

Jan. 16, 1962

C. R. OUTTERSON ET AL

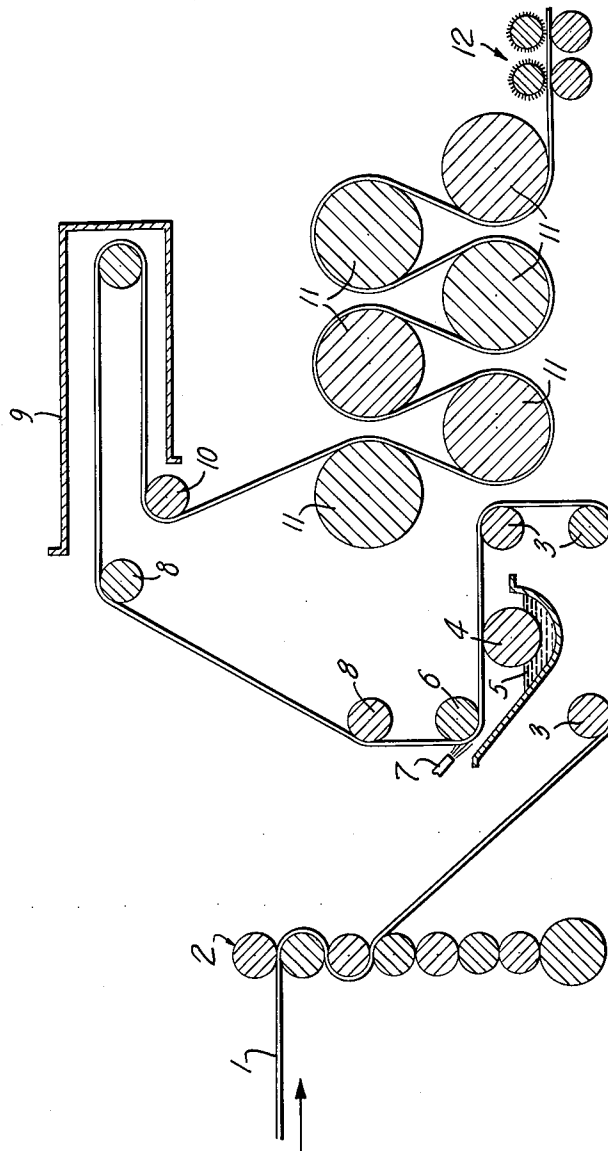
3,017,295

COATED PAPER AND PAPERBOARD AND PROCESS FOR MAKING SAME

Filed July 8, 1958

2 Sheets-Sheet 1

Fig. 1.



