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3,684,641

LAMINATED PRODUCT BONDED WITH COLORED ADHESIVE

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FIG. 1

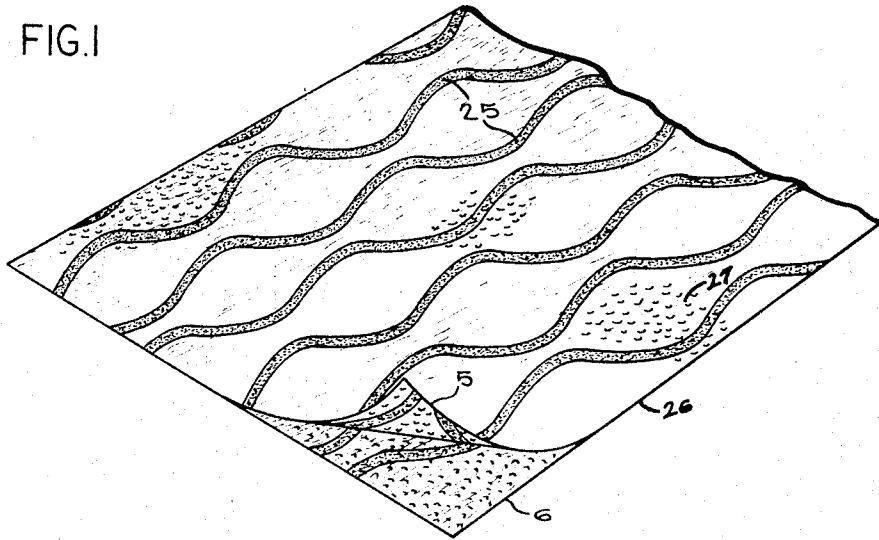


FIG. 2

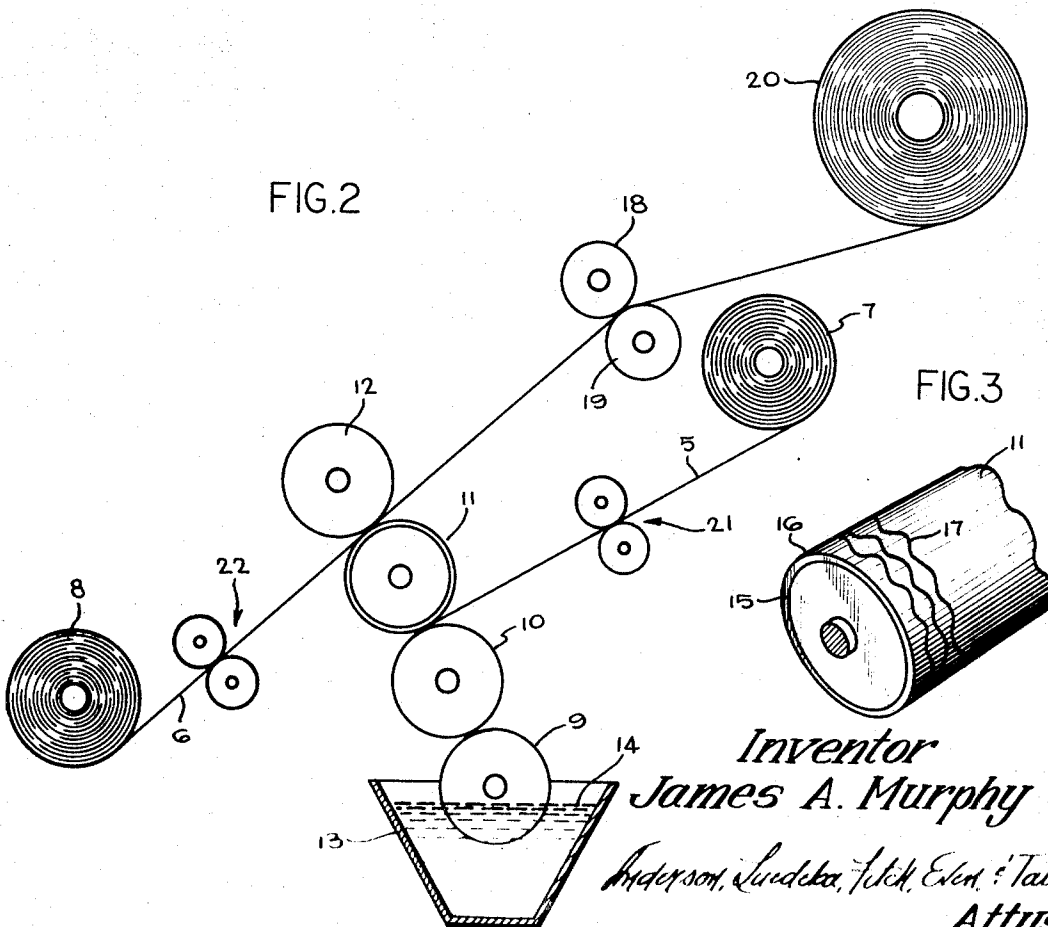
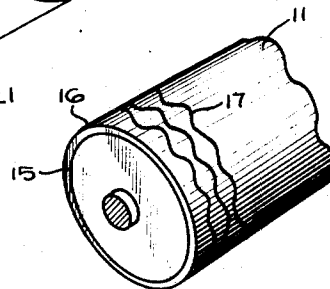


FIG. 3



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LAMINATED PRODUCT BONDED WITH COLORED ADHESIVE

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9 Claims

ABSTRACT OF THE DISCLOSURE

A multi-ply creped tissue paper containing printing between the plies of tissue to create a pattern of muted and aesthetically pleasing coloration visible on the exterior surface of the plies and the method of making the product which involves the use of water based adhesives as the printing media.

This invention relates generally to an improved printed product and more particularly to a printed creped cellulosic tissue as well as the method of making the same.

It is desirable to apply decorative designs to creped tissue products such as facial tissue, bathroom tissue, household towels and like products which include as an element creped cellulosic tissue. There is a substantial demand for such products having printed designs but the acceptance of such products has not reached its full potential because they have been printed with normal printing techniques.

Products of the type herein referred to are made of relatively thin, lightweight webs having a basis weight of less than about 15 pounds (weight per ream of 2880 sq. ft.). The tissue is creped, usually having a crepe ratio of about 1.5 or less (unit length of tissue before creping divided by unit length of tissue after creping). To be effective in absorbing liquids they must have a relatively porous structure and accordingly such webs have a relatively high void volume.

When conventional printing techniques are employed on webs of this character the printed surface results in many cases in a harsh hand to the product and even though the inks are specially formulated to provide a soft printed surface, the consumer believes that because of the presence of the coloring matter that the surface is harsh.

To avoid this difficulty and to overcome the fear on behalf of some consumers that the printed surfaces are unsanitary or undesirable, manufacturers have provided multi-ply tissue products, one of the plies being printed and the other of which is unprinted. The unprinted surface, the surface which is placed in contact with the skin, thus remains soft and appears sanitary. However, such a multi-ply product does not result in attaining the full potential of two printed surfaces.

Accordingly, it is the principal object of this invention to provide an improved printed product of the class described and the method of making the same. A more specific object of the invention is the provision of a method of printing on webs of the class described which will provide a pattern of muted, aesthetically pleasing appearance, the surfaces of the resulting product having substantially the same hand as the web from which it was made and which conveys the appearance of a soft, sanitary product. Other objects and advantages of the invention will become apparent from the following description of the invention, including the drawings in which:

FIG. 1 is a representation of the printed product of this invention and depicting one corner of the top ply turned back to more fully expose the adhesive between the plies;

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FIG. 2 is a representation of apparatus for manufacture of the product of this invention; and

FIG. 3 is a fragmentary view of a plate roll for use in the apparatus of FIG. 2.

In general, the product is fabricated from creped cellulosic tissue having a basis weight of less than about 15 pounds and preferably in the range of from about 4 to 12 pounds and having a crepe ratio of less than about 1.5. In carrying out the process two such webs are employed. The printing media employed has a water base vehicle whose viscosity is adjusted through the use of adhesives to between 600 and 50,000 centipoises. The vehicle containing the coloring agent is then applied using ordinary printing techniques to one surface of one of the webs. Thereafter, before the vehicle has dried, the second web is overlaid on the printed surface and the two webs with the colored vehicle therebetween are pressed together to cause the vehicle with the contained coloring agent to wick into the opposed webs whereupon the coloring matter becomes visible on both sides of the web. The amount of the printing media and the pressure between the webs is so controlled that substantially all of the coloring agent lies beneath both surfaces of the printed areas so that the original hand of the product is substantially retained. The colored design thus established in the fibers and visible on the outer surface of the product is muted due to the diffusion through the cellulosic fibers and by the presence of uncolored fibers on the exterior surfaces of the sheets. Moreover, the presence of the adhesive prevents the sheets from shifting relative to one another so that during winding and other processing the sheets are bonded into a unitary structure thereby preventing the shifting of the printed pattern out of register which would result in an unsightly product.

When printed matter is applied in the manner above described, the coloring material which is embedded in and between the layers of the sheets is not subject to flaking or abrasion when the surface is rubbed thereby preventing particles of the coloring material becoming disengaged from the fibers when the product is used.

The adhesive employed may be any one of the water dispersible adhesives which are ordinarily employed in the paper field; however, because of the nature of the products e.g. facial tissue, bathroom tissue, etc., the adhesives should be nonallergenic and be approved for use in such products. One preferred adhesive which has been employed is polyvinyl alcohol. A particular formulation which has been employed is formulated by mixing together five parts of water dispersable polyvinyl alcohol sold under the trade name COVOL 9870 (Corn Products Co., New York, N.Y.) with 80 parts by weight of water together with 1 part by weight of a wetting agent such as Triton X-100 (Rohm & Haas Co., Philadelphia, Pa.) and 0.1 part by weight of an antifoaming agent such as that sold under the trade name of Antifoam B (Rohm & Haas Co.). The wetting agent and the antifoaming agents are optional but in the mixture the wetting agent tends to make the adhesive more water permeable in the final product and the antifoaming agent tends to reduce foaming and thereby decreases the tendency of the adhesive to change its viscosity because of air entrapped in the mixture. To the polyvinyl alcohol solution there is added an amount of coloring agent to obtain the desired color in the final product. The coloring agent may be of any of the well-known liquid dyes or inks such as one of the series "710" inks sold commercially by Inmont Corporation, Clifton, N.J. Pigment type dyes particularly those which are partly soluble in water may also be employed either alone or in combination with liquid dyes or inks. The shade of the color developed by the adhesive formulation printing media as outlined above may be obtained by alter-

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ing the relative quantity of coloring agent in the solution. We have found that ordinarily 2 to 10% by volume of a liquid coloring agent provides the desired color.

The viscosity of the formulation described above is about 1,000 to 1,500 centipoises and this value may be increased or decreased within the limits outlined above, i.e. 600 to 50,000 centipoises by increasing or decreasing the amount of adhesive.

In applying the colored media one of the webs is printed in the normal manner employing a normal blanket roll or offset roll.

It is important that the spacing between the applicator roll e.g. the blanket roll or offset roll is adjusted to provide a nip spacing which is approximately that of the thickness of the printing media coating on the printing roll. By this means the printing media is transferred in a controlled quantity to the web and due to the surface tension and viscosity of the printing media as well as the absence of any substantial pressure applied in the nip, the printing media will lie substantially on the surface of the web and will not spread appreciably outside the limits of the printed pattern. Immediately thereafter the second web is laid upon the printed surface of the first web and the two webs are passed through a nip so as to force the printing media into the fibrous structure of each web. The nip by which the lamination is applied preferably should not exert a substantial pressure on the webs but instead should only be sufficient to press the webs together to cause the printing media to partially wick through the sheets. Thereafter, the laminated product may be slit into widths, perforated, wound on cores to make tissue rolls or interfolded or otherwise sheeted to make facial tissue or flat towel products.

When the foregoing method is employed the body of the colored printing media remains substantially hidden from view and all that is seen is the muted colored design which becomes visible on the exterior surface of the laminated product. The adhesive, upon setting up, bonds the two sheets together and thereafter the sheets will not shift relative to one another thereby maintaining the printing in register.

It has been found that although the surface of the sheet remain soft the sheet may be stiffened somewhat unless the printing media is applied in lines or patterns less than about 0.125 inch wide. These lines may be closely spaced together however there should be a definite break between them. Dot patterns of printing also may be employed.

As shown in FIG. 1, the colored printing media may be printed onto one side of one of the web plies in accordance with a pattern of wavy lines 25, for example, extending in the machine direction of the laminated product 26 and the two webs subsequently pressed together in the manner noted above.

Referring now to FIG. 2, in the manufacture of the disclosed product, a first cellulosic web 5 is fed forwardly from a supply roll 7 to the nip between a transfer roll 10 and a plate roll 11. The transfer roll 10 is in rolling contact with a meter roll 9 having a portion thereof immersed beneath the surface of a colored liquid printing media 14 contained in a tank 13. As the meter roll 9 is rotated, it picks up printing media from tank 13 and transfers it to the transfer roll 10 in the form of a uniform surface coating on the transfer roll. This transfer roll conveniently may be a cylindrical steel roll having its outer surface etched with a multiplicity of depressions into which the printing media is deposited from meter roll 9 at the nip between rolls 9 and 10. The quantity of printing media deposited on roll 10 may be selected by adjusting the nip spacing between rolls 9 and 10.

The plate roll 11 is depicted in detail in FIG. 3 where it will be noted that this roll preferably comprises a hard surface steel roll 15 clothed with a rubber mat 16 having a series of circumferential projections 17 defining the desired design to be imparted to the fabric product. Em-

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ploying the depicted plate roll in the apparatus shown in FIG. 3, web 5 may be passed through the nip between the transfer roll 10 and the plate roll 11. The circumferential projections 17 on the plate roll force the web into contact with the transfer roll only in those areas corresponding to the circumferential projections. Printing media is thus transferred from the roll 10 to the web 5 in accordance with a pattern corresponding to the pattern defined by the circumferential projections 17 on the plate roll. Other portions of the web 5 remain free of printing media. The web 5 bearing printing media is trained part way around the plate roll. A second web 6 is overlaid on the printing media-bearing web 5 and the two webs are passed simultaneously through the nip between plate roll 11 and a smooth surface impression roll 12. As the two webs, with the colored printing media therebetween, pass between rolls 11 and 12, the circumferential projections 17 of the plate roll force the webs together to create a bond only in those regions which bear printing media. The laminated printed product is collected as in the form of a roll 20.

Alternatively, one or both of the webs 5 and 6 may be fed through a set of embossing rolls 21 or 22, respectively, or the laminated product may be embossed as by embossing rolls 18, 19. Such embossing may enhance the appearance of the product or otherwise impart desirable properties to the product as is known in the art. Such embossing is indicated by the numeral 27 in FIG. 1.

Employing the method described above, a creped tissue web having a basis weight of 13 pounds per ream, a crepe ratio of 1.3 and a nominal thickness of 0.004 inch was fed through the nip between a transfer roll and a plate roll having a pattern of projections as depicted in FIG. 3. The transfer roll carried a coating of printing media which was metered thereon by a meter roll having a portion of its circumference disposed beneath the surface of a quantity of printing media contained in a tank adjacent the meter roll.

The printing media formulation employed included:

Parts by volume	
Polyvinyl alcohol (10% solids) -----	5
Water -----	80
Triton X-100 -----	1
Antifoam B -----	0.1
Inmont 710 printing ink -----	4.3

The viscosity of this formulation was 1,200 centipoises as measured with a Brookfield Viscometer, using a #3 spindle at 20 r.p.m. and 25° C.

The nip spacing between the transfer roll and plate roll was 0.006 inch so that as the web passed through this nip, the patterned projections on the plate roll gently forced portions of the web into contact with the printing media to transfer a quantity thereof to the web in a pattern substantially identical to the pattern on the plate roll.

