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L. G. BUCKLEY

3,536,574

EMBOSSED PLYWOOD PANEL SIMULATING NATURAL WOOD GRAIN LINES

Original Filed Jan. 9, 1967

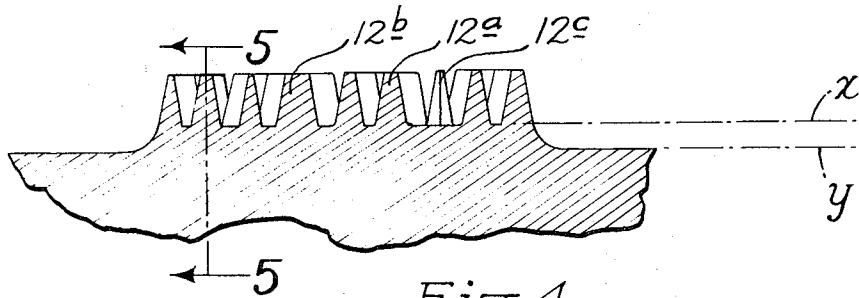


Fig. 4

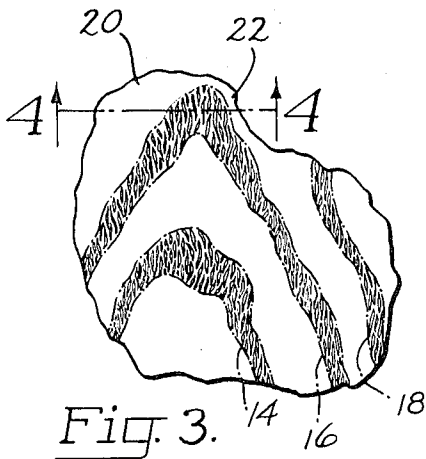


Fig. 3.

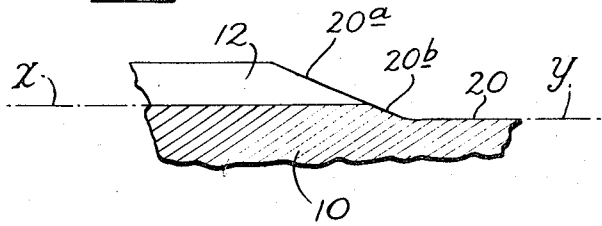


Fig. 5.

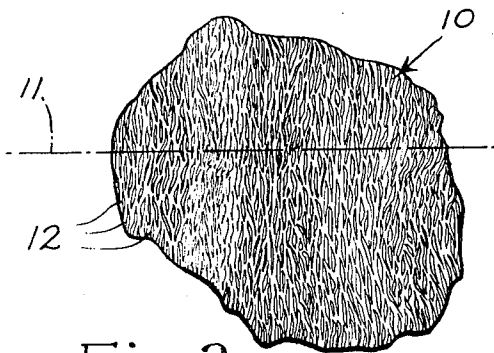


Fig. 2.

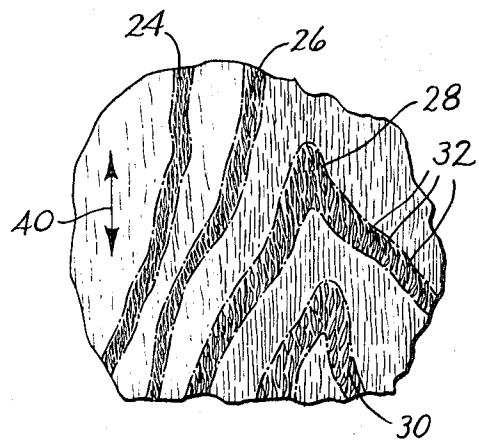


Fig. 6.

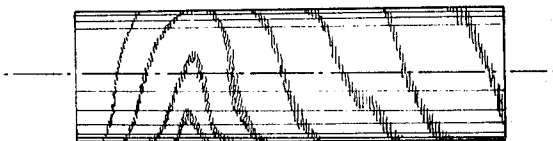


Fig. 1.

Lawrence G. Buckley

INVENTOR

BY

Kolisch & Hartwell

Attys.

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## EMBOSSED PLYWOOD PANEL SIMULATING NATURAL WOOD GRAIN LINES

Lawrence G. Buckley, Bellevue, Wash., assignor to Welsh  
Panel Company, Longview, Wash., a corporation of  
Washington

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Jan. 9, 1967. This application Aug. 21, 1967, Ser. No.  
663,926

Int. Cl. B35b 3/30

U.S. Cl. 161—123

6 Claims

### ABSTRACT OF THE DISCLOSURE

A panel with a distinctive grain pattern simulated on  
its face by indented regions of two general depths, in-  
cluding slightly indented elongated valleys extending in  
irregular courses over the panel, and significantly smaller  
elongated recesses distributed as concentrations within  
the valleys and indented inwardly on the panel from the  
floors of the valleys.

This application is a continuation of application Ser.  
No. 607,929, filed Jan. 9, 1967, entitled "Panel Product  
and Method for Making the Same"—now abandoned.

This invention relates to the surfacing of panels, and  
more particularly to a novel way of simulating grain on  
a panel surface that otherwise lacks any distinctive grain  
pattern.

An object and feature of the invention is the provision  
of a panel with a distinctive simulated grain pattern de-  
picted thereon by elongated, slightly indented valleys ex-  
tending in irregular courses over a panel face, and dis-  
tributed as concentrations within these valleys indented  
inwardly from the floors of the valleys, multiple, signifi-  
cantly smaller elongated recesses that extend (with respect  
to each other) generally in a common direction across  
the panel.

The panel described, and in a preferred and specific  
embodiment of the invention, may be coated with a pig-  
menting material, such as a stain, with such stain after  
application being wiped off with light pressure. After such  
wiping, most of the applied stain is removed from the  
raised areas on the panel face. Somewhat greater concen-  
trations of stain remain distributed over the floors of the  
valleys, between the recesses described, and the greatest  
concentrations of stain remain lodged in the recesses  
(these concentrations being relatively little affected by  
the wiping). A colored effect is produced where the elon-  
gated recesses have most pronounced coloration, a some-  
what less pronounced coloration extends along the ex-  
panses of the valleys between such recesses slightly  
accentuating the presence of the valleys and their irregular  
course over the panel, and expanses between the valleys  
having relatively little or no pronounced coloration. A  
panel so surfaced may be made to have a realistic-appear-  
ing grain, which very closely resembles the distinctive  
natural grain patterns found in such wood as walnut,  
chestnut, oak and sen.

The invention has particular utility in connection with  
the production of grain patterns of a distinctive nature on  
panels faced with wood such as lauan which by nature  
has no distinctive grain.

When viewed casually, the distinctive grain which is  
visible in a wood such as walnut comprises what appears  
to be elongated lines referred to as grain lines, that vary  
in width and follow irregular courses over the surface of  
the wood. Upon closer examination, it has been observed  
that such grain lines comprise what appear to be concen-  
trations of small, elongated relatively narrow cracks or

fissures in the cellular structure of the wood. Such fissures  
extend generally in a direction paralleling the fiber di-  
rection in the wood. The fissures may be straight, but  
ordinarily are somewhat curved and adjacent fissures are  
not exactly parallel but extend at slight angles relative  
to one another. The fissures also usually have random  
length and widths and are offset from each other, both  
longitudinally and laterally. Expanses of wood between  
such so-called grain lines while they also may have such  
fissures distributed thereover, usually appear relatively  
plain on casual viewing, because the fissures which are  
present are more widely dispersed and are not concen-  
trated sufficiently to give the impression of a distinctive  
line. With many woods, the grain lines, where they ex-  
tend in irregular courses over the surface of the wood,  
have a somewhat darker coloration than expanses of the  
wood between the grain lines, and the fissures described  
which are concentrated in the grain lines have significantly  
darker coloration than other portions of the wood. Ac-  
cording to this invention, a grain may be simulated in  
wood which otherwise has no distinctive grain possessing  
many of the characteristics above generally described in  
connection with natural grain, including the presence of  
such concentrations of fissures and the multiple colora-  
tions including darkest coloration in the areas of such  
fissures, somewhat lighter coloration in the grain lines  
between these fissures, and lightest coloration in the ex-  
panse of the wood between the grain lines.

With the invention, the coloration variation desired to  
depict the grain is relatively easily obtained by the appli-  
cation of a pigment with subsequent wiping, by reason  
of the presence of the two general depths of indented re-  
gions across the face of the panel (more specifically, the  
relatively slightly indented valleys that extend in irregu-  
lar courses over a panel face and the elongated smaller  
recesses which are distributed within the valleys and are  
indented inwardly from the floors of the valleys thus to  
have greater depth of indentation than the valleys). With  
the application of the pigment and subsequent wiping,  
and because of the different depth levels, three distinctly  
different color effects are obtained directly, with no com-  
plicated multistep process for the application of pigments  
in different concentrations required.

Various other objects and advantages of the invention  
will become apparent as the description which follows is  
read in conjunction with the accompanying drawings,  
wherein:

FIG. 1 illustrates, on a reduced scale, an embossing roll  
such as may be used in preparing panels according to the  
invention;

FIG. 2 illustrates, on a somewhat larger scale, portions  
of a surface of a cylindrical roll, as such would appear  
when laid out in a plane, the roll surface having multiple,  
relatively small, elongated ridges closely distributed there-  
over, of the type that may be used according to the in-  
vention in the embossing of elongated recessed regions  
in a panel simulating the fissures referred to above found  
in naturally grained wood;

FIG. 3 is a view similar to FIG. 1, but illustrating a  
roll after certain expanses of such ridges have been re-  
moved, to leave the closely distributed ridges in zones  
extending in irregular courses over the roll, the general  
outline of such zones being depicted by dot and dash  
lines;

FIG. 4 is a cross-sectional view, on a greatly enlarged  
scale, illustrating the ridges and adjacent surface portions  
of the roll, as they typically would appear when viewed  
along a line such as line 4—4 in FIG. 3;

FIG. 5 is a view, on approximately the scale of FIG. 4,  
taken along the line 5—5 in FIG. 4; and

FIG. 6 illustrates on approximately the scale of FIGS.

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2 and 3, portions of a panel face such as may be prepared according to the invention.

In the following description, it has been felt expedient to describe in some detail how an embossing roll might be prepared of the type that might be used to emboss a panel to produce on its face the type of pattern contemplated by the invention, since by understanding the construction of the roll, it becomes easier to understand the type of pattern produced. By describing particulars of the embossing roll, however, it is not intended to be limited to articles prepared only with such specific or similar types of rolls, or necessarily to articles prepared only by a roll embossment process generally. A roll embossment process has been found well suited for the production of the panels contemplated, and accordingly, such a procedure is considered as a preferred method of practicing the invention.

The embossing roll used in the invention may be prepared utilizing, in general terms, two distinct cutting operations. In the first cutting operation the roll is cut with narrow furrows to prepare on the surface of the roll multiple, closely distributed, relatively small, elongated ridges left between the furrows, such as those shown at 12 in roll surface 10 in FIG. 2. The ridges have their longest dimension extending circumferentially about the axis of the roll (in FIG. 2 the roll axis is shown at 11). In the second cutting operation, large expanses of the roll surfaces are cut away, to a somewhat deeper level than the level of the furrows producing the ridges. After this second cutting operation, the ridges are left distributed in elongated zones following irregular courses extending over the surface of the roll, such as the zones indicated at 14, 16 and 18 in FIG. 3.

Considering in somewhat more detail a method for preparing the ridges earlier described, a smooth surfaced cylindrical roll may be placed in operative position on a lathe, with a check or other means engaging an end of the roll which is turnable under power to rotate the roll about its longitudinal axis. A cutting tool mounted on the usual traveling carriage in the lathe is advanced along the roll surface in a direction paralleling the axis of the roll, and the roll is rotated with the tool engaging the surface thus to cut out a narrow furrow on the roll surface.

Mechanism is provided on the carriage for producing irregular lateral displacement of the cutting tool in a plane generally paralleling the axis of the roll. Such may comprise cams or other means producing lateral back and forth movement of the cutting tool simultaneously with the roll surface moving under the tool and with steady advancement of the carriage. As the result of such lateral displacement a furrow following a serpentine path on the roll surface is produced.

In a typical cutting operation, the carriage may be advanced by turning of the lead screw at a steady rate, which typically may be somewhere between 0.012 to 0.033 inch for each rotation of the roll, and for purposes of explanation it will be assumed that an advancing rate of 0.025 inch has been selected. The cam mechanism or other means on the carriage producing back and forth lateral displacement of the cutting tool is set to produce a maximum amount of displacement from a median position for the tool somewhat exceeding the distance that the carriage is advanced on each rotation of the roll, or the 0.025 inch distance above-described for illustration purposes. As a consequence, the serpentine furrows which the tool produces on the roll surface will overlap and extend across each other in certain regions of the roll surface. Further, in other regions of the roll surface islands of material will remain between furrows where no cutting has been performed, and it is these islands which constitute the small, elongated, closely distributed ridges which are shown extending over the roll surface in FIG. 2.