INVENTORS
CHARLES R. OUTTERSON
JAMES L. BAKER
BRENTON S. HALSEY

BY *Mason, Fenwick & Lawrence*
ATTORNEYS

Jan. 16, 1962

C. R. OUTTERSON ET AL

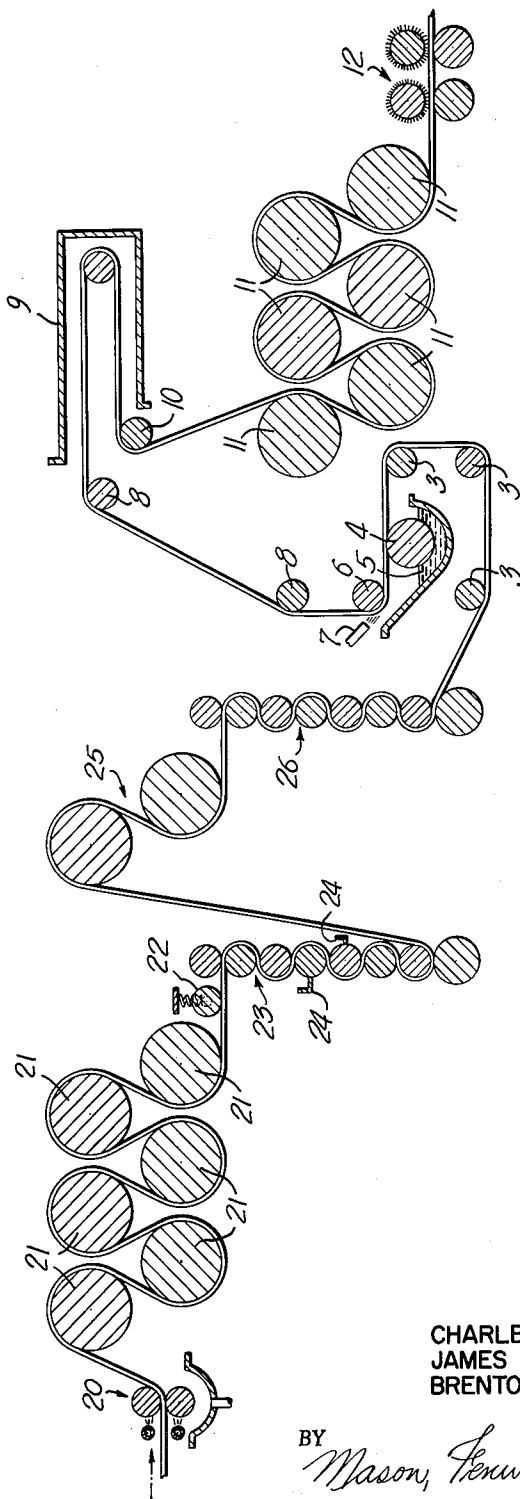
3,017,295

COATED PAPER AND PAPERBOARD AND PROCESS FOR MAKING SAME

Filed July 8, 1958

2 Sheets-Sheet 2

Fig. 2.



INVENTORS
CHARLES R. OUTTERSON
JAMES L. BAKER
BRENTON S. HALSEY

BY *Mason, Fenwick & Lawrence*
ATTORNEYS

1

3,017,295

COATED PAPER AND PAPERBOARD AND PROCESSES FOR MAKING SAME

Charles R. Outterson, Richmond, James L. Baker, Sandston, and Brenton S. Halsey, Richmond, Va.; said Outterson assignor to Albemarle Paper Manufacturing Company, Richmond, Va., a corporation of Virginia
Filed July 8, 1958, Ser. No. 747,147
11 Claims. (Cl. 117—155)

This invention relates to new coated, solid sheets of unbleached kraft paper and paperboard which are characterized by high quality printability and processes for making same.

The term "solid" sheet, as employed in the specification and claims refers to a single sheet of the desired thickness made on a Fourdrinier machine without a superimposed layer of a different stock laid down by secondary headbox. The term further distinguishes from the laminated paperboard made by cylinder machine.

Conventional procedures for making coated papers for high quality printing, namely paper suitable for half tone reproduction, consist essentially in employing a suitable paper base of light color and smooth, even surface free from imperfections, applying a coating containing an adhesive and a covering pigment, generally clay or mixtures of clay and other pigments, such as titanium dioxide or satin white, and then calendering or, more generally, super-calendering to smooth the coating. The paper is generally made from bleached sulfite raw stock or a mixture of bleached sulfite and soda or sulfate stock. If a dark colored board is to be coated, it is usually provided with a smooth white liner for reception of the coating. Since the coatings, if too plastic, tend to blacken during the calendering operation, it has been the standard practice to dry the coated paper to a maximum moisture content of about 4 or 4.5% before calendering. Although this expedient reduces the blackening phenomenon, it also weakens the paper to a very substantial extent.

The characteristics of solid paper or paperboard sheets made from unbleached softwood sulfate stock or mixtures of unbleached softwood and hardwood sulfate stock, particularly where the pulp is only lightly beaten, are such that direct coating to form a uniformly white surface of high quality printability has not hitherto been feasible. The base stock is dark in color and, by conventional coating procedures, requires as much as 90 to 100 lbs. of coating solids per ream for barely satisfactory coverage. The application of such large amounts of coating is obviously impractical, if not impossible.

Kraft sheets, which require fibers of the greatest possible length to produce strength, are also characterized by wildness, namely lack of uniformity of fiber distribution, particularly in the case of thick sheets having a caliper of about 0.006 in. or higher, which are made from very free stock, namely lightly beaten or substantially unbeaten stock, so that they can part with water readily on the wire of the paper making machine. Good formation of the paper base has hitherto been considered essential for high quality coating and printability.

The surface finish of such sheets is not only uneven because of the wildness of formation, but also rough and fuzzy. To some extent, this can be remedied by calendering the sheet before coating. However, calendering must be kept to a minimum where the strength of the paper must be preserved, as in the case of sack papers. Calendering of kraft paper having a moisture content higher than about 4.5% tends to blacken the paper and reduction of the moisture content to this point may also be undesirable, since this impairs strength. Thus the surface of the paper or paperboard lacks the smoothness

2

hitherto considered necessary to produce high quality coated sheets.

There has, however, been an important need for low cost heavy duty papers, such as sack papers, and for paperboard, such as that used for containers, cartons and the like, which present a finely finished surface of good printability. This has generally been achieved by the application of a surface liner made from bleached or highly refined stock laid down either on the cylinder machine or by means of a secondary headbox on the Fourdrinier machine. This is, however, a costly expedient since it requires the preparation of and facilities for a different stock. Cylinder machine production is also substantially slower and more costly than paperboard manufacture on the Fourdrinier machine.

The coating of solid sheets of unbleached sulfate paper and paperboards having a caliper of about 0.005 in. and up poses still another problem, since I have discovered that such coated sheets cannot be subjected to calendering to smooth the coating without darkening. This darkening phenomenon occurs even where the sheet has been dried to the low moisture content which is standard procedure in the industry to prevent blackening.

The object of this invention is the production of solid sheets of unbleached sulfate paper and paperboard having a single high quality surface coating of superior appearance and printability, on one or both faces of the sheet.

Another object is the application of a coating of excellent appearance and printability to unbleached solid kraft papers without sacrifice of the strength of the paper.

Still another object is the direct application of a coating of excellent appearance and printability to solid sheets of unbleached kraft paperboard without requiring a bleached or highly refined top liner.

Other objects and advantages of the invention will become obvious from the following description.

In the drawings:

FIGURE 1 is a diagrammatic representation in elevational view of an apparatus which may be used in carrying out the invention.

FIGURE 2 is a diagrammatic view showing a modification.

We have discovered that solid paper and paperboard sheets having a minimum caliper of about 0.005 in. and made from unbleached, lightly beaten softwood sulfate pulp or a mixture of unbleached, lightly beaten softwood sulfate pulp and lightly beaten or substantially unbeaten hardwood alkaline-cooked pulp, either sulfate or soda, preferably sulfate, can be coated with certain specified coating compositions, on or off the machine in a continuous process, and dried to a moisture content best suited to the desired properties of the sheet in use, with or without substantial calendering prior to coating, to form coated sheets of uniform whiteness having excellent printing smoothness without calendering or other treatment of the coating after drying.

Printability is a general term characterizing the printing quality of paper. For good printability, the paper must present a smooth surface to the printing plate or roll during the printing process, namely a surface which comes into sufficiently close and uniform contact with the inked imprinting surface to give good reproduction, including half tones. The smoothness which is of primary importance to the printer is not surface smoothness under unstressed conditions, but printing smoothness, namely the smoothness of the paper under the pressure of the printing press or roll. A paper which is resilient under the printing form, though somewhat rough surfaced, will often print better than a very smooth but hard paper which is not compressible. The coated paper

and paperboard sheets made according to our process, though having surface irregularities under unstressed conditions, possess good printing smoothness because of their resiliency and, therefore, good printability.