This first web, bearing the pattern of colored printing media was trained part way around the plate roll and fed simultaneously with a second cellulosic web of the same kind as the first web through the nip between the plate roll and a smooth-surfaced impression roll. The nip spacing between these latter two rolls was 0.008 inch thereby insuring sufficient pressing of the webs together as caused a transfer of colored printing media to the second web and limited intrusion of the printing media into the fibers of the webs. The adhesive matter in the printing media, upon curing, created a bond between the webs such that substantially no deregistration of the overlaid webs took place.

In this example, the lines of the printing pattern were each 0.125 inch wide and the total printed area covered about 3% of the surface area of the multi-ply product. The printing media remained substantially between the webs of the product and established an aesthetically-pleasing muted colored design which was visible on the exterior

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surfaces of the product, giving it a sanitary appearance.

The hand of the product was soft and the product exhibited no undesirable stiffness.

The multi-ply sheet product was folded, severed into units of selected length and packaged. The colored printing media, being disposed interiorly between the web plies

While a preferred embodiment has been shown and described, it will be understood that there is no intent to limit the disclosure, but rather, it is intended to cover all modifications and alternate constructions falling within the spirit and scope of the invention as defined in the appended claims. For example, the quantity of coloring matter may be adjusted to alter the degree of coloring desired such as by employing less coloring matter when using lighter colored webs. Moreover, the webs may be overlaid with reinforcement, such as a scrim, disposed between the plies or bonded to one or both of the exterior surfaces of the product.

What is claimed is:

1. A multi-layered sheet product comprising at least two superposed cellulosic web plies each having a basis weight between about 3 and 15 pounds per ream, and a water-based printing media, including an adhesive component and a coloring component, disposed between said webs in accordance with a pattern and bonding said plies against deregistration, said colored printing media intruding into said superposed webs and being applied in such manner and amount that substantially all of the colored printing media lies beneath both the external surfaces of the web plies and is limitedly visible when viewed from the exterior of said product whereby said colored printing media creates a pattern of muted coloration visible on the exterior surface of at least one of said plies.

2. The multi-layered product of claim 1 wherein each of said cellulosic webs comprises creped tissue having a crepe ratio less than about 1.5.

3. The multi-layered product of claim 1 wherein said colored printing media is disposed in a pattern of lines

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not wider than about 0.125 inch arranged in an aesthetically pleasing design visible on at least one of the exterior surfaces of one of the plies of said product.

4. The multi-layered product of claim 3 wherein said lines occupy less than about 10% of the total surface of said laminated product and are disposed in spaced-apart relation from another.

5. The multi-layered product of claim 1 wherein said adhesive component comprises polyvinyl alcohol.

6. The multi-layered product of claim 1 wherein said coloring component of said printing media comprises a liquid dye.

7. The multi-layered product of claim 1 wherein said coloring component of said printing media comprises a colored pigment.

8. The multi-layered product of claim 1 wherein said coloring component is present in said printing media in an amount equal to between about 2% and 10% of the total volume of said printing media.

9. The multi-layered product of claim 1 wherein the viscosity of said printing media is between about 600 and about 50,000 centipoises.

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J. J. BELL, Assistant Examiner

U.S. Cl. X.R.

156—277, 291, 295; 161—138, 146, 148, 156

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,684,641 Dated August 15, 1972

Inventor(s) James A. Murphy

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

Column 1, line 59, delete "and the method of making the same";

Column 1, line 61, delete "method of" and insert therefor
-- product developed by --;

Column 2, line 69, delete "soluable" and insert --soluble--
therefor;

Column 3, line 12, delete "applicator" and insert --printing--
therefor;

Column 3, line 13, following "roll" (first occurrence), insert
a comma;

Column 3, line 13, following "roll" (third occurrence), insert
--, and its transfer roll--;

Column 3, line 15, following "the" (first occurrence), insert
--web being printed plus the thickness of the --;

Column 3, line 43, delete "remain" and insert -- remains --
therefor;

Column 4, line 2, delete "FIG. 3" and insert --FIG. 2-- therefor;

Column 6, line 5, following "surface" insert --area--.

Signed and sealed this 30th day of January 1973.

(SEAL)

Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents