

- [54] APPARATUS AND METHOD OF PATTERNING SHEET MATERIAL
- [75] Inventors: **Bernd Bayer**, Elsenfeld; **Alexander Hubert**, Owrth am Main; **Werner Riess**, Erlenbach; **Helmuth Schaefer**; **Hans Wetteroth**, both of Elsenfeld, all of Germany
- [73] Assignee: **Glanzstoff AG**, Wuppertal, Germany
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- [58] Field of Search **117/10, 64 R, 65.2; 118/44, 104, 116, 117, 206, 249**
- [56] **References Cited**
UNITED STATES PATENTS
2,093,451 9/1937 Jennett 117/10

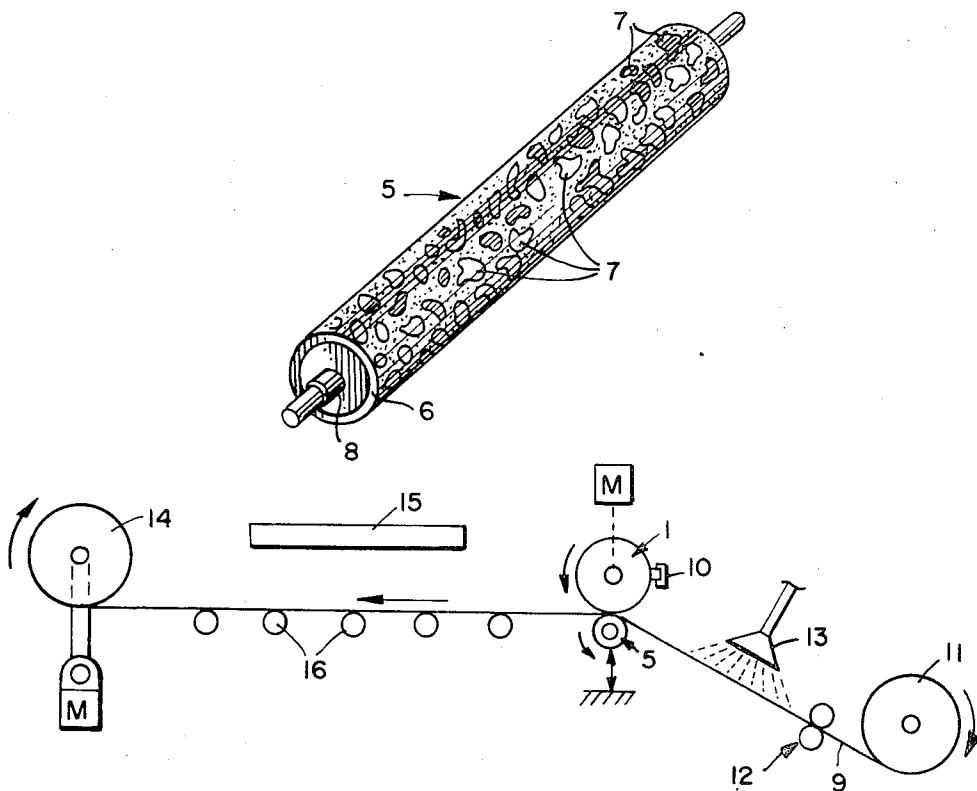
1,949,384 2/1934 Weyner 117/64 R
2,758,036 8/1956 Cyr 117/10
2,971,857 2/1961 Baxter 117/10

Primary Examiner—William D. Martin
Assistant Examiner—Theodore G. Davis
Attorney—Johnston, Root, O’Keeffe, Keil, Thompson & Shurtleff

[57] **ABSTRACT**

Apparatus for brush patterning a synthetic sheet material including a pair of parallel rollers, one of which is a buffing wheel rotated independently of means for transporting the sheet material and the other of which is a pressure roller with an outer elastomeric surface layer containing irregularly shaped indentations around its circumference and positioned at an interval from the buffing wheel roller sufficient to exert a corresponding irregular pressure on the surface being brushed. The apparatus and method further include means for applying a finish coating liquid while transporting the sheet material between the two rollers.

7 Claims, 4 Drawing Figures



APPARATUS AND METHOD OF PATTERNING SHEET MATERIAL

It has previously been found desirable to achieve cloud-like shades or patterns, sometimes referred to as a "brush patterning effect," in the finishing of a number of synthetic sheet materials, including porous or non-porous sheets or substrates having a relatively smooth surface and employed, for example, as the leg or shank materials in finished products such as shoes. Thus, various artificial leather materials are readily available in both porous and non-porous form with reference to the surface to be color finished. In the conventional finishing of the final articles, it has been quite conventional to spray on the finished coat by hand, for example onto the outer surface of an assembled shoe or boot, after which the coated finish is non-uniformly brushed off by hand. This procedure is quite expensive in terms of the time and effort required, and moreover, the achievement of a brush patterning effect by hand requires a very high degree of skill on the part of the individual finisher doing the work.

One object of the present invention is to produce this brush patterning type of effect of different shades, tints or nuances on the outer surface of artificial leather sheet materials or similar flexible synthetic sheet materials. More particularly, it is an object of the invention to produce such patterning not on the final article such as a shoe or the like, but instead on the initial sheet material before it is fabricated into the final article. Another object of the invention is to achieve this patterning effect of the sheet material as it is being wound and/or unwound from appropriate take-up or feed spools. Still another object of the invention is to provide suitable apparatus and an operating method which are easily and economically carried out so as to achieve a brush patterning effect which is commercially acceptable and substantially equivalent to that achieved by hand. Other objects and advantages of the invention will become more apparent upon consideration of the following detailed disclosure.

It has now been found, in accordance with the invention, that one can achieve a very effective device or apparatus for the brush patterning of a flexible, smooth-surfaced, synthetic sheet material by those elements which include in combination a first buffing wheel roller rotatably mounted for driven rotation and adapted to be coated on its outer peripheral surface with a buffing wax, a second pressure roller rotatably mounted on an axis parallel to the axis of said first roller and at an adjustable interval therefrom for application of pressure on a length of said sheet material passed between the rollers, said second roller having an outer elastomeric surface layer containing irregularly shaped indentations around its entire circumference, means to transport the sheet material in a path between the parallel rollers independently of said first driven roller, and means to apply a finish coating liquid onto the surface of the sheet material being brush patterned.

The apparatus and method of the invention are explained in greater detail in conjunction with the accompanying drawing in which

FIG. 1 is a perspective view with certain portions omitted of a typical buffing wheel roller used for purposes of the present invention;

FIG. 2 is another perspective view showing the combination of the buffing wheel roller and the pressure

roller of FIGS. 1 and 3 in operative contact with a sheet material being patterned;

FIG. 3 is a perspective view of a pressure roller according to the invention which is somewhat enlarged in comparison to FIG. 2 and

FIG. 4 is a schematic flow-sheet diagram of the overall apparatus according to the invention, including a preferred sequence of operations.

Referring first to FIG. 1, the buffing wheel roller 1 illustrated by way of example consists of a large number of cotton twill discs or annular sheets or layers 2 mounted on a spindle or drive shaft 3 and compressed or held together by suitable flanges 4 at either end of the cylindrically-shaped roll. The intermediate portions of the fabric discs 2 have been omitted in FIG. 1 in order to more clearly point out the fact that a layered construction is especially preferred. These discs 2 can of course consist of other equivalent materials, for example wool, linen, leather, or other similar fibrous materials.