The raw stock, as aforementioned, can be made entirely from an unbleached softwood sulfate pulp or from a mixture of unbleached softwood sulfate pulp and an unbleached alkaline-cooked hardwood pulp, preferably made by the sulfate process. Where a high degree of tensile and tear strength is important, as in the case of sack papers, which normally have a caliper of about 0.005 to 0.006 in. it is preferable to employ a predominantly softwood, long-fibered pulp with, at most about 10 to 12% of the short-fibered hardwood pulp. In the case of heavier paperboards which can be made on the Fourdrinier wire up to caliper thicknesses of about 0.030 in., generally up to about 0.020 in., where stiffness is more important than tensile strength, proportions of the hardwood pulp as high as 75%, can be incorporated. Addition of the short-fibered hardwood pulp is particularly desirable in the thicker boards since it increases the stiffness of the solid board, minimizes the wildness of formation which may become so pronounced as to form lumps in the thicker boards when the softwood pulp is used alone, and improves bulk and resiliency.

The pulps can be processed in conventional fashion including such standard additives in the beater as rosin or other size, alum and the like. The finished pulp should, however, have a minimum Canadian freeness value of about 400 ml., preferably about 450 to 550 ml. and up to 600 ml. or higher. Thus the unbleached softwood pulp must, at most, be only lightly beaten. The hardwood pulp should also be very lightly beaten or even just mixed unbeaten with the lightly beaten softwood pulp and other additives in the beater.

The light beating which results in the high freeness values serves two functions. It provides a paper or paperboard sheet having the requisite bulk and resiliency to give the cushioning effect essential to impart good printing smoothness to the finished coated product. It also makes possible the ready parting with water by the thick web of pulp on the machine wire, which is desirable for continuous, rapid processing.

The finished pulp is diluted with water, processed on the Fourdrinier machine and then dried in conventional fashion. The degree of drying depends largely on the desired characteristics of the finished product with regard to such properties as strength or stiffness. Where a strong paper having high tensile and bursting strength is desired, as in the case of sack paper, it is preferable that the sheet be dried to a minimum moisture content of about 6 to 7%. Drying below this point tends to make the paper irreversibly brittle and weak. In the case of paperboards for cartons, folders, and the like, where stiffness is a prime requisite, drying can be taken down to about 4.5 to 5.5%. It should be noted, however, that the moisture content of the sheet is not critical in so far as the coating is concerned and, therefore, can be adjusted to maximize the other desired physical characteristics of the particular paper or paperboard product.

After leaving the dryers, the sheet, if it is paperboard, can optionally be given a size treatment, applied by conventional size press, by means of a calender water box, or both. Such sizing is preferably omitted where the tear strength, as in the case of sack paper, must be preserved. In the case of thick, stiff paperboards, where tear strength is of relatively minor importance, a size treatment, though not essential, is of some assistance in improving finish of the board, as by laying down the fuzz. The size can be of any conventional type, such as 2 to 5% aqueous solutions or dispersions of a starch, e.g. corn, potato, tapioca, sago; a modified starch, e.g. a starch ester; sodium carboxymethyl cellulose; casein; animal glue; etc. After sizing, the paperboard is again dried.

The dry sized or unsized paper can now be coated.

Preferably, however, it is first given a calendering, the extent of which is determined by the desired physical characteristics of the finished product. This calendering is the normal type of calendering without sufficient moisture being present in the paper to produce glazing. If high strength is required, as in the case of sack paper, calendering should be light, as, for example, about one to three nips of a standard calender stack. Heavy calendering should be avoided because this tends to destroy the strength of the paper and also tends to blacken it at such relatively high moisture contents as 6 to 7%.

On the other hand, full calendering of paperboard, though not essential, is desirable since it improves the flexibility of the board and also improves its surface smoothness. At low moisture contents, e.g. less than 5.5 or 6%, blackening is no problem. The board can, for example, be passed through all nips of a standard calender machine and then through a second standard calender machine. If the board is sized by water box on the first stack, it can be passed through a conventional dryer on its way to the second stack. Note that the water content of the paper is not sufficient to produce glazing, and therefore, according to the present invention the paper base is unglazed. It should be noted that the degree of calendering is optional and to a considerable extent is determined by the desired physical characteristics of the paper product rather than by coating requirements.

The coating compositions must meet certain critical standards. Solids content must be high both to provide the large amount required for adequate and uniform coverage of the dark colored unbleached paper base in a single coating and to minimize the amount of water to be removed when the coating is dried, so that drying time is within a practical range. The viscosity of the composition, despite the high solids content, must not be excessive for proper application and even distribution on the paper. It is also important that the coated surface be flexible enough to accept scoring and folding without cracking along the score or fold lines.

Compositions comprising clay and titanium dioxide as the coating pigments, with or without other pigments such as calcium carbonate and satin white, and a synthetic latex as the sole adhesive possess the requisite properties for our purpose. By synthetic latex is meant an aqueous colloidal dispersion of an elastomeric polymer such as styrene-butadiene, acrylic, methacrylic, vinylacrylic, isoprene and chloroprene polymers and copolymers. The styrene-butadiene and acrylic polymers are particularly suitable. The requisite large concentrations of pigment can be admixed with the synthetic latices in adequate amounts for good bonding of the pigment particles within the coating and of the coating to the paper fibers, without excessive loss of fluidity, when the latices are employed without other adhesive components or extenders such as starch or casein. This makes possible and economically practical the application of a single heavy coating and its drying without slowing up either on or off machine processing.

The elastomeric adhesive possesses the further advantages of permitting folding and scoring without cracking and of providing an additional resilient cushion which, in combination with the resilient paper base, contributes to the desired printing smoothness of the finished paper product. Furthermore, these adhesives permit easy polishing of the finished product to a high gloss, if such is desired.

For complete and uniform coverage of the dark colored paper base, the coating should be laid down at a minimum solids concentration, by weight of the air dry paper, of about 20 lbs. per ream (3000 sq. ft.) and preferably about 25 lbs. Up to about 30 lbs. or more of coating solids can also be applied. Generally speaking, larger additions do not provide such proportionately improved results as to make them economically worthwhile.

Solids concentration in the coating composition should be in the range of 55 to 65% by weight, preferably about 58 to 60%. At concentrations below 55%, drying time required becomes excessive for practical manufacture. At concentrations above 65%, the viscosity of the coating becomes too high for practical and uniform application.

The ratio of clay to titanium dioxide in the coating can be varied depending on the final brightness desired, although the clay should be in major proportion. In general the preferred ratio of clay to titanium dioxide is 85:15 to 95:5. For adequate adhesion to prevent pick, the concentration of latex solids should be about 14 to 20 parts per 100 parts of pigment, though this can be varied depending on the particular latex used.

The coating composition is applied in excess to the paper sheet in any desired conventional fashion, as, for example, by means of applicator roll. The coating is then smoothed and excess removed preferably by air brush, although other conventional means, such as a doctor blade, can be employed. The air brush coater is, however, most effective with the particular paper base and coating composition in producing a relatively smooth, evenly distributed surface. Under the action of the air brush and by virtue of its own fluidity, the coating penetrates and fills surface voids and depressions, and flows around and over surface roughnesses and fuzz, thereby eliminating such irregularities in the finished coated paper surface.

The coated paper is then dried in such manner that the coating does not touch any surface until it is substantially set. Any conventional drier can be employed for this purpose, such as a hot air oven. After the coating is sufficiently dry to be firmly set, drying to the desired moisture content can be completed by passage over conventional drum driers. The final moisture content is determined by the desired physical characteristics of the paper product. If retention of high strength is desired, drying should preferably not be taken below 6% moisture. In the case of stiff paperboards, moisture content can be taken down to about 4.5% or less.

The dried, coated paper sheet now presents a uniformly white surface which completely covers the dark color of the paper base. Since the coating is not calendered, its surface shows some irregularities which are relatively small and evenly distributed, so that they form a pattern or texture of pleasing appearance. The presence of these surface irregularities does not adversely affect the printing properties of the coated sheet to any considerable extent because the resiliency or compressibility of the paper base and the elastomeric coating provide the cushion essential for good printing smoothness under the pressure of the printing form, when, in effect, the surface irregularities of the resilient coating are "ironed out."

