

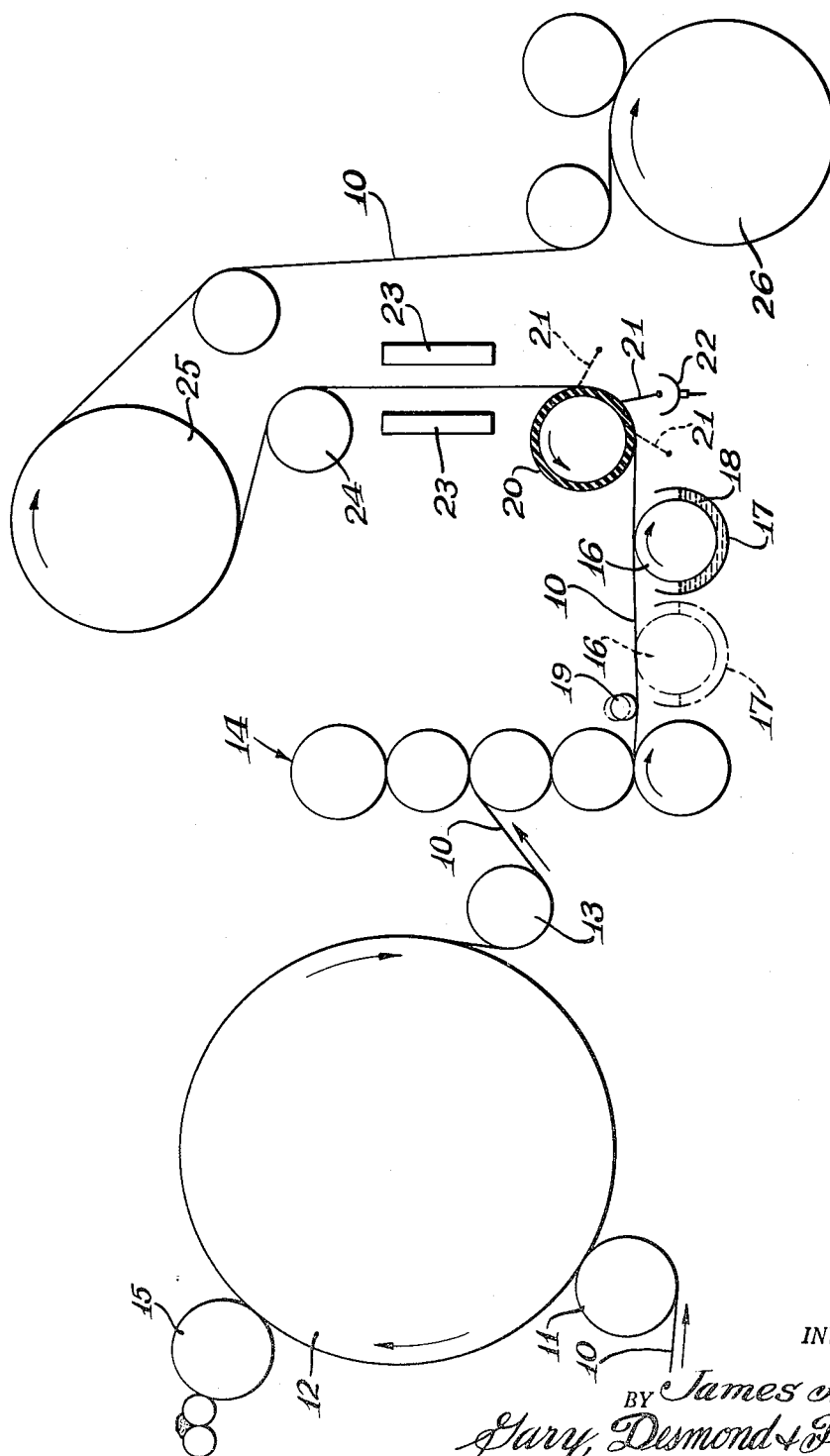
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PRODUCTION OF COATED SHEET MATERIAL

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PRODUCTION OF COATED SHEET MATERIAL

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This invention relates to the production of sheet material of novel character.