It will be understood that this buffing wheel is a relatively conventional element commonly employed to achieve a very mild abrading or polishing action as applied to leathers or other sheet materials. The present invention does not reside in the construction of the particular buffing wheel roller but rather in the manner in which it is combined and used in the apparatus of the invention. It has been found to be most convenient to work with a buffing wheel roller in which the outer diameter is about 30 cm. while its length or effective working width is about 1 meter. In order to prevent excessive abrasion or too rapid a loss of fibers from the peripheral surface of the buffing wheel roller, it is desirable to apply a typical buffing wax onto the outer surface of the buffing roller. Such buffing waxes are quite well known and include a wide variety of organic materials, especially hydrocarbons, the substances usually being a solid at normal temperatures and providing a certain lubricating action and a means of effectively retaining the fibers on the buffing wheel without being rapidly abraded or thrown therefrom. Thus, for purposes of the invention, it is possible to apply any conventional buffing wax or lubricant, preferably by means of an oscillating and evenly pressed wax bar or rod.

In FIG. 3, one embodiment of a pressure roller 5 as an essential element of the present invention includes an outer elastomeric layer or coating of a rubbery-elastic material 6 in which there are provided irregularly-shaped indentations 7 around the entire circumference of the roller. These indentations are preferably discontinuous, at least in a circular plane or segment around the periphery of the roller, and can be easily cut into the outer surface or layer 6 of the elastomeric material, which may consist for example of natural rubber or various synthetic rubbers such as butyl rubber, Buna-S or Perbunan. At least one mounting spindle or shaft 8 is preferably provided so that the pressure roller 5 is not driven by its axial shaft but is free to rotate under the action of an applied and transported sheet material.

The surface area of each of the individual indentations as well as their total surface area naturally depends upon the specifically desired pattern and can therefore be varied within wide limits. For example, individual indentations can be varied between limits of approximately 1 to 20 cm.², and the depth of the indentations is preferably about 1 to 3 mm. These values rep-

resent an especially preferred range in each instance, and it will be understood that special circumstances may require even wider variations.

FIG. 2 illustrates in partly schematic form the cooperative arrangement of the pair of rollers, i.e., the buffing wheel roller 1 and the pressure roller 5 as they are mutually applied to the sheet material 9 being treated to achieve the desired brush patterning effect. The overall apparatus and procedure may also be reviewed in conjunction with the schematic flow diagram of FIG. 4.

The buffing wheel roller 1 is preferably continuously coated with buffing wax from the oscillating or reciprocating bar 10 pressed evenly onto the peripheral surface of the buffing wheel. By way of example, the buffing wheel roller 1 can be operated at a peripheral speed of about 75 meters/minute opposite to the direction of travel of the sheet material 9 being treated, and in general, it has been found preferable to operate buffing wheels with a variable cylindrical diameter of 15 to 30 cm. within limits of about 600 to 1,300 r.p.m. Again, this speed of the buffing wheel can also be varied within very wide limits, the optimum speeds being easily determined by a few preliminary tests. Since the individual fabric discs 2 making up the cylinder of the buffing wheel are gradually abraded over a long period of operation, they are generally replaced after they have been reduced to about 15 cm. in diameter from their original 30 cm. diameter.

The pressure roller 5 is adjustably mounted by any suitable adjustable mounting frame or guide member so as to be placed at a specific interval from the buffing wheel roller 1. In this manner, a specific pressing effect is produced on the transported sheet of material as indicated by the upward movement of the double-headed arrow on the center line of shaft 8. In other words, a pressure is exerted by the roller 5 upwardly against the underside of the sheet material 9 as the sheet material is passed between the two rollers and is pressed slightly against or in slight buffing contact with the roller 1. The most advantageous amount of pressure is easily determined by the observed action of the brushing effect.

It is especially preferred that the pressure roller 5 be adjustably arranged with its axis parallel to that of the buffing wheel roller, but in such manner that this pressure roller can rotate quite freely under the influence of the sheet material 9 being drawn thereover. Thus, the speed of rotation of the pressure roller 5 is determined by the rate at which the sheet material is drawn between the two rollers against the opposing driven rotation of the buffing wheel roller 1. Thus, roller 5 is essentially driven by the transported sheet material 9.