As aforementioned, the coated paper must not be calendered, since such treatment causes darkening of the coating regardless of the moisture content of the paper base or the type of coating applied. We have found, for example, that unbleached kraft sheets, coated with clay compositions employing latex, starch or casein as the adhesive at a solids rate of 20 to 25 lbs. per ream and dried to the conventional moisture content of 4% or less, all darken upon calendering. This phenomenon is apparently due to the nature of the lightly beaten, unbleached kraft stock. The reason for this has not as yet been satisfactorily explained, though the likelihood is that the calendering pressure forces the coating into the stock so that the base color shows through.

If a high gloss is desired, the coating lends itself to easy polishing in any conventional fashion, as, for example, by rubbing the coated surface with soft cloths or by brushing with natural or synthetic bristle brushes. A gloss substantially as good as that obtained by cast coating can be obtained.

The coating operation, with suitable driers, can be accommodated to conventional paper machine speeds,

and, therefore, can be processed not only off but on the machine with resulting economy in production. Our process provides strong, heavy duty, unbleached kraft paper and solid unbleached kraft paperboards having a white surface of excellent printing quality at low cost since it eliminates the need either for secondary headbox application of a top layer of high quality bleached or refined stock on the Fourdrinier machine, or for processing on a slower, costlier cylinder machine where a top white liner can be applied.

FIGURE 1 is a diagrammatic representation of typical means for making coated kraft paper of high strength according to my process. The paper sheet 1 after leaving the Fourdrinier machine and the paper machine driers (not shown) is given a light three nip calendering on calender machine 2. From here the paper sheet passes under and around guide rolls 3 and then contacts applicator roll 4 which applies an excess of the fluid coating 5. The sheet is passed immediately around breast roll 6 where excess coating is removed and the coating is spread and smoothed by means of air brush 7. The uncoated surface of the sheet is carried over guide rolls 8 into dried 9 where the coating is sufficiently firmly set not to be marked when it contacts guide roll 10. The coated sheet is further dried by passage over drum driers 11 and then goes to polisher 12.

The apparatus diagrammatically shown in FIGURE 2 is designed for the processing of solid sheets of paperboard where stiffness is desired. The apparatus is substantially similar to that shown in FIGURE 1 with the exceptions that the board sheet coming off the Fourdrinier machine and machine driers (not shown) passes through size press 20, where it receives a sizing treatment, over driers 21, past spring roll 22, to calender stack 23 equipped with waterboxes 24 for additional size application if desired. The sheet receives the full calender stack treatment, passes through drier 25 to dry the size and then is calendered by machine calender stack 26. From here the sheet is given a similar coating, drying and polishing treatment as is shown in FIGURE 1.

Although for most purposes, a coating on one surface of the paper or paperboard sheet is adequate, it will be understood that after the coating has been applied and dried on one face the other side can be similarly coated.

EXAMPLE 1

The following furnish was introduced into the beater:

75% unbleached sulphate hardwood pulp
25% unbleached sulphate pine pulp
0.3% rosin size (maleic adduct of rosin, saponified)
2.3% alum

The stock was blended thoroughly in the beaters but not beaten and heated to 120° F. The beating cycle was 65 minutes, including filling and dumping. The stock was brushed lightly in 2 jordans to obtain Canadian Freeness 460 ml.

The stock was formed into .015 board on the Fourdrinier machine at a speed of 240 f.p.m.; passed through a bath of 3% potato starch at a size press; dried to 4.8% moisture content; and given 5 nips in the first stack of calenders and 7 nips in the second.

The sheet was air brush coated on one side with a coating comprising:

90 lbs. clay
10 lbs. TiO₂
34 lbs. 12 oz. B15 (vinyl acrylic resin latex made by Rohm & Haas—46% solids)
0.3 lb. Calgon, an alkaline metaphosphate dispersing agent

This batch of coating color was mixed with water to 58% solids and applied at 20–25 lbs. per ream. The wet sheet was run at 300 ft./min. over drying cans (steam pressure 30 lbs.) and dried to a moisture content of 6%. The dried sheet was wound without polishing.

EXAMPLE 2

The following furnish was introduced into the beater:

100% Halifax regular (unbleached sulphate pine pulp)
0.2% rosin size (maleic adduct of rosin, saponified)
0.5% alum

The stock was blended in the beaters. The beating cycle was 40 minutes including filling and dumping. The stock was brushed lightly in 4 jordans to Canadian Freeness 550 ml.

The stock was run at 750 ft./min. into sack paper on the Fourdrinier machine and then passed through 3 nips of a calender stack.

The sheet was air brush coated on one side with a coating comprising:

90 lbs. clay
10 lbs. TiO₂
31 lbs. 4 oz. 512-R (Dow Chemical, 48% solids, 63 lbs. styrene, 37 lbs. butadiene latex)
0.3 lb. Calgon

This coating color was mixed with water to 60% solids and applied at 20-25 lbs. per ream at a speed of 330 ft./min. The coated sheet was dried to 7% moisture content. It did not require polishing.

EXAMPLE 3

The following furnish was introduced into the beater:

75% unbleached sulphate hardwood pulp.
25% unbleached sulphate pine pulp.
0.3% rosin size (maleic adduct of rosin, saponified).
2.3% alum

The stock was blended in the beaters, heated to 120° F., given a 65 minute beating cycle including filling and dumping, brushed in 2 jordans. The Canadian Freeness was 545.

The stock was formed into .008 board on the Fourdrinier machine at a speed of 310 ft./min. The sheet was sized with 3% potato starch at a size press; and then with a solution consisting of 1.5% Penford gum 250 (ester of starch) and 0.1% carbowax to prevent sticking (polyethylene glycol made by Carbon & Carbide) at one calender water box; the sheet was dried to 6.0% moisture; given 3 nips in 1st stack and 5 nips in 2nd calender stack.

The sheet was air brush coated on one side with a coating comprising:

90 lbs. clay
10 lbs. TiO₂
34 lbs. 12 oz. B-15 (vinyl acrylic resin latex made by Rohm & Haas—46% solids)
55 lbs. H₂O
0.4 lb. Foam Killer (Nopco 407)
0.3 lb. Calgon

This batch of coating color tested 61% solids and was applied at 20-25 lbs. per ream. The sheet was run at 320 ft./min. and dried on cans at 40 lbs. steam pressure to moisture 5.1%. No polishing.

EXAMPLE 4

The following furnish was introduced into the beater:

75% unbleached sulphate hardwood pulp
25% unbleached sulphate pine pulp
0.3% rosin size
2.5% alum

The stock was heated to 120° F. and given a 40 minute beating cycle to Canadian Freeness 590.

The stock was run into .015 board on the Fourdrinier machine at a speed of 325 ft./min. The sheet was given 3 nips and 5 nips on two calender stacks.

The sheet was air brush coated on one side with a coating comprising:

90 lbs. clay
10 lbs. TiO₂
39 lbs. 2 oz. B-15 (vinyl acrylic resin latex—Rohm & Haas, 46% solids)
0.3 lb. Foam Killer (Nopco 1407)
52 lbs. H₂O
0.3 lb. Calgon

This coating tested 62% solids and was applied at 20-25 lbs. per ream. The coated sheet was dried on cans (steam pressure 30 lbs.) at 310 ft./min. No polishing.

Printing smoothness of the above paperboards was measured by means of a Chapman printing smoothness tester to determine printability. This instrument measures the smoothness of paper by determining the area of optical contact between a paper specimen and a glass prism while the specimen is under a compressive load against the prism corresponding to the platen pressure of a printing press. For comparative purposes, a commercial, single "white patent coated" newsboard, made on a cylinder machine with a bleached white liner, which had also been clay coated and calendered, was also tested. The results are given in Table 1.

Table 1

Paper sheet:	Chapman smoothness, 700 p.s.i.
Ex. 1	36
Ex. 2	44
Ex. 3	52
Ex. 4	67
White patent coated newsboard	26

It will be noted that the printing smoothness and, therefore, the printability of the coated sheets made according to our process were, in all cases, very much superior to that of the white lined and coated cylinder machine newsboard.