More particularly, the present invention relates to the coating of a paper of particular character, with an opacifying coating composition adapted to provide a surface of enhanced printability, the whole after being waxed being eminently suitable for and particularly adapted for use as wrapping material for bread, cake, and the like. The printed and waxed paper of the present invention is particularly characterized by its high gloss, sheen or brightness, striking legibility, enhanced esthetic effect, and softness.

Opaque, printed, waxed wrapping papers of various character are known and employed for the indicated purpose. Those heretofore known and employed have, however, left much to be desired in brightness, legibility, and over-all eye or consumer appeal, primarily due to the nature of the paper base and the character of the coated or uncoated surface thereof to which the printing was of necessity applied and subsequently waxed.

The production of the novel, opaque, printed, waxed wrapping papers having the aforementioned superior properties is characterized by employment of a specific paper base having a characterizing formation and surface structure, and the application thereto of a particular opacifying coating composition to result in a combination highly susceptible to fine, sharp, and clear-color printing due to its extremely level and bright surface character. The nature of this surface is such that after printing and waxing, the wax complements it to further enhance its brilliance and clearness.

The invention is further characterized by the ability to opacify the paper base and to provide an improved printing surface in one step by means of a single coating composition; the ability to carry out the operation at high speeds, such as paper-making speeds so that the coating may be a continuous step in the paper-making process if desired; the elimination of the necessity for super-calendering; the manner and means for applying the coating; and other advantages and economies as will hereinafter appear from a consideration of the following specification and accompanying diagrammatic drawing.

The paper base employed in the practice of the present invention is characterized by what is known as a "machine glazed" surface and is of a thin or tissue-like, translucent character, characteristic of papers produced on a so-called "Yankee" paper machine. Such machines have a dryer in the form of a steam-heated drum about 12 feet in diameter having a highly polished surface. A paper web, after formation on a Fourdrinier wire, is transferred in wet, approximately 70% moisture content condition, by means of a pair of felts and a couch roll to the indicated drying drum, embraced about a major portion of its

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peripheral surface, and then stripped therefrom in a dry or substantially dry condition, i. e., from about 5% to about 15% final moisture content. If desired, the wet web from the Fourdrinier wire may be predried to a moisture content of not less than about 50% before being brought into contact with the indicated large diameter polished drying drum, when it is desired to produce paper at speeds greater than about 500 feet per minute.

The surface of the wet web which is brought into intimate contact with the highly finished and heated drum surface takes on a glazed or "ironed" appearance due to hot pressing of the wet web against the polished drum surface. Although this web is of a generally porous nature due to the character of drying essentially against a single surface, the fibers at the glazed web surface become smoothed or laid down to substantial parallelism with the web surface. The outer or opposed surface of the web may be partially smoothed down during the drying operation by means of rolls acting against the drum, and/or by means of a calender after being stripped from the drum.

In production of paper of this character and by the indicated means it is not desirable or economical to add all of the mineral fillers or pigments necessary for opacification to the paper stock, and therefore the resultant sheet is translucent. If opaque paper is desired, such translucent material must subsequently be coated. This can be done on the Yankee dryer by applying an opacifying coating composition to the outer face of the web as it passes over the dryer as shown, for example, in the Thiel and Richmond Patent 2,216,143 or Adrian Patent 2,313,497. The result is an opaque sheet having one coated surface and one uncoated "machine glazed" surface. Such paper has been conventionally employed for bread and the like wrapping paper by printing on the glazed surface, followed by waxing both faces. The glazed surface, per se, is not, however, very receptive to fine, sharp printing and the overcoat of wax results in a reduction of brightness, leaving much to be desired.

In accordance with the present invention, this "machine glazed" surface is coated with a mineral pigment opacifying composition containing latex, after being stripped from the Yankee dryer. The opposed surface may, if desired, be coated as previously described, merely as an opacifying supplement, but such is not essential to the practice of the present invention. The thus coated "machine glazed" surface does not require any supercalendering and is highly receptive to fine printing, such as finer than 110 line screen with minimum amounts of printing inks, and upon final waxing it is possessed of a high gloss presenting a novel, graphic effect.

The coating composition is desirably employed in high solids aqueous suspension, such as from about 40% to about 70% and preferably from about 55% to about 65% solids, and can be employed in such high concentration due to its milk-like fluidity due to the presence of rubber latex. On a dry weight solids basis the composition is comprised of from about 5% to about 20% and preferably from about 10% to about 15% of latex solids, and the balance mineral fillers such as clay and opacifying pigment such as titanium dioxide, satin white, lithopone, and the like. Small amounts of adjuvants may be added such as minor amounts of clay dispersing agent, latex stabilizing agents, antifoaming agents, and the like. The latex may be of natural rubber or of a synthetic rubber, such as the butadiene-styrene or butadiene-acrylonitrile copolymers, polychloroprene, polyisobutylene,

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butyl rubber, and the like. These are employed in commercial aqueous dispersions or suspensions and necessary water is added to the latex-opacifying mineral mix to provide desirable solids content.

The following is a typical example of a suitable coating composition:

	Parts by weight Solution	Parts by Weight
Water.....	275.00	
Titanium Dioxide.....	160.00	160.00
Clay.....	240.00	240.00
Sodium Tetraphosphate.....	.75	.75
Butadiene-acrylonitrile latex.....	103.00	51.00
Casein.....	40.00	5.00
Aqueous Ammonium Hydroxide.....	1.25	
	820.00	456.75

The foregoing composition has a solids content of about 55.5%. The sodium tetraphosphate (Quadrafos) is used as a dispersing and deflocculating agent for the minerals. The casein is used as a latex stabilizing or anti-coagulating agent, and other protein materials may be used for this purpose. The ammonia is used to preserve alkalinity of the composition and as an adjuvant for the casein. If desired, antifoaming agents may be added, such as about 50 cc. of an aqueous solution of tributylphosphate or an alkaline aqueous emulsion of a drying oil. The addition of two parts by weight of an emulsion composed of one part linseed oil, one part water and a minor amount of ammonium hydroxide has been found particularly useful as an antifoaming agent. The latex not only acts as the principal binder or adhesive for the coating composition, but provides the end sheet with a desirable softness or pliability. Further, due to its oil resistant nature, it minimizes the amount of printing ink subsequently required, which is a matter of considerable economy.

Referring to the drawing, the reference numeral 10 indicates a newly formed wet web after leaving the Fourdrinier wire, either in the normal condition of about 70% moisture content, or in a partially dried but not less than about 50% moisture content condition if predryers, not shown, are employed. The wet web is then transferred by means of the roll 11 to the large polished surface, steam-heated Yankee drum dryer 12 and carried thereon about the major portion of its peripheral surface until it is stripped therefrom over the roll 13. Stripping is accomplished by means of the driven rolls of the calender stack 14. This calender stack may be replaced by a single pair of driven pinch rolls, not shown, for drawing the paper from the drying drum 12. In the alternative the lowermost two rolls of the illustrated stack may be employed for this purpose. As illustrated, the paper passes through several nips which may optionally be desirable for the purpose of densifying the web so as to reduce its absorbency to wax with which the sheet is to be ultimately saturated.

The web after it leaves the Yankee drum 12 is preferably in a fully dried condition, i. e., having a moisture content of about 5%. The surface of the web which was maintained in contact with the polished face of the drying drum 12 is now "machine glazed" and is of a porous nature due to the unidirectional vaporization of moisture content from the web while wrapped about the drum. The web is further of a translucent character, being either unfilled or but partially filled with opacifying mineral pigment, i. e., about one-third of that normally required for opacification. If desired, although not essential, some opacifying coating composition material of conventional character may be applied to the outer face of the web as it passes around the drum 12 by means of the diagrammatically indicated roll coating means 15.

Thereafter a latex-containing opacifying coating composition is applied to the glazed surface of the web. Al-

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though the dried web 10 may be reeled up after being drawn from the drying drum and subsequently subjected to coating on its machine-glazed side, it will be apparent that such operation is economically unadvantageous, and it is therefore preferred that the entire paper-making, drying and coating operation be carried out in a continuous process flow, as diagrammatically illustrated. When, for example, employment is made of a drying drum of about twelve feet in diameter and the web is applied thereto in a condition of maximum moisture content as it leaves the Fourdrinier dryer, the complete operation may be carried out at speeds of about 500 feet per minute. Speeds in excess of 500 to about 1000 feet per minute may be accomplished in a continuous operation if the wet web as it leaves the Fourdrinier dryer is subjected to partial predrying, as previously indicated.

The dry web after it leaves the lowermost two rolls of the calender stack 14, or an equivalent pair of pinch rolls, is drawn with its machine glazed surface downward over the coating applicator roll 16, which may be a hard surface roll revolving in the fountain 17 holding a supply of latex-mineral pigment opacifying composition 18 of the character previously described. This applicator roll 16 is preferably driven by means of a variable speed motor, not illustrated, and at approximately 7% of the paper speed. A vertically adjustable depressing roll 19 brings the paper in contact with the applicator roll. The paper then passes around the resilient, i. e. rubber covered, backup roll 20 and excess coating is removed from the web by means of the fixedly mounted flexible doctor blade 21, whereat excess coating is collected in the trough 22 and returned to the system, preferably after screening to remove fibers and other coarse particles, the doctor blade acting against the coated web portion in contact with the resilient backup roll 20.

The amount of latex-opacifying coating composition is desirably controlled so as to apply to the web from about two to about five and preferably about three pounds of coating composition per three thousand square feet (i. e., a ream of 500 24 x 36 inch sheets). Amounts less than two pounds do not provide adequate coverage and opacifying, and greater than five pounds have a tendency to cause streaking and mottling or graininess. Depending upon the speed of the web, and the weight of coating desired to be applied, the spacing between the point of coating application and removal of excess may be varied, so as to permit a variation in the interval for absorption by the porous web of a requisite amount of coating composition. This may be accomplished by moving the applicator in a horizontal position, as illustrated by the dotted lines, or, in the alternative, by shifting the position of the doctor blade, as for example further illustrated by the dotted lines indicating alternate position of the doctor blade. Means, not shown, are provided for adjusting the angle and pressure of the doctor blade with respect to the backup roll, and to further permit cleaning of the blade when necessary.

After the web has absorbed the requisite amount of coating composition and the excess has been doctored off, the coated web is subjected to drying. In order to prevent sticking of the moist, coated surface of the web, to means such as steam-heated drying drums, the web is first passed between spaced dryers 23—23 which may comprise banks of infrared lamps or air jets. The coated web may be fully dried in this manner, or preferably drying may be accomplished in this manner to an extent only adequate to insure prevention of sticking of the coated surface to a subsequently employed drying drum.

Thus, as illustrated, after the web passes between the banks of dryers 23, it passes over the roll 24 and the coated surface of the web comes in contact with the face of the steam drying drum 25, whereat it is completely dried and then wound up on the reel 26. The drying drum 25 may, for example, be one of about four feet in diameter, and it will be noted that the coated surface

of the web is brought into contact with the face of the drying drum so as to insure retention of a smooth surface. As a further alternative, the banks of infrared lamps or air jet dryers 23 may be dispensed with and the roll 24 may be replaced by a steam drying drum which, as illustrated, will first contact the uncoated face of the web 10 and thus dry it to an extent that the coated surface of the web can then be safely brought into contact with the face of the drum 25.

As a further alternative, when the wet web is subjected to partial predrying, as previously indicated, and greater speeds are employed, a plurality of final drying drums may be employed. During the drying operation, particularly in the final step thereof where the coating is brought into contact with the surface of the steam-heated drying drum 25, the rubber latex under the influence of the heat becomes sufficiently dry to provide proper adhesive strength for the coating composition.

The finally dried paper is of an extremely smooth and highly glazed surface which requires no further calendering or supercalendering and may be subjected to final printing and wax impregnation without further treatment. The coated, machine glazed surface is now of an exceptionally smooth character. Due to the nature of its rubber-mineral pigment composition it is receptive to extremely fine line printing by means of minimum amounts of printing inks. After printing the sheet may be saturated or impregnated with conventional wax, such as paraffin wax generally employed in the manufacture of opaque waxed wrapping papers, such final printed and waxed product taking on a final "solid" appearance and a bright, novel, graphic effect.

I claim as my invention:

1. The method of making opaque coated paper of enhanced physical properties and printability adapted for the production of waxed food wrapping which comprises coating a sheet of thin, porous, absorbent, translucent paper having a machine glazed surface by applying to said machine glazed surface an excess of an aqueous suspension containing mineral filler and opacifying pigment together with rubber latex as the principal organic binder therefor, doctoring excess coating from said surface after absorption of a portion thereof by the sheet and while the sheet is carried by a resilient moving surface, and then drying the resulting coated sheet.

2. The method of making opaque coated paper of enhanced physical properties and printability adapted for the production of waxed food wrapping which comprises coating a sheet of thin, porous, absorbent, translucent paper having a machine glazed surface by applying to said machine glazed surface an excess of an aqueous suspension containing mineral filler and opacifying pigment together with rubber latex as the principal organic binder therefor, doctoring excess coating from said surface after absorption of a portion thereof by the sheet and while the sheet is carried by a resilient moving surface, drying the resulting coated sheet, imprinting the resulting coated surface, and then waxing the printed sheet.

3. The method of making opaque coated paper of

enhanced physical properties and printability adapted for the production of printed waxed food wrapping, which comprises applying an excess of an aqueous suspension of mineral filler and opacifying pigment containing rubber latex as the principal organic adhesive therefor, to the machine glazed surface of a continuously moving web of thin, porous, absorbent, translucent machine glazed paper, moving the web forwardly to bring its opposed face into contact with a moving resilient supporting surface and thereat wiping excess coating composition from the coated face of the web, and then drying the coated web.

4. The method of making opaque coated paper of enhanced physical properties and printability adapted for the production of printed waxed food wrapping, which comprises applying an excess of an aqueous suspension of mineral filler and opacifying pigment containing rubber latex as the principal organic adhesive therefor, to the machine glazed surface of a continuously moving web of thin, porous, absorbent, translucent machine glazed paper, moving the web forwardly to bring its opposed face into contact with a moving resilient supporting surface and thereat wiping excess coating composition from the coated face of the web, and then drying the coated web by first subjecting it to partial heat drying with the web coating spaced from a heated surface and then to complete drying with the coating in direct contact with a moving heated surface.

5. The method of making opaque coated paper of enhanced physical properties and printability in a continuous paper-making process, which comprises continuously applying an excess of an aqueous suspension of mineral filler and opacifying pigment containing rubber latex as the principal organic adhesive therefor, to the machine glazed surface of a forwardly moving newly formed dry web of thin, porous, absorbent, translucent, machine glazed paper, bringing the opposed face of the web into contact with a moving resilient supporting surface spaced from the point of coating application, and thereat resiliently doctoring off excess coating composition, while correlating the solids content of the coating composition, speed of web travel and spacing between the point of coating application and doctoring to control the amount of coating absorbed by the web, and then heat drying the coated web by first partially removing its moisture while maintaining its coated face spaced from a heated surface, and then to complete drying by applying the coated face to a moving heated surface.

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