As shown even more schematically in FIG. 4, the sheet material 9 is first withdrawn from a feed spool 11 and drawn upwardly at an inclined angle between the buffing wheel roller 1 and the pressure roller 5. If desired, a pair of nip rollers or tensioning rollers 12 can be used to guide and/or tension the sheet material so that it is more smoothly withdrawn and fed from the feed spool 11. As the sheet material 9 is drawn up between the two rollers 1 and 5, a conventional liquid finish is applied thereto, preferably by spraying the liquid as shown at 13. Many finish coating liquids are available in this art to produce a brush patterning effect, and such finishes generally comprise a liquid solvent, a bonding agent and a dye or pigment component. The exact composition and specific materials employed in

such finish coating liquids do not constitute part of the present invention since they are quite common in this art. Adjustments can be made in their compositions in order to achieve the desired rate of application, drying and the like as is known.

As the sheet material 9 is brought between the motor-driven buffing wheel roller 1 and the pressure roller 5, it adapts itself to the elevated or depressed portions created by the indentations in the elastomeric layer of the pressure roller, so that at those points which are relatively more elevated on the coated surface, the dyed or pigmented coating is partially brushed off depending upon the degree of elevation. In other words, a more complete brushing off is achieved in the relatively more elevated proportions in comparison to the depressed portions. Moreover, the edges or borders between elevated areas and depressed areas resulting from the indentations 7 produce an intermediate effect where the finishing liquid is partially brushed off so that one area blurs into the other to achieve the desired brush patterning effect due to the resilient pressure exerted by different areas of the pressure roller. Thus, even though the indentations themselves are quite sharply defined on the surface of the roller 5, there is a complete blending or shading of each distinctly brushed area of the sheet material so that one effectively achieves a pattern of different shades or tints in a very desirable brushed effect.

The rate at which the sheet material 9 is drawn or transported over the pressure roller 5 in buffing contact with the roller 1 can likewise be varied within relatively wide limits. In general, however, it is especially preferred to transport this sheet material at a rate of 1 m/min to 10 m/min. Again, the relative speeds as between the transported sheet 9 and the roller 1 can be easily determined to achieve an optimum effect by making a few simple routine variations in such speeds while visually observing the effect being obtained. By using a variable speed motor to draw or transport the sheet material 9 onto the take-up spool 14, or other conventional means can be employed in order to transport the sheet material at a predetermined rate. As the sheet material 9 emerges from the pair of parallel rollers 1 and 5, it can be conducted through a conventional heating or drying zone beneath any suitable heater or dryer 15, e.g. an infrared heating device, an air dryer or the like. A supporting conveyor such as guide rollers 16 or similar means can be used to support the relatively flexible sheet material until it is taken up on the spool 14. When the liquid finish coat contains a very volatile solvent and is substantially self-drying, the heating zone can be eliminated and/or the drying zone can be quite short. The rate of drying also depends upon the thickness of the finished coat after it has been brushed, and it will be apparent that a substantial amount of excess liquid should be avoided in achieving a uniform brush patterning effect. In this respect, it should be noted that a "uniform" effect is desired in the sense that there is a uniform pattern caused by the irregular indentations in the pressure roller 5. It is feasible, of course, to employ a more regular pattern of indentations so as to achieve a more distinctive and regular design in the finished material. However, the brush patterning effect in which there is a seemingly random and irregular blending or shading of the finished color is much more desirable.

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The interval between the pressure roller 5 and the buffing wheel roller 1 can be gradually changed by hand as the wheel 1 is gradually worn down over a long period of treatment, or if desired, this gradual reduction of the interval can also be made automatically based upon a certain degree of operating experience. Also, either the buffing wheel 1 or the pressure roller may be spring-tensioned or spring-balanced to achieve a substantially constant interval at all times. In general, very little pressure is exerted by the buffing wheel roller 1 onto the surface of the sheet material 9 as it passes over roller 5, and especially good results are achieved if this roller 1 primarily or exclusively acts as a buffing element to brush off portions of the coated surface of the sheet material, thereby permitting the pressure roller 5 to continuously regulate the particular areas in which more or less of the freshly applied coating liquid is being removed. Thus, the patterning effect is not achieved by regulating the pressure of the buffing or brushing element, but instead is achieved by the difference in back pressure exerted by the roller 5 due to the difference in size and location of the indentations therein.