Printing tests made with the products of the foregoing examples at different platen pressures also showed good half tone reproduction. Pick resistance of the coating is excellent. No pick was encountered in any of numerous printing tests made.

The coated paper product of our invention possesses the unique property of being absorbent to wax without preventing wetting and glue adhesion of the surface coating to other surfaces. This is of particular importance in the packaging art, where a printable coated paper is laminated on to a cheaper paperboard base with a wax adhesive, the wax being employed to provide a moisture barrier. Such laminated board is frequently subjected, during shipping or storage, to high climactic temperatures, which cause migration of the wax through the coated paper to form an outer non-wettable film on the coating which prevents the adhesion of glue when the board is folded into cartons or boxes. Various expensive treatments have been employed to prevent such wax migration. We have found that when my coated paper is employed as the printable, laminating liner, the wax migrates through the paper into the coating but is absorbed or distributed within the coating without producing a non-wettable film on the surface or preventing glue adhesion when the board is folded into carton or the like.

It will be understood that although the above description discloses practical and preferred embodiments of our invention, various modifications are possible which fall within the scope of the claims.

We claim:

1. A process for making coated paper sheets which comprises applying a coating composition comprising an aqueous dispersion of clay and titanium dioxide pigment, the clay being in major proportion relative to the titanium dioxide, in a synthetic latex, the synthetic

elastomeric polymer in said latex being the sole adhesive agent in said coating composition, the total solids concentration in said coating composition being about 55 to 65% by weight, to a face of a solid unglazed paper sheet in an amount such that at least about 20 lbs. of coating solids are deposited per 3000 sq. ft., said sheet having a minimum caliper of about 0.005 inch and being made from unbleached stock made from pulp selected from the group consisting of softwood sulfate pulp and mixtures of softwood sulfate pulp and alkaline-cooked hardwood pulp, said stock having a minimum Canadian Freeness value of about 400 ml., and drying said coated sheet until set without contact with a highly polished surface, thereby forming a finished, white uncalendered coating on the paper to produce a coated sheet having good printing smoothness.

2. The process of claim 1, wherein the paper sheet prior to the application of the coating is calendered.

3. Process of claim 1, wherein the paper sheet prior to the application of the coating is treated with an aqueous size and dried.

4. The process of claim 1 in which the unbleached alkaline-cooked hardwood pulp is a sulfate pulp.

5. The process of claim 4 in which the latex polymer is selected from the group consisting of styrene-butadiene and acrylic polymer.

6. The process of claim 5 in which the latex polymer is in the ratio of about 14 to 20 parts per 100 parts of pigment.

7. The process of claim 6 in which the coating is applied in amount such that at least about 25 lbs. of coating solids are deposited per 3000 sq. ft. of sheet.

8. A coated paper product comprising a solid paper sheet having a minimum caliper of about 0.005 in and formed from unbleached pulp selected from the group consisting of softwood sulfate pulp and a mixture of softwood sulfate pulp and alkaline-cooked hardwood pulp, said sheet having on a surface at least about 20 lbs. per 3000 sq. ft. of an uncalendered coating composition comprising clay and titanium dioxide pigment, the clay being in major proportion relative to the titanium dioxide, and a sole adhesive agent comprising an elastomeric polymer, said sheet being characterized by a uniformly white surface and good printing smoothness.

9. The coated paper product of claim 8 in which the hardwood pulp is sulfate pulp.

10. The coated paper product of claim 9 in which the elastomeric polymer is selected from the group consisting of styrene-butadiene and acrylic polymer.

11. The coated paper product of claim 10 in which the coating surface has substantial gloss.

References Cited in the file of this patent

UNITED STATES PATENTS

2,746,878	Rush	May 22, 1956
2,759,847	Frost et al.	Aug. 21, 1956
2,790,736	McLaughlin et al.	Apr. 30, 1957

OTHER REFERENCES

"The Dictionary of Paper," 2nd edition, 1951, pp. 186-187.

Labarre: "Dictionary of Paper and Paper-Making Terms," 1937, pp. 114-115.

Casey: "Pulp and Paper," vol. II, 1952, page 903.