The cutting tool employed in producing such ridges usually has beveled side cutting edges. As a consequence,

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and referring to FIG. 4 (which is a cross-sectional view, somewhat enlarged, of a typical set of ridges), the sides of a ridge, such as ridge 12a in FIG. 4, are not parallel but incline toward each other progressing outwardly on the roll. Successive ridges will have varying widths at given points along their lengths, as can be seen by comparing ridge 12a with ridge 12b, depending upon the closeness of adjacent cuts produced by the tool. In regions where adjacent cuts converge on each other to produce overlapping, a sharpened edge, such as that shown at 12c, is formed. The furrows producing the ridges are cut to a level indicated by line X in FIG. 4.

Viewing the outer surface of the roll, the ridges, as can be seen in FIG. 12, extend generally in a common direction which is circumferentially about the roll. Successive ridges, however, have nonuniform widths and lengths and tend not to be absolutely straight. Adjacent ridges in the usual instance are not absolutely parallel but extend at slight angles with respect to each other. The appearance of the outer roll surface bears a certain resemblance to the woven fabrics known as ticking. As a consequence, the roll is described herein as being prepared with ticking extending over its outer surface.

To complete the roll for the embossing of panels as contemplated by this invention, the roll is subjected to another cutting operation wherein expanses of the roll surface, such as those shown at 20, 22 in FIG. 3, are cut away to a somewhat greater depth than the level of the furrows producing ridges 12. Remaining after the cutting operation are the elongated zones of closely distributed ridges extending in irregular courses over the surface of the roll, previously described and identified at 14, 16 and 18 in FIG. 3. The depth of cut used in cutting away expanses 20, 22 is illustrated in FIG. 4 at Y. As shown in FIG. 5, which is a view illustrating the side of a ridge adjacent where an expanse of the roll has been removed, progressing in a direction extending circumferentially about the roll, the roll surface is cut away gradually, as demonstrated by cut 20a, which terminates a ridge and cut 20b which is a cut extending down to level Y in the roll.

The cutting away of the roll expanse may be done using the method and apparatus disclosed in my prior filed copending application, Ser. No. 583,556, filed Oct. 3, 1966, now Pat. No. 3,425,303, entitled "Method and Apparatus of Producing Relief Pattern."

Describing generally how the roll surface may be cut away using the method disclosed in said application, a pattern member may be prepared in the form of a transparent pattern belt which has elongated opaque zones extending thereover in irregular courses. These zones in general correspond in their shape to the zones where it is desired to retain the ticking on roll 10. Roll 10 is mounted on a lathe-like device for rotation about its longitudinal axis, and the pattern belt is mounted on a pair of drums for movement in a pattern scanning station. The drums of this scanning station are interconnected with the means mounting the roll in the lathe-like device in such a manner that one revolution of the pattern belt takes place with one rotation of roll 10. A sensor which includes means sensitive to the passage of light through the pattern belt is advanced, simultaneously with rotation of the belt and roll, in a direction extending transversely of the pattern belt. A cutting tool and mounting in the lathe-like device is advanced along the axis of the roll 10 at the same time that the sensor is advanced. When an opaque portion of the belt passes the sensor to block the passage of light through the belt, such actuates a control circuit to produce retraction of the cutting tool away from the roll surface, to a noncutting position. On such opaque region of the pattern belt traveling beyond the sensor, whereby a transparent portion of the belt crosses the sensor, the sensor detects the passage of light through the belt and actuates the control circuit whereby the cutting tool is advanced back toward the roll to return to a cutting position. The apparatus includes means pro-

ducing a throttling effect, whereby on an opaque portion of the pattern belt first moving past the sensor the response in the cutting tool is not immediate, but the tool is moved gradually away from the roll to produce a gradual decrease in cutting. Similarly, on a transparent or light pervious portion of the pattern belt first moving into the sensor, the tool responds by not abruptly but gradually moving into the work to start cutting again. Using such a method, uncut zones on roll 10 are produced containing ticking extending in zones similar in shape to the opaque zones on the pattern belt.

FIG. 1 illustrates, in somewhat simplified form and on a reduced scale, the completed embossing roll 10.

To produce on a surface a pattern simulating the distinctive natural grain pattern of wood, the product is embossed with the roll described to impress in such product multiple, small, closely distributed, elongated recessed regions where the ridges forming the ticking on the roll are present, and shallow valleys extending in irregular courses over the surface of the product where the plane X is defined along the base of the ridges. The recessed regions are concentrated within the valleys and extend downwardly from the floors of the valleys. Margins of the valleys have sloping floors, and the elongated recessed regions decrease in depth progressing toward higher elevations of the floors.

