in accordance with the well-known methods. Such methods may comprise substantially complete removal of all moisture from a light porous mat followed by pressing of the bone-dry mat within a temperature range of from 350° F. to about 500° F. at a pressure ranging from mere contact up to 1500–2000 lbs. per square inch.

If desired, a similar product may be produced by spraying or otherwise coating the fiber insulation board disclosed in the Devereux Patent No. 2,225,585 with a dye or some other type of coloring matter. After drying the coated insulation board may preferably be sanded sufficiently to remove the "high lights" and expose the uncoated interior. It will be understood that the freshly coated board may also be cleaned as by wiping with a cloth, and the coating removed from the high spots whereas the hollows will retain their coating. The products produced in the above-described manner may likewise be processed further by heat and pressure.

Though the preferred process is the specific illustration given below, which is confined to the use of bleeding dyes incorporated integrally to the product, it is obvious that this product may be produced in other than the illustrated manner, and it is not intended to be limited by the illustration except by prior art and the appended claims.

Reference will now be made to the drawing, wherein

Figure 1 is a transverse sectional view of the wet mat from which the product of this invention is formed;

Fig. 2 is a similar view of the dry mat, indicating the manner in which the bleeding dye precipitates on the surface of the mat during drying;

Fig. 3 is a transverse sectional view of the mat shown in Fig. 2 after the mat has been sanded or ground along the line A'—A' of Fig. 2; and

Fig. 4 is a sectional elevation of an apparatus suitable for producing a fibrous mat in accordance with this invention.

Referring now more particularly to the drawing, Fig. 1 depicts a sectional view of the wet mat, which has on one side thereof a plurality of hollows 11 and ridges 12 which are produced in a manner to be hereinafter set forth. The mat contains a high percentage of water which contains the dye in solution or extremely fine suspension, said dye being of the bleeding type for the fibrous material employed. While the mat is drying, the bleeding dye will migrate to the surface thereof and precipitate in a layer 13 (Fig. 2), which layer may be partially removed by suitable grinding of the dry surface so that the resulting product will contain dyed surface portions 13 and undyed portions 14 as indicated in Fig. 3.

In order to produce this improved fiber mat, a rotatably mounted drum or cylinder 15 is provided, the outer periphery of which is composed of a foraminous support, such as a wire screen. This drum dips into a tank 16 which contains a water suspension 17 of the bleeding dye such as Pontamine Black E (B. C. I. #581) and vegetable fibers such as wood fibers of willow, cottonwood, or other desired trees or woody plants. This water-fiber suspension is introduced into the tank 16 through an inlet device 18, and suction is applied to the inside of the drum in a manner well known to the art, so as to form a fiber mat 19 on the foraminous support. Any excess water overflows from tank 16 through an outlet device 20. The fiber mat 19 which is formed is led off the drum 15, over a guide roller 21 and between endless belts 22 and 23 of suitable material, such as felt, which are pressed heavily against the two faces of the mat by pairs of pressure rollers 24 so as to squeeze out excess dye solution from the mat and prepare it for a subsequent drying operation.

A roller 25 or other rigid member is rotatably mounted at its ends in the lower ends of a pair of arms 26. The upper ends of the arms 26 are pivotally supported on a rod 27 which is received in bearing sockets 28 secured on brackets 29, the latter being supported on the framework of the machine. The arms 26 depend from the rod 27 at an angle to the vertical so that the roller 25 presses lightly against the mat 19 in its formative state due to the action of gravity on said roller. Springs 30 may connect each of the arms 26 to a fixed support to increase the pressure of the roller 25 on the mat being formed. However, the springs 30 may be dispensed with and the pressure of the roll on the mat varied by changing the position of the rod 27 relative to the cylinder 15, thus depending entirely upon gravity. The roller 25 may be located below the level of the fiber suspension 17 in tank 16, or it may be raised slightly above the level of said suspension with good results. The action of the roller 25 is to retard the movement of the loose surface fibers of the mat as the body of the mat moves ahead. When sufficient loose fibers are built up in back of the roll, the latter raises slightly and rides up over the elevated masses of fibers. Suction is maintained on the periphery of the drum 15 so as to insure an integral bond between the fibers in the elevated areas and the body of the mat. The gently inclined surfaces 11*a* of the elevated fiber areas appear on the leading side of said areas, while the abruptly inclined surfaces 12*a* appear on the trailing sides thereof (Figs. 1 and 2). The pressure rollers 24 acting on the belts 22 and 23 serve to flatten down these elevated fiber areas to some extent and give the surface of the mat a more uniform and pleasing appearance.

