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Daunheimer et al.

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[54] **METHOD OF MAKING DECORATIVE PANELS**

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[73] Assignee: **Masonite Corporation,** Chicago, Ill.

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[52] **U.S. Cl.** ..... **117/37 R,** 117/64 R, 117/65.2, 117/102 R, 117/102 L, 117/111 C

[51] **Int. Cl.** **B44d 5/10**

[58] **Field of Search** ..... 117/37 R, 43, 64 R, 65.2, 117/102 R, 102 L, 111 C, 39, 45; 52/113; 156/61; 161/41

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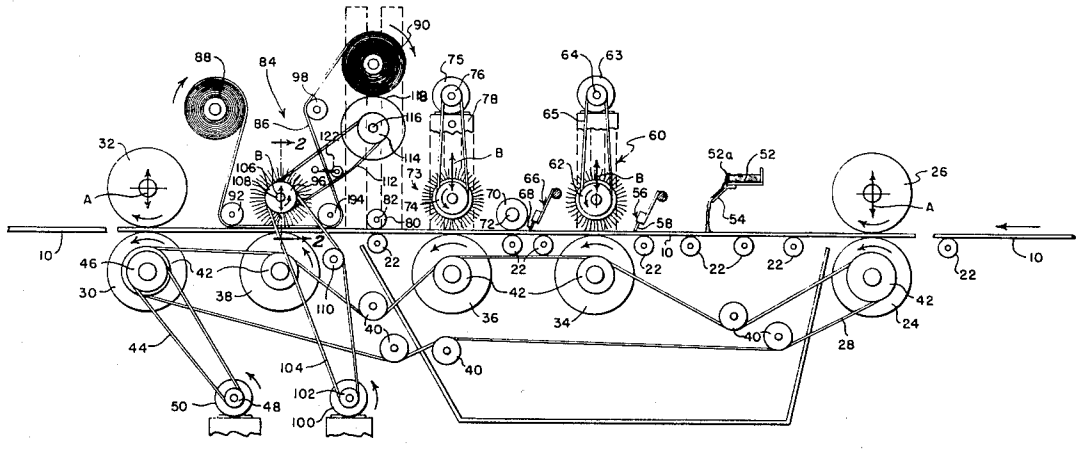
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Primary Examiner—Thomas J. Herbert, Jr.
Assistant Examiner—Bruce H. Hess
Attorney, Agent, or Firm—Mason, Kolehmainen, Rathburn & Wyss

[57] **ABSTRACT**

A sheet of building material having a decorative outer surface comprising an embossed panel with segments of different thickness and grooves formed in the outer surface between adjacent segments, said outer surface covered with a first ground coat of solid color, a second coat of stain applied and wiped to provide elongated streaks, a third solid color ground coat applied to the surface of said segments exclusive of said grooves and a finish coating comprising a printed pattern of wood grain. Apparatus for the production of said decorative panels includes means for applying a liquid coloring agent over said surface and wiping the same with an elongated belt of woven fabric movable relatively over the surface at a selected rate and biased into wiping contact with said surface by a rotary brush having a plurality of bristles, with free ends of bristles relatively movable with respect to the woven fabric belt and rotated to movingly penetrate at least some of the openings in said woven fabric thereby forming elongated streaks of coloring agent on said surface of said panel.

7 Claims, 6 Drawing Figures



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FIG. 1

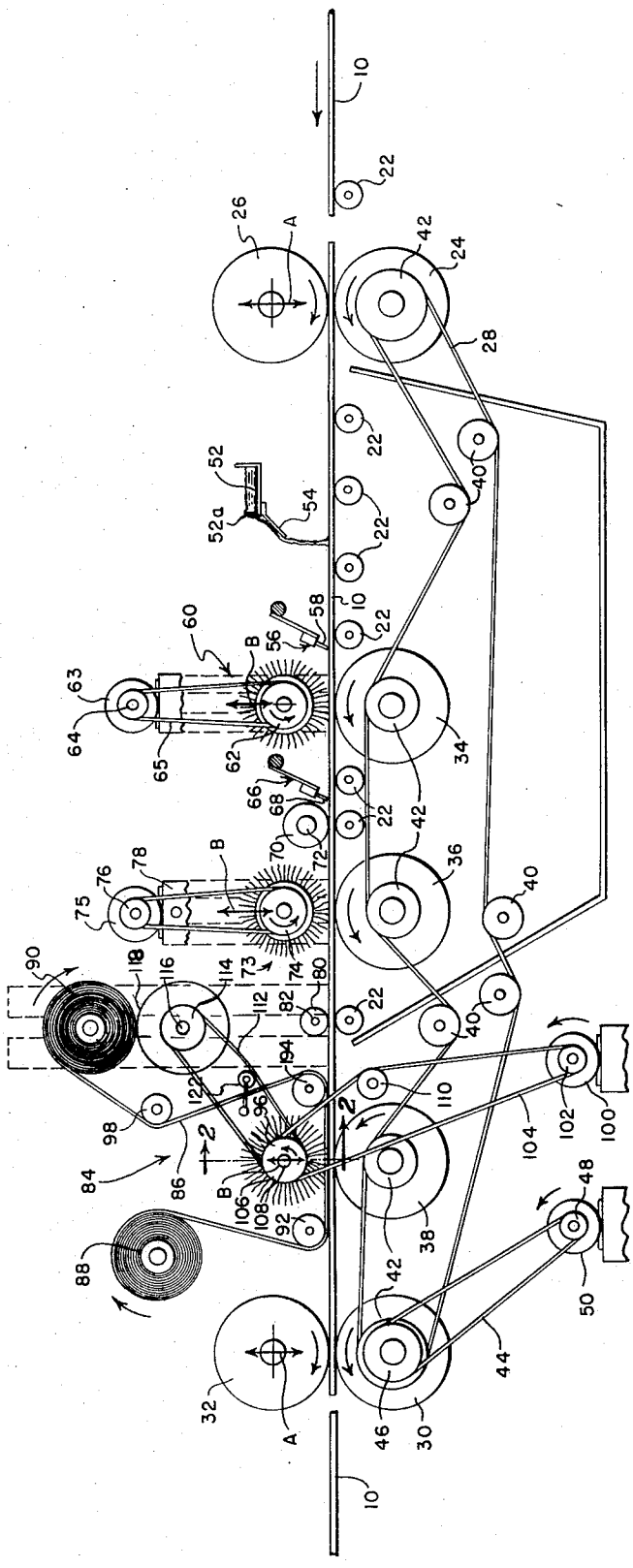

10
22
26
A
42
24
28
40
52
52a
54
58
60
B
56
63
64
65
62
34
66
68
70
72
36
75
76
78
80
73
74
82
112
114
16
18
90
94
96
122
98
84
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102
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FIG. 2