To prepare in a panel faced with wood such as lauan, which has no distinctive natural grain, a pattern simulating the grain of such a wood as chestnut or oak, the lauan faced panel may be passed under the embossing roll with the axis of the roll disposed generally normal to the direction of the fibers in the lauan faced panel. As the roll is rotated to produce embossing of the panel, the ridges forming the ticking on the roll surface produce recessed regions in the panel extending generally in the direction of the fibers in the lauan.

As a result of the embossment process, a panel face is formed, such as that shown in FIG. 6, where the direction of the fibers in the wood extends generally in the direction of the double-ended arrow 40. Extending over the face of the panel are elongated, visually distinctive valleys of varying width and following irregular courses, the valleys being slightly indented. These valleys, for reasons of clarity, are outlined in the drawings by dot-dash lines shown at 24, 26, 28 and 30. Further accentuating these elongated valleys are the concentrations of significantly smaller, elongated, fissure-like recesses 32, distributed within the confines of the valleys. The fissure-like recesses extend generally in a common direction over the panel, which is generally in the direction of the wood fibers, and the fissures are offset laterally and longitudinally of each other. The concentrations of fissure-like recesses occupy and accentuate elongated areas of the floors of the valleys, which areas follow courses corresponding to the regular courses that the valleys follow over the face of the panel.

In finishing the panel, it is contemplated that the panel face be coated with a pigmenting medium, such as a stain. After applying the stain the panel is wiped with light pressure, to remove most of the stain from the raised surface areas of the panel between the valleys. Within the valley regions, the floors of the valleys between the recesses are covered with slightly greater concentrations of stain, making the general outlines of the valleys truly visually distinctive in the final panel. Greatest concentrations of stain remain in the elongated fissure-like recesses, rendering these recessed regions the regions having deepest coloration. The gradients of staining, comprising small regions of heavy coloration contained within elongated zones or expanses of lighter coloration, which zones or expanses are distributed over regions of significantly less or no coloration, results

automatically on wiping or removing the stain or pigmenting material from the panel by reason of the two general levels of depth provided. The final result is a panel having a natural-looking, distinctive, simulated grain extending over its face, resembling both in texture and coloration the distinctive grain present in such woods as walnut, sen, etc.

The panel may further be processed by applying a sealer or clear coating. Ordinarily when such coating is done, it is preferable not completely to fill the recessed regions of the panel face in order that the tactile quality of the panel face produced by the embossment be retained.

While a preferred embodiment of the invention has been described, as well as procedures for carrying out the invention, it is not intended by such description to be limited to all of the various specifics herein set forth as it is appreciated that variations and modifications may be made without departing from the spirit of the invention.

It is claimed and desired to secure by Letters Patent:

1. A panel product having a face lacking distinctive natural grain lines, and means depicting in at least two general depth levels distinctive grain lines extending over the face, simulating the distinctive natural grain of certain woods, said means comprising elongated, visually distinctive, slightly indented valleys of varying width and following irregular courses extending over the face of the panel, and concentrations of elongated, significantly smaller, fissure-like recesses distributed within the valleys which are indented into the panel product inwardly from the floors of the valleys, said recesses extending generally in a common direction along the panel face in closely adjacent relation and being offset laterally and longitudinally from each other, said valleys in their irregular courses extending in reaches which are substantially parallel and in reaches which are disposed at an angle relative to the common direction in which said recesses extend, such concentrations of fissure-like recesses occupying and accentuating elongated areas of the floors of the valleys which areas follow courses corresponding to the irregular courses that the valleys follow over the face of the panel.

2. The product of claim 1, wherein the floors of the valleys slope inwardly from the margins thereof, and the elongated recesses generally decrease in depth progressing toward higher elevations of the floors of the valleys.

3. The product of claim 2, wherein the elongated recesses generally decrease in depth progressing toward ends of the recesses.

4. The product of claim 2, wherein the recesses have random lengths and widths.

5. The product of claim 4, wherein adjacent recesses while extending in a generally common direction, are disposed at slight angles relative to one another.

6. The product of claim 5, wherein the product is a panel faced with wood, and the recesses approximately parallel the direction of the fibers in the wood.

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PHILIP DIER, Primary Examiner

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117—37; 144—328; 156—209, 219; 161—138, 166