In the actual operation of the apparatus thus far described, however, it has been found that some difficulties occur due to the fact that lumpy stock shed by the fiber mat in its formative state, particularly as it passes under the roller 25, accumulates at the surface of the water-dye suspension 17 and eventually causes sufficient congestion to stop the texturing process accomplished by the roller 25 in its relation to the cylinder 15. Accordingly, in order to prevent such difficulties, there is provided, adjacent the level of the water suspension in the neighborhood of the roller 25, agitating means comprising a small positively driven paddle wheel 31. This paddle wheel, which may of course have any desired number of agitating blades, is positively driven at a relatively low speed and serves to mix the lumpy stock shed by the mat with the body of the water suspension 17 so as to maintain the stock adjacent the roller 25 in condition to be reformed on the face of the wheel 15.

The resulting mat is then introduced into a drying chamber. During the drying operation the

bleeding dye migrates to the surface with the water and precipitates as hereinabove described. A high humidity or high moisture content of the air during the initial stages of the drying has been found to promote the bleeding action. The resulting dry board is then sanded or ground on the uneven surface in order to remove the ridges 12 from the surface and to expose the undyed or only slightly dyed portions 14 of the fibrous material.

If desired, the resulting insulating board may be further treated by subjecting it to heat and pressure in a hydraulic press in order to produce what is known as a hard board. The resultant board will also present a variegated surface of the same character as the uncompressed fiber board from which it is produced. The pressing of the hard board may be carried out by any of the well-known processes, the temperatures and pressures employed being largely determined by the characteristics of the desired product.

A dry fiber board produced from a suspension of cottonwood fibers in a dilute solution (1/16000) of a suitable black dye such as the sodium salt of p - sulphobenzene-azo-m-phenylene-diamine-azo-diphenyl-azo salicylic acid, and according to the method indicated above, may be pressed in a hydraulic press for about 4 minutes at 1500 to 2000 pounds per square inch and at about 450° F. The bleeding dye imparts a greyish color to portions of the resulting board, and the remaining surface portions are somewhat brown due to the coloration of the fibers during the pressing operation. The hard board prepared in accordance with this method has a hard, uniformly dense structure with a substantially uniformly porous surface. The product is pleasing in appearance and has improved paintable qualities as previously explained.

If desired, a dye of a non-bleeding type or an insoluble pigment may also be incorporated into the original fibrous suspension. This type of dye will be retained within the body of the material during drying, and a color may be imparted to portions of the surface of the final product that is different from that of the natural color of the fibers and the bleeding dye. In such a case the area 14 of Fig. 3 will take on a color imparted by the non-bleeding dye alone, while area 13 will take on a color due in general to the combined effect of the dyes used.

Bleeding dyes that are contemplated for use in this invention are those dyes which are soluble or form fine colloidal suspension in the liquid and are capable of running or bleeding within the material which is being dried. The non-bleeding dyes are those that become fixed to the material by chemical processes or are prevented from bleeding due to their particle size.

It is not contemplated that this invention be limited to fibrous materials such as may be prepared from vegetable fibers. Any material that may be formed from a liquid suspension of comminuted particles wherein the liquid migrates to the surface during drying or setting of the product may be prepared in a manner as set out in this invention. For example, a variegated surface may be obtained on the surface of an asbestos-cement shingle if prepared in accordance with this invention, since it is well known that water migrates to the surface and dries off during the setting of these products.

It will also be recognized that it is not necessary to produce a structure having hollows and ridges which may be surfaced by grinding in order to produce a product within the contemplation of this invention. If desired, an evenly surfaced board or slab may be produced, whose surfaces may be subsequently scooped out by any suitable means in order to expose the undyed portions of the material. On the other hand, if a uniform color is desired on the surface of the product, it is not necessary that it be surfaced at all.

While a particular embodiment of this invention is shown 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, to cover by the appended claims any such modifications as fall within the true spirit and scope of this invention.

I claim:

1. A method for producing a variegated surface on a porous material which comprises impregnating the material with a liquid solution of a bleeding dye, evaporating the liquid from the surface of the material whereby the dye is concentrated adjacent said surface, and removing a portion of the dyed surface whereby undyed portions are exposed.

2. A method for producing a variegated surface on a porous fiberboard which comprises impregnating the board with a liquid solution of a bleeding dye, evaporating the liquid from the surface of the board whereby the dye is concentrated adjacent said surface, and removing a portion of the dyed surface whereby undyed portions are exposed.

3. A method for producing a variegated surface on a material fabricated from a liquid suspension of particles which comprises incorporating a bleeding dye into the suspension, removing a portion of the liquid, shaping the wet material, drying the wet mass whereby the bleeding dye is concentrated near the surface, and removing a portion of the dyed surface whereby relatively undyed portions are exposed.

4. A method for producing a variegated surface on a fiberboard which comprises preparing a liquid suspension of fibers, introducing a bleeding dye into the suspension, forming a wet mat from said fibers, said mat having at least one irregular surface, drying said mat whereby said dye concentrates near the surfaces of the board, and removing the high portions of the irregular surface of the substantially dry board in order to expose relatively undyed portions.

5. A method for producing a variegated surface on a fiberboard which comprises forming a mat from a suspension of fibers in a solution of a bleeding dye, wet-pressing said mat whereby excess solution is removed from the mat, drying said mat whereby the dye is caused to concentrate on and adjacent said surface, and removing a portion of said surface whereby to expose portions of the core of said board.

6. A method for producing a hard, uniformly dense, pressed board having a variegated surface which comprises preparing a suspension of vegetable fibers in a solution of a bleeding dye, forming a mat from the fiber suspension, producing an uneven surface on at least one side of said mat, drying said mat whereby the major proportion of the bleeding dye concentrates adjacent the surface of the drying mat, removing the high portions of the resulting uneven surface of the substantially dry board, and hot pressing the resulting product to produce a board of the density desired.

7. A method for producing a two-color varie-

gated surface effect on a fiberboard which comprises forming a mat from a suspension of fibers in a mixed solution of a bleeding dye and a non-bleeding dye, drying said mat whereby the bleeding dye is caused to concentrate and precipitate principally on and adjacent the surface, the non-bleeding dye remaining substantially equally distributed throughout the mat, and removing a portion of said surface to expose portions of the board free from substantial amounts of the bleeding dye.

8. A method for producing a hard, uniformly dense, pressed board having a two-color variegated surface which comprises preparing a suspension of vegetable fibers in a mixed solution of a bleeding dye and a non-bleeding dye, forming a mat from the fiber suspension, producing an uneven surface on at least one side of said mat, drying said mat whereby the bleeding dye is caused to become concentrated principally on and adjacent the surface, the non-bleeding dye remaining substantially evenly distributed throughout the mat, removing the high portions of the resulting uneven surface of the substantially dry board, and hot pressing the resulting product to produce a board of the density desired.

9. A method for producing a variegated surface on a fiberboard which comprises forming a board impregnated with a liquid solution of a bleeding dye, said board having at least one irregular surface, drying the liquid of the solution from the board whereby the bleeding dye is concentrated mainly on or near the surfaces of said board, and removing the high portions of the irregular surface of the substantially dry board in order to expose the relatively undyed portions.

10. A method of producing a hard, uniformly dense, pressed board having a variegated surface which comprises forming a lightweight board impregnated with a liquid solution of a bleeding dye, said board having at least one irregular surface, drying the liquid of the solution from the board whereby the bleeding dye is concentrated mainly on or near the surfaces of said board, removing the high portions of the irregular surface of the substantially dry board in order to expose the relatively undyed portions, and compressing the resulting board to produce the desired dense product.

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