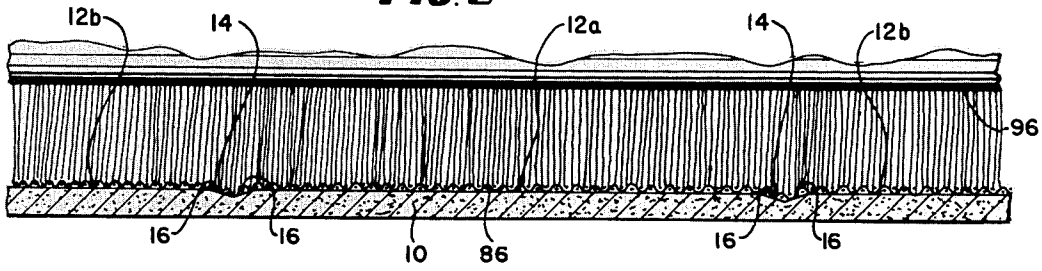


FIG. 3

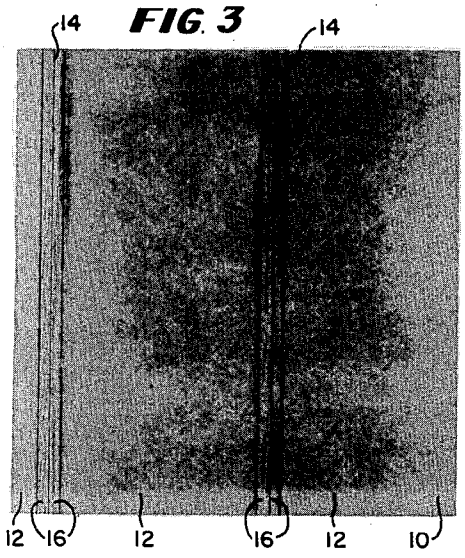


FIG. 4

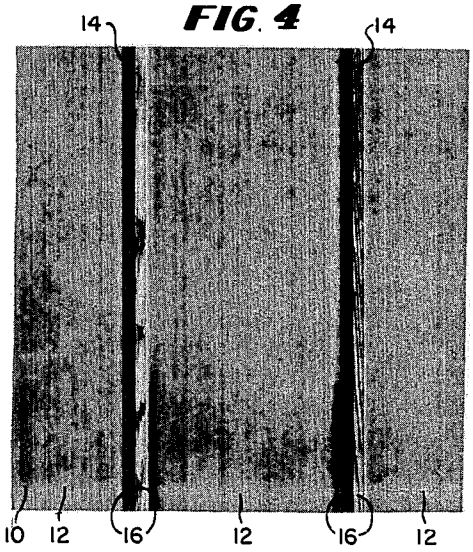


FIG. 5

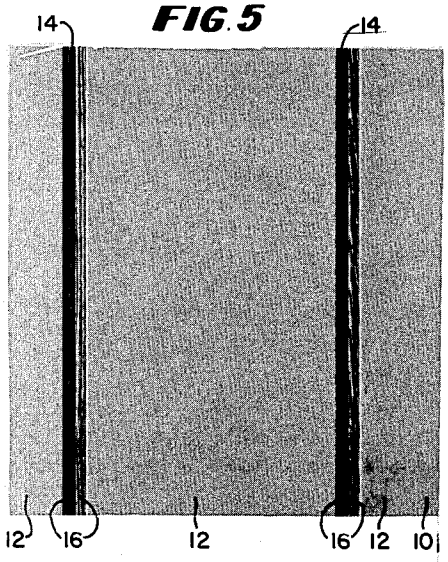
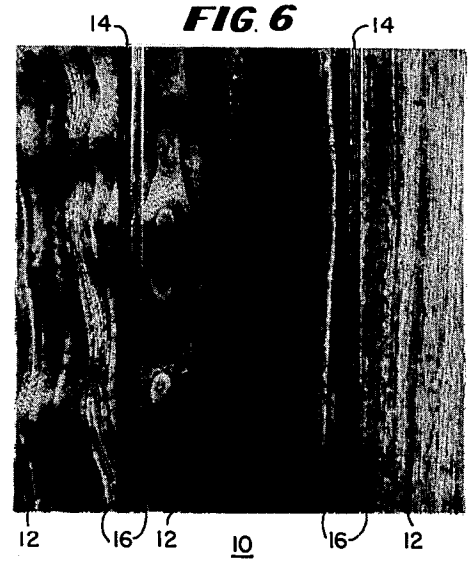


FIG. 6



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METHOD OF MAKING DECORATIVE PANELS

The present invention relates to a new and improved decorative building panel and more particularly to a building panel having a decorative outer surface resembling that of V-groove wood planks laid side to side. The panel is formed with a plurality of segments of different thickness, and grooves are formed in the simulated joints between adjacent segments to make the panel have an appearance of actual V-groove type wood planks laid side by side.

In prior art paneling sheets decorated to resemble V-groove wood planks laid side by side, difficulty has been encountered in providing suitable finishing techniques for the surfaces of the V-groove joints between adjacent plank sections. The deep relief of such joints greatly improves the appearance of the paneling, however, requiring a higher cost because of the difficulty of treating and properly finishing the surfaces of the grooves.

In wood grain decoration on panel sheets, the wood grain pattern is usually applied with a roll in a liquid form such as ink or other coloring agent, and the printing pattern is usually developed from a photograph taken of actual V-groove type wood planks laid side by side. Another difficulty has been encountered in obtaining uniform application of a wood grain printed pattern on the outer surface of a panel when segments of the surface are at different levels due to different thicknesses of portions of the panel sheet. Another problem has been the extremely difficult task of obtaining an authentic appearing stained panel having randomly oriented lines or streaks resembling those produced by the old time hand craftsman when using antique finishing techniques.

It is an object of the present invention to provide a new and improved decorative panel sheet.

Another object of the present invention is to provide a new and improved decorative panel sheet of the type having a decorative outer surface resembling that of actual wood planks laid side by side.

Another object of the invention is to provide a new and improved decorative panel of the character described having sections resembling wood planks of different thickness with grooves formed between adjacent sections.

Another object of the present invention is to provide a new and improved panel sheet of the character described wherein the surfaces of the grooves are provided with embossed wood grain patterns therein.

Still another object of the present invention is to provide a new and improved method of finishing the decorative outer surface of panel sheets of the character described.

Another object of the present invention is to provide a new and improved finishing method wherein a coloring agent such as stain is applied over the surface of a decorative panel and is thereafter wiped to produce random orientated streaks.

Still another object of the present invention is directed toward the provision of novel apparatus for the mass production finishing of decorative panel sheets including novel means for applying liquid coloring agents and subsequently wiping the same to provide a streaked effect having the appearance of a wiping stain.

Another object of the present invention is to provide a new and improved apparatus for producing paneling of the type described wherein the surfaces of the grooves formed in the panel are treated with stain and thereafter the stain is wiped slowly with a woven fabric biased into contact by rotary brush means to provide random orientated streaks.

The foregoing and other objects and advantages of the present invention are accomplished in a new and improved paneling sheet of building material having a decorative outer surface comprising segments of different thickness with grooves formed between adjacent segments. The surface of the panel sheet is covered with a first ground coat of solid color, a second coat of stain is applied and wiped with woven fabric to provide elongated streaks, a third solid ground color coat is applied only to the surface of the segments exclusive of the grooves, and a final or finish coat comprising a printed pattern of wood grain is then applied onto the segments.

A novel apparatus in accordance with the present invention provides means for applying a liquid coloring agent such as wiping stain over the surface of the panels passing through the same and for slowly wiping the stain with an elongated belt of woven fabric which is relatively movable over the surface at a controlled rate and which is biased into wiping contact against the surface of the panels by a rotary brush having a plurality of bristles. The outer free ends of the bristles are adapted to rotate and movingly penetrate through at least some of the openings in the woven fabric and engage the stain thereby forming elongated streaks resembling a hand wiped stain.

For a better understanding of the present invention reference should be had to the following detailed description taken in conjunction with the drawings in which:

FIG. 1 is a side elevational, schematic view of the new and improved machine for decorating the outer surface of a building panel in accordance with the features of the present invention;

FIG. 2 is a fragmentary sectional view taken substantially through lines 2—2 of FIG. 1;

FIG. 3 is a photograph of a sheet of paneling in accordance with the present invention taken after only the first solid color ground coat had been applied to the surface thereof;

FIG. 4 is a photograph of the paneling sheet taken after the application of a second coating of stain has been applied and wiped;

FIG. 5 is a photograph of the paneling sheet taken after a third solid color ground coat has been applied on the surfaces of the plank segments exclusive of the grooves between adjacent segments; and

FIG. 6 is a photograph of a finished panel sheet in accordance with the present invention taken after the final application of a wood grain, printed pattern.

Referring now more particularly to the drawings, a new and improved decorative, embossed building paneling sheet constructed in accordance with the present invention is shown in FIG. 6 and is generally referred to by the reference numeral 10. The finished sheet of paneling 10 is decorated to appear similar to actual V-groove, tongue and groove type wood planks joined side by side and includes a plurality of segments or sections 12 resembling individual wood boards or planks, some of which are thicker than others as best indicated

in FIG. 2 by the reference numerals 12*a* (thick section) and 12*b* (thinner sections).

Between each pair of adjacent sections **12** each of which resembles a surface of an individual plank or board of lumber, there is formed an indented, elongated groove **14** having a pair of inwardly sloped, angularly intersecting, opposite surfaces **16** to provide the same visual effect as a V-groove joint between adjacent boards or planks. As best shown in FIGS. **4** and **5**, the surfaces **16** of the grooves **14** are embossed with grain patterns therein and accordingly are relatively difficult to finish on automatic equipment because of variations in the surface. It is desirable that the groove surfaces be finished to appear the same as actual wood after finishing is complete. It should be noted that many prior art panels have dark coloring of a solid nature in the grooves, which coloring detracts from the authenticity of the appearance of the finished panels and which does not accurately portray V-groove joints between planks.

The paneling sheets **10** are preferably formed with a hydraulic press, at relative high temperature and pressure, and the materials used normally comprises wood fibers or chips which have been exploded into small size fibrous pieces. The pieces are mixed and heated with steam and finally are compressed under extremely high pressure and temperature with an embossed pressure plate to provide the section thickness variations and the authentic appearing V-groove joints with embossed grain patterns therein. The assignee of this application makes and sells paneling sheets of the same general type under the trademark "MASONITE," however paneling sheets of other construction and materials such as fiber board, particle board, pressed wood etc. may be utilized when decorated in accordance with the present invention to closely resembly V-groove wood planks or boards laid side by side.

In accordance with the present invention, blank paneling sheets **10** formed of pressed wood fiber material and the like with an outer surface embossed with V-grooves therein as described, are first passed through a ground coating paint or color applicator station, preferably of the roll type such as shown and described in the U.S. Pat. applications Ser. No. 244,623 filed Apr. 17, 1972 and Ser. No. 178,556 filed Sept. 8, 1971, which applications are assigned to the same assignee as the present application and which applications are incorporated herein by reference. After the paneling sheets **10** have been covered with the first solid color ground coat, the decorative surface of the paneling sheets appear as shown in the photograph of FIG. **3**. The ground coat application provides a solid color base for the subsequent application of stain coloring agents, such as paint or ink in printed patterns. The color of the first coat is chosen to provide a base or background compatible with the type of wood which is to be resembled by the finished paneling sheets. It should be noted that the grooves **14** and the surfaces **16** thereof are formed with embossed grain patterns therein, however, the grain pattern does not stand out in deep contrast as shown in FIG. **3** after the application of the first ground coat. A single application of a solid color ground coat alone does not particularly enhance the relief appearance of the grooves formed in the panels, and subsequent finishing steps in accordance with the invention produce a dramatic and pleasing change in appearance.

After the panels **10** have received the first solid color ground coat application which has been dried, they appear as shown in the photograph of FIG. **3**. These panels are next passed through a stain applicator as indicated schematically in FIG. **1** and referred to generally by the reference numeral **20**. The novel stain applicator **20** in accordance with the invention includes a plurality of support rolls **22** for carrying the ground coated panels **10** along a horizontal path as indicated. In addition to the individual support rolls **22** there is provided a first pair of pulling pinch rolls **24** and **26** which are adapted to move the panels **10** into and through the stain applicator **20**. The lower roll **24** of the first pair of pinch rolls is power driven by means of an endless chain **28** which chain drivingly interconnects the roll **24** with the lower one of a second pair of pulling rolls **30** and **32** at the outlet or exit end of the stain applicator. The endless chain **28** is drivingly engaged with a plurality of separate, lower support rolls **34, 36** and **38** which are spaced intermediate the pairs of pinch rolls at the entry and exit end of the apparatus. As indicated schematically in FIG. **1** a number of idler sprockets **40** are provided to maintain the proper tension on the chain drive, and each of the drive rolls **24, 30, 34, 36** and **38** is supported on a horizontal axle for free rotation as driven by the chain through a sprocket **42** on the roll shaft. The lower exit roll **30** is rotated at a controlled and adjustable speed by means of a drive chain **44** which interconnects a driven sprocket **46** on the roll shaft with a sprocket **48** on the output shaft of an electric motor powered, variable speed, main drive, gear reducer unit **50**.

In an apparatus constructed in accordance with the present invention, the reduction gear unit **50** and/or electric drive motor was selected in order to provide a wide variable speed range of feed for the panels **10** moving through the apparatus **20**. The drive unit was selected to provide a speed variation from a minimum of approximately 45 feet per minute to a maximum of over 180 feet per minute. The driven upper pinch rolls **26** and **32** are spaced above the respective lower, driven pinch rolls **24** and **30**, and the upper rolls are adjustable in a vertical direction as shown by the arrows "A" so that the desired contact pressure may be maintained upon the paneling sheets **10** to pull them through at the desired speed. In this connection it should be noted that the contact pressure is increased somewhat at higher feeding speeds and may be reduced somewhat at lower feeding speeds because of the decreased tendency to slip.

In accordance with the present invention, a fast drying liquid stain of the proper color or tint is applied onto the upper decorative surface of the paneling sheets **10** as they move through the stain applicator **20**. The stain is supplied from a liquid trough **52** extending across the sheets and having an elongated dam or weir **52***a* over which is flowed a thin curtain of stain. The liquid curtain of stain moves downwardly onto the panels guided by a sloped applicator strip **54**. The stain is flooded over the entire upper surface of the moving panels **10** at a controlled flow rate and is spread and disbursed over the sections **12** and into the grooves **14** by means of a first squeegee type applicator **56** having a blade **58** formed of rubber or other flexible material capable of deflecting enough to move the stain down into the groove surfaces **16** and the grain patterns formed therein.

After the panels pass the first spreader blade **58,** most of the stained surface is covered uniformly and the stain is evenly distributed. As the panels continue to move, they pass under a first rotary brush assembly **60** which includes a drum **62** having a plurality of radial bristles formed of polypropylene plastic material and having crimped or bent over outer ends for engagement with the panels. As indicated in FIG. **1,** the drum and bristles are rotated in a counterclockwise direction so that the relative bristle movement is counter to the direction of movement of the paneling sheets at the region of contact between the bristles and panel. The rotary drum is adjustably movable in a vertical direction (arrows "B") to increase or decrease the amount of bristle contact with the stained surface of the panels. The drum **62** is driven to rotate at adjustable speeds varying in a range of 200 to 600 rpm. An electric motor **63** of variable speed and a gear reduced **64** are connected to drive the drum of the brush assembly through a belt drive **65.**

The flexible squeegee-like blade **58** serves to distribute the stain over the entire surface of the paneling sheets and removes much of the excess stain that is present. The rotating bristles on the drum **62** similarly serve to evenly distribute the stain over the entire surface of the paneling sheets while working the stain in thoroughly into the grain pattern indentations in the groove surfaces **16.** Any excess stain remaining is also removed by the rotating bristles which act to help dry the stain by creating an air flow over the surface. As the rotating bristles pass over the panels in a direction contra to that of panel movement, the excess stain is sort of swept off and the stain is substantially uniformly distributed over the entire upper surface of the moving panel sheets **10** and is thoroughly worked into the indentations in the embossed grain pattern.

As the panels continue to move through the stain applicating apparatus **20,** they pass beneath a second squeegee-like mechanism **66** having a blade **68** like that of the blade **58** formed of flexible material such as rubber. This blade removes any excess stain that may remain on the upper surface of the panels after passage through the first brush roll assembly **60.** The panels move past the second squeegee-like blade **68** and pass underneath a plurality of holddown disks **70** which are spaced apart on a transverse axle **72.** The disks maintain the paneling sheets **10** in driving engagement against the drive rolls **34** and **36.** The panels then pass under a second rotary brush assembly **73** similar to the first rotary brush assembly **60,** and the brush action is similar and will not be described in detail herein. The second rotary brush assembly rotates in a counterclockwise direction and its speed is adjustable so that the drum **74** rotates in a speed range from 200 to 600 rpm with the tips of the bristles operating in a speed range of 267 feet per minute to approximately 1,100 feet per minute relative to the surface of the panels. The second rotary bruxh assembly is driven by a variable speed electric brush **75** and gear reducer **76** connected to the drum **74** by a belt drive **78.**

After passage through the second rotary brush assembly **73,** the stain is reduced to a thin, evenly distributed coating over the entire surface of the panel sheets **10** and is beginning to become dry and somewhat tacky. With the stain in the described condition, the panels move under a second set of holddown disks **80** spaced apart on a transverse axle **82** and move to a stain wiping station indicated generally by the reference numeral **84.**

At the wiping station **84,** the somewhat tacky, partially dry stain coating is wiped by an elongated belt **86** of woven stranded material to produce elongated, random streaks in the stain coat to provide an appearance like that shown in the photograph of FIG. **4.** The stain coating is wiped to provide a random orientated streaked effect as might be provided in the olden days by an individual craftsman, and this streaked stain effect is especially noticeable on the surface **16** of the grooves **14** between adjacent plank segments **12.** The wiped stain streaks on the surface of the segments **12** also provide some slight surface variation away from a completely planar surface, and when an additional solid color ground coating is applied following the stain wiping process, these surface variations in depth provide added authenticity for the final wood grain printed pattern.

The novel stain wiping station includes an idler supply or feed roll **88** for the wiping belt and a driven take-up roll **90.** The belt is passed beneath a pair of idler rolls **92** and **94** adjacent the upper surface of the moving panels and spaced on opposite sides of a rotary brush roll **96** having a large number of radial bristles formed of polypropylene plastic material 3 to 3½ inches long and crimped or bent over at their outer free ends. The bristles are relatively stout and are approximately .014 inch in diameter. In general, the bristles on the drums **62** and **74** are similar and the drum **96** is movable vertically like the others (arrows "B") to increase or decrease the area of bristle contact with the back side of the wiping belt **86.**

The belt **86** passes over a tensioning idler roll **98** before it is wound up on the take-up roll **90** in a clockwise direction as shown. The wiping mechanism is powered by an adjustable speed electric motor **100** and gear reducer **102** via a belt drive **104** running to a pulley **106** on the shaft **108** supporting the brush roll **96.** A belt tensioning idler **110** is provided to accommodate belt adjustments when the brush roll **96** is adjusted. A relatively constant speed ratio is maintained between the wiping belt **86** and the brush roll **96** by means of an interconnecting drive chain or belt **112** running from a pulley or gear **106** on the brush drum axle to a pulley or gear **114** carried on a shaft **116** mounted beneath the take-up roll **90.** A knurled drive drum **118** on the shaft **116** drives the take-up roll **90** of the belt **86** in a clockwise direction as shown, to provide constant belt speed for the wiping belt. An idler **122** is provided to tighten or loosen the belt or chain **112** as needed.

In accordance with the present invention, the wiping of the stain by the belt **86** occurs at a relatively low speed so that only about 6 inches of belt travel occurs during the interval of time required for a panel **10** which is 8 feet in length, to travel across the wiping station. It has been found that a wiping speed of approximately this value works well and provides a desirable appearance. However, the motor **100** and gear reducer **102** permit a relatively wide range of belt speeds to be utilized so that speeds can be varied over a range of 6 to 1. It has also been found that the type of woven fabric used for the belt is an important factor in the finished appearance of the wiped stain, and different fabrics may require adjustments in wiping speeds. For example, heavy cotton duck No. S/55252 purchased from B. J. Seaman & Co. of Chicago with minimal sizing or

unsized works well. Hopsacking of a relatively rough weave with heavy fiber or strand size and relative large openings has worked effectively.

In accordance with the invention, the rotating bristles of the drum **96** urge and bias the woven wiping belt **86** into contact with the paneling sheets **10**. The tip speed of the bristles is considerably slower than that of the bristles on the first and second brush assemblies **60** and **73**. The tip speed of the bristles on the drum **96** is set up to be substantially the same as the speed of the slow moving belt **86** and the moving mass of bristles form a sort of resilient cushioning effect on the back side of the belt which urges the belt into wiping contact against the paneling sheets **10** moving therebeneath. This cushioning effect provides for a sort of randomness that the wiped streaks in the stain appear to have, and this is one of the effects that makes the wiped stain appear as an authentic hand wiped job. In addition some of the bristles which are moving at a tip speed ranging from 2.6 feet per minute to 15.5 feet per minute may randomly penetrate random openings in the weave of the belt **86** and come into contact with the stain to provide a streaked effect therein. The belt **86** moves at about the same speed as the tips of the bristles of the rotary drum **96** which act as a biasing force on the belt to produce the wiped stain effect as if it was done by hand. FIG. **2** illustrates the belt **86** biased in wiping contact with the panel sheet **10** by the bristles of the brush drum **96**, and the drum is movable vertically as indicated by the arrows "B" to increase or decrease the wiping contact area.

After the paneling sheets **10** have passed through the apparatus **20** of the invention and appear as shown in FIG. **4**, they are passed through another solid color ground coat applicator wherein only the board or plank segments **12** are covered to provide a base for the final grain pattern printing application in ink. The grooves **14** and surface **16** thereof remain the same before and after the solid color ground coat application following the stain and wiping process. However, it should be noticed that the contrast between the solid color coated plank segments **12** and the grooves **14** is much greater than before as shown by the difference in appearance between the paneling in FIG. **5** and the partially finished sheets of FIGS. **3** and **4**.

The paneling sheets **10** are then passed through a printing station wherein a wood grain pattern (FIG. **6**) is applied onto the plank segments **12** and then a clear seal coat is applied over the entire decorative surface of the paneling sheets to produce the finished panels is illustrated, which panels closely resemble the actual thing.

The building panels may comprise wood particles and/or wood fibers formed under pressure and may also comprise plywood sheets or embossed plywood sheets wherein the decorative outer face is formed with sections of different thicknesses and grooves along the joints between the sections. Mineral filler or gypsum board panels may also be used in accordance with the present invention.

Referring to FIG. **4**, the building panels **10** may be provided with only a olid color ground coat (FIG. **3**) followed by the application of wiped stain on the apparatus **20**. The panels appear as shown in FIG. **4** and are then covered with a final clear sealer coat. The resulting panels do not have a printed grain pattern as do the panels of FIG. **6**, but instead have only the hand wiped stain appearance with streaks therein as shown in FIG. **4**.

Another embodiment of a panel may be provided by eliminating the second solid color coating on the flat surfaces (FIG. **5**) and following the wiping of the stain with the printing of a grain pattern on the flat surfaces. This type of panel is similar in appearance to the panel of FIG. **6** but may have a slightly different subtle undertone more closely related to the color of the first solid color coating.

Although the present invention has been described with reference to several illustrative embodiments thereof, it should be understood that numerous other modifications and embodiments can be devised by those skilled in the art that will fall within the spirit and scope of the principles of this invention.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. A method of decorating the surface of a building panel comprising the steps of flowing liquid stain onto said surface, spreading said stain over said surface, and wiping said stain by the application of woven fabric biased against said surface by a rotating brush, said brush including bristles having free outer ends moving relatively against the back side of said fabric to bias the same into wiping contact with said stain, said bristles positioned for random penetration of the openings in said woven fabric during rotation.

2. The method of claim **1** wherein said bristles are formed of plastic material and said free ends are bent back, said bristles randomly penetrating openings in said woven fabric.

3. The method of claim **1** including the step of brushing said liquid stain with a rotary brush to work said stain into said panel surface and remove excess liquid therefrom.

4. The method of claim **3** including the step of partially drying said stain before wiping thereof by said woven fabric.

5. The method of claim **4** including the step of additionally brushing said liquid stain by the application of a high speed rotary brushing after said first brushing and before wiping thereof by said woven fabric.

6. A method of decorating the outer surface of a sheet of building material comprising the steps of applying liquid stain onto said surface; brushing said applied stain at relatively high speed with a plurality of flexible bristles; and wiping said brushed stain at relatively low speed with woven stranded material having openings therein and biased against said surface by a rotating brush having bristles with free ends movingly penetrating at least some of said openings momentarily to form elongated streaks in said stain.

7. The method of claim **6** including the step of working said stain into said surface with squeegee means before said high speed brushing.

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