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G. HOUSEHOLDER ET AL

2,139,269

DECORATIVE PAPER AND METHOD OF MAKING THE SAME

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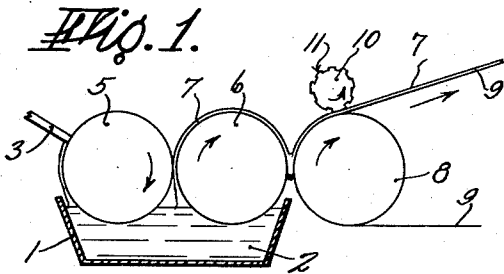


Fig. 3.

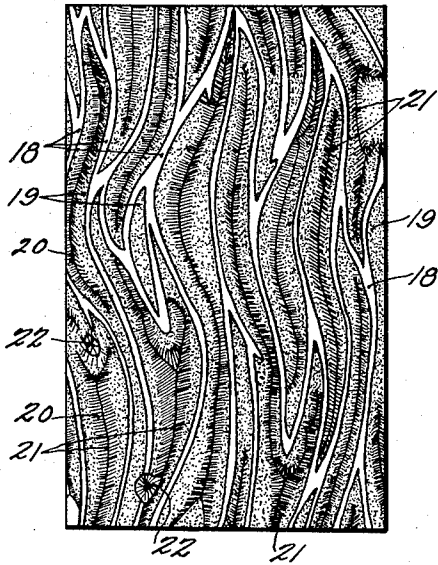


Fig. 2.

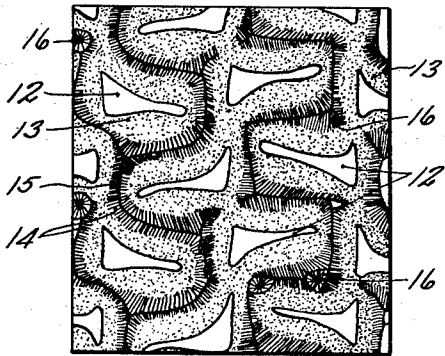


Fig. 4.

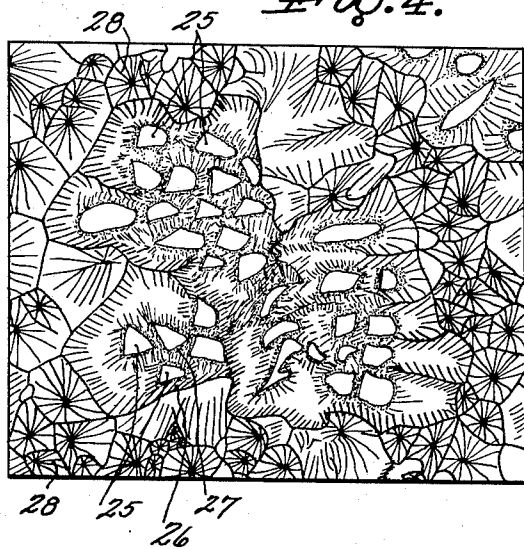


Fig. 5.

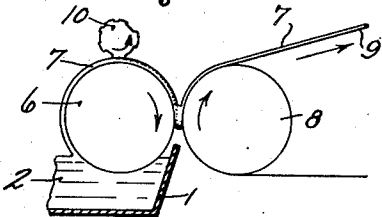


Fig. 6.

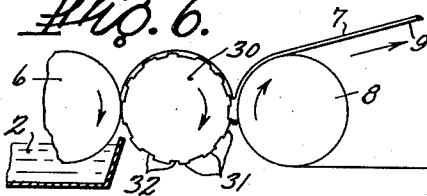
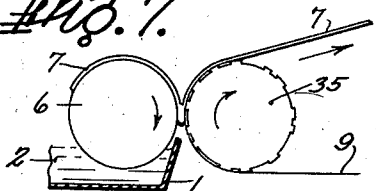


Fig. 7.



INVENTOR
GARRISON HOUSEHOLDER AND
BY WALTER V. SHEARER
Chapin + Neal
ATTORNEYS

UNITED STATES PATENT OFFICE

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DECORATIVE PAPER AND METHOD OF MAKING THE SAME

Garrison Householder, South Hadley, and Walter V. Shearer, Springfield, Mass., assignors to The Beveridge-Marvellum Company, Holyoke, Mass., a corporation of Massachusetts

Application May 13, 1935, Serial No. 21,138

6 Claims. (Cl. 91—67.9)

Our invention relates to the decoration of paper and the like and more particularly to the decoration of paper by means of a crystallizable material in a lacquer containing a volatile solvent of the crystallizable material. When such coatings are applied to a paper sheet and the solvent permitted to evaporate the result is an irregular but definitely defined crystalline pattern having a smooth velvety sheen.

It is the object of our invention to provide a paper having the light and shadow characteristics afforded by these crystal-lacquer coatings but in which relatively definite and predetermined patterns are produced and repeated over the surface of the paper upon the evaporation of the solvent material. A further object is to provide a method of and means for producing such a decorated paper.

In the accompanying drawing which illustrates one manner of carrying out the method and examples of the product,

Fig. 1 is a diagrammatic view of a device for carrying out the method;

Figs. 2, 3 and 4 are diagrammatic views illustrating certain characteristics of the decorative surface obtained;

Fig. 5 is a fragmentary view, similar to Fig. 1 but showing a different arrangement by which modified results may be obtained; and

Figs. 6 and 7 show two other modified arrangements.

We have found that by applying pressure to the crystallizing coating solution after its transfer to the paper but before any substantial crystallization has taken place (or prior to its transfer to the paper) a predictable change in the subsequent crystal formation takes place, or the formation of crystals may be more or less completely inhibited. We believe this is mainly due to resulting changes in the thickness of the coating of the lacquer carrier. We do not intend however to broadly limit ourselves to this theory.

Referring to the drawing, Fig. 1 shows diagrammatically, a suitable form of coating apparatus in which 1 designates a reservoir containing a body of coating material 2. This material may consist of a crystallizable material such as phthalic anhydride, a volatile solvent mixture composed of butyl acetate, ethyl acetate, ethyl alcohol, methyl alcohol, and toluol, carried in a pyroxylin lacquer. There are other well known forms of crystallizing lacquers and our invention is not limited to the specific type of lacquer employed. Two rolls 5 and 6 adjustable toward

and from each other are mounted to dip into the body of coating material and these rolls are rotated by variable speed drive means (not shown) in the direction of the arrows. A doctor 3 removes all material from roll 5 and this roll in turn removes a portion of the coating material carried up by roll 6 so that by properly adjusting the spacing of rolls 5 and 6, a coating 7 of desired thickness is obtained. A roll 8, about which the web 9 to be coated passes in the direction of the arrow, is adjustably mounted adjacent the downwardly traveling side of roll 6 and by suitably adjusting the spacing of rolls 6 and 8 the coating carried by roll 6 is transferred to the surface of the web 9 as it passes around roll 8. The structure so far described follows a standard coating practice in use for the commercial production of coated papers.

In carrying out our method we provide a roll 10 riding freely as shown in Fig. 1, on the coated web as it is carried by roll 8. Roll 10 is provided with raised areas indicated at 11, which press upon and thin the areas of the coating with which they come in contact. These areas may be isolated to leave intervening areas uncompressed or they may form a complete pattern over the entire surface of the roll. The pressure applying areas on roll 10 may be of equal height or the heights may vary to vary the pressure applied to the coating.

The coated web with its coating 7 as manipulated by roll 10 passes on from roll 8 and as the solvent evaporates crystallization takes place in accordance with the conditions imposed by the manipulation of the coating by roll 10.

It will be understood that our invention is not limited to the specific coating device shown and that the coating may be initially applied to the paper by any other suitable means such as spreading with a knife, or carrying the web into contact with a liquid bath, or by any other well known coating methods.

Figs. 2, 3 and 4 show diagrammatically three types of results obtainable.

Fig. 2 shows a substantially complete modulation of the normal crystalline pattern. In this figure areas 12 have been thinned to the point at which crystallization is substantially inhibited and no crystalline structure appears, in adjacent areas 13 a very fine, almost granular crystallization appears, at other portions as at 14 a feathery or needle-like crystal structure takes form and meets to form definite boundaries 15 whose position is in general, but indirectly, determined by the surface structure or pattern of roll 10 since

these boundary lines appear on areas which have been pressed very lightly or not at all by the roll but which are of insufficient extent for a second system of crystals to form. At occasional points and haphazardly, and over very restricted areas, small normal crystals may form as indicated at 16.

Fig. 3 shows a quite different arrangement of substantially the same types of predetermined crystalline structures. In this case crystalline structure has been inhibited along narrow bands 18 adjacent these areas the fine granular structure appears at 19 changing into zones of feathery structure at 20 which meet to define boundary lines as at 21. At free ends of the bands 18 or at juncture points of such bands, or where a break appears in the bands, a normal crystal tends to form as indicated at 22.

Fig. 4 illustrates the result of treating separated areas of the coating. In this case crystallization is inhibited at a group of points 25 so arranged that granular structure 26 and feathery structures 27 form to produce a suggestion of a cluster of pine cones. Along the edges of the treated area the feathery structure is free to extend until a second system of crystallization starts and the coating being unmanipulated at the intermediate areas a normal crystal form appears to fill the untreated areas as indicated at 28.

Subsequent treatment of the paper may follow the usual practice with respect to this class of papers.

It will be understood that Figs. 2, 3 and 4 are diagrammatic and that such terms as "granular" and "feathery" are only generally descriptive of the various crystalline formations which are quite variable and grade from one appearance to the other in the several areas. No attempt has been made to indicate the sheen and varying light reflecting qualities which the various areas possess.

In Fig. 5 the pressing roll 10 is shown in position to manipulate the coating on the applying roll 6. In this case the effects of the roll 10 are modified by the transfer of the manipulated coating to the paper. As a result, a substantial part of the design is made up of areas or masses of miniature "normal" crystals such as are indicated at 16 in Figs. 2, 3 and 4, and which follow a definable pattern, and at other points the design is formed of nearly normal crystals but with boundaries following a general design form.

A different arrangement is shown in Fig. 6 in which the roll 30 which corresponds to roll 6 in Fig. 1 and takes the coating from roll 5 is provided on its surface with raised portions 31, and depressions 32, which may be of varying heights and depths. In this form the coating is applied to the paper in varying thicknesses, the principle of modification of the crystallizing action being the same as previously described. In Fig. 7 the relief or intaglio pattern is formed on a roll 35, which supports the paper and corresponds to roll 8 of Fig. 1. The result here as in the previously described forms is to vary the thickness of the coating with the effect that the crystal formation is modified in a predetermined manner.

It should be emphasized that in each case the decorative characteristics are formed by crystallization and that the roll 10 does not act in the manner of a printing roll or an embossing roll to apply or emboss a design on a paper web or plastic coating. The resulting decorative

pattern is by no means merely a reproduction of the design carried by roll 10 but the latter acts to impose limitations on or to "condition" the subsequent crystallization which will subsequently take place upon evaporation of the solvent, and the crystals that form present substantial individual variations within the limits imposed. Stated in another way, the crystalline structures have been directed and guided into an ordered array to produce a desired and predetermined effect. In the above specification we have indicated several ways in which this can be done but obviously the ordering of the pattern arrangement may be brought about by changing the crystallizing conditions over predetermined areas in other ways as by the application of heat, or by chemical acceleration or retardation of the crystal formation at predetermined points or areas or by treating the paper so that it takes up varying amounts of coating.

We claim:

1. The method of decorating paper which comprises coating the paper with various thicknesses of a solution containing a crystallizable material in solution in a volatile solvent, said variations in thickness extending over areas of different shape and extent to form a predetermined pattern, and then evaporating the solvent to cause crystallization of the crystallizable material whereby predetermined areas of differing crystalline characteristics are produced dependent upon the difference in the coating thickness.

2. The method of decorating paper which comprises applying to the paper a coating solution containing a crystallizable material in solution in a volatile solvent, applying pressure over predetermined areas of the coated surface prior to any substantial evaporation of the solvent to decrease the thickness of the coating over said areas and thereby change the conditions of crystal formation throughout said areas and then evaporating the solvent to cause crystallization of the crystallizable material.

3. The method of decorating paper which comprises forming a coating of a solution containing a crystallizable material in solution in a volatile solvent, changing the thickness of the coating over predetermined areas to thereby change the condition of crystal formation throughout said areas in degrees dependent on the change in thickness of the coating, transferring the coating to the surface of the paper, and then evaporating the solvent to cause crystallization of the crystallizable material.

4. A decorative paper, the decorative surface of which comprises a continuous coating formed of contrasting areas of crystalline structure, the various areas differing throughout in the character of their crystal structure, the areas being arranged in a predetermined relation to each other to present a predetermined design pattern distinct from the haphazard crystalline patterns of the individual areas.

5. The method of decorating paper which comprises coating the paper with a solution containing a crystallizable material in solution in a volatile solvent, the thickness of said coating being varied over areas of predetermined shape and extent to produce throughout said areas crystalline structures characteristic to said areas and dependent upon the thickness of the coating covering said areas for their difference in character.

6. The method of decorating paper which com-

prises applying to the paper a coating of a solution containing a crystallizable material in solution in a volatile solvent, said coating being of a thickness to effect a predetermined normal crystallization of the crystallizable material upon evaporation of the solvent, changing the thickness of the coating over predetermined areas before appreciable crystal formation starts to there-

by change the condition of crystal formation throughout said areas in degrees dependent on the change in thickness of the coating, and then evaporating the solvent to cause crystallization of the crystallizable material.

GARRISON HOUSEHOLDER.
WALTER V. SHEARER.