The apparatus of the invention has been applied to many different porous and non-porous synthetic sheet materials having a relatively smooth surface as distinguished from a highly textured or typical piled textile surface. The invention is particularly applicable to the finish coating or brushed coating of artificial leather materials, e.g., in which a bonded or impregnated fibrous fleece or non-woven web has been provided with a polyvinyl chloride or polyurethane surface coating so as to provide a very flexible and relatively elastic sheet material quite similar to natural leather. The thickness of the sheet material can range between about 0.5 mm to 3 mm it again being understood that such parameters may be widely varied in combination with similar variations in the buffing wheel roller and especially the pressure roller. The specific method of applying the liquid finishing coat prior to treatment with the rollers of the invention as well as other steps in the overall process may be varied and adapted to specific circumstances without departing from the spirit or scope of the invention.

The invention is hereby claimed as follows:

1. Apparatus for the brush patterning of a flexible, smooth-surfaced, synthetic sheet material which comprises:

- a buffing wheel roller as a first roller rotatably mounted for driven rotation in brushing contact with said sheet material and adapted to be coated on its outer peripheral surface with a buffing wax;
- a pressure roller as a second roller freely rotatably mounted on an axis parallel to the axis of said first roller and at an adjustable interval therefrom for

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application of back pressure by said second roller against one side of said sheet material passed between the rollers, said second roller having an outer elastomeric surface layer containing irregularly shaped indentations around its entire circumference, whereby said sheet material adapts itself to the elevated and depressed portions created by the indentations such that those points which are relatively more elevated on the surface of the sheet material being coated with a finishing liquid are more completely brushed off by contact with said first roller;

means to transport the sheet material in a path between the parallel rollers independently of both said buffing wheel roller and said pressure roller; and

means to apply a finish coating liquid onto the surface of the sheet material coming into contact with said buffing wheel roller.

2. Apparatus as claimed in claim 1 wherein said buffing wheel roller is composed of a large number of soft, abradable fibrous discs mounted together in compressed cylindrical shape on a common spindle and wherein the outer layer of said pressure roller consists essentially of a natural or synthetic rubber.

3. Apparatus as claimed in claim 1 including means to apply a buffing wax onto said buffing wheel roller.

4. Apparatus as claimed in claim 1 including means to dry the finish coated and brushed surface of the sheet material after it has passed between said rollers.

5. Apparatus as claimed in claim 1 including means to spray said finish coating liquid onto the surface of the sheet material as it is being transported between said rollers.

6. A method of brush patterning a flexible, smooth-surfaced, synthetic sheet material which comprises first applying a liquid finishing coat onto the surface of said sheet material to be brush patterned and then transporting the liquid coated sheet material over a freely rotatable pressure roller for contact with an elastomeric circumferential surface layer of said roller containing irregularly-shaped indentations in order to exert a correspondingly irregular pressure against the sheet material, applying a buffing wheel roller to the opposite side of said sheet material in axially parallel relation to said pressure roller with the outer circumferential surface of said buffing roller being rotated in a direction opposite to the direction of travel of the transported sheet material, thereby irregularly brushing off the applied liquid finishing coat as between elevated and depressed portions irregularly imparted by the pressure roller to said sheet material.

7. A method as claimed in claim 6 wherein said sheet material is an artificial leather.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 3,769,058

DATED : October 30, 1973

INVENTOR(S) : Bernd Bayer et al

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In Column 1, Line 32, delete "of" and substitute --on--

Signed and Sealed this

Twenty-eighth Day of September 1976

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks