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PROCESS OF CAST-COATING PAPER

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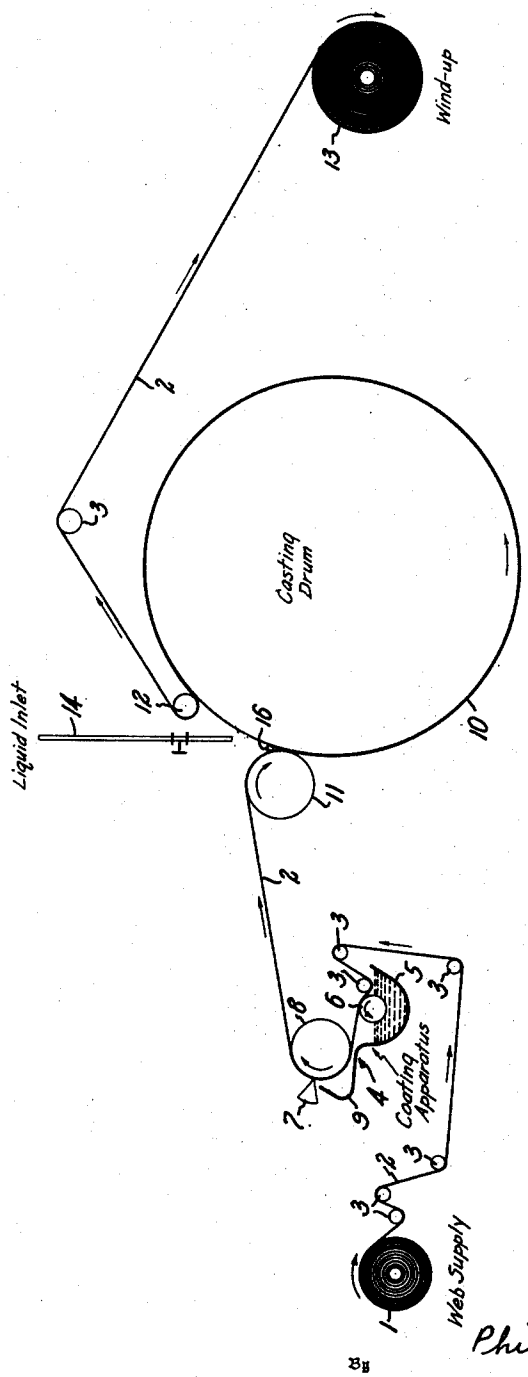

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PROCESS OF CAST-COATING PAPER

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3 Claims. (Cl. 117—64)

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This invention relates to the production of glossy mineral-coated paper sometimes called "cast-coated" paper.

The method of cast-coating disclosed by D. B. Bradner in U. S. Patent No. 1,719,166 consists essentially in application of an aqueous mineral coating composition to paper, immediately pressing the wet coated surface into contact with a polished metal surface, drying the coating while it remains in such contact and stripping the coated paper from the metal surface. The dried surface is a mirror image of the polished metal surface against which it has been dried, and in consequence may be extremely glossy.

It is well known, however, that following the Bradner disclosure almost invariably produces paper the surface of which shows numerous flaws or un-cast or non-glossy areas usually attributed to air being trapped between the paper surface and the surface of the casting drum. To overcome this difficulty, the present commercial practice is to spread the coating composition on the paper by means of the casting-drum itself. The latter practice has serious liabilities, however, among which are inability to apply a predetermined and uniform weight of coating over all parts of the paper surface being coated, and difficulty in keeping the drum surface clean, especially near the ends beyond the edges of the paper web being coated.

The present invention avoids the disadvantages and liabilities resulting from application of fluid coating composition in the nip at the casting-drum, yet effectively eliminates the liability of entrapping air between the drum and a coated paper surface applied thereto. According to the invention a fluid mineral-coating composition is applied in desired quantity to one side of a paper web by any desired conventional coating means such as a roll coater; and the so-coated paper is then pressed with its freshly coated side against a polished casting drum by means of a backing roll while the entering side of the nip between said casting drum and said coated surface is kept continuously filled or flooded with water. The flood of water in the nip eliminates the possibility of air being entrapped in the nip and at the same time wets the casting surface and insures good contact between the wet casting surface and the wet coated paper.

Apparatus suitable for carrying out the process is illustrated diagrammatically in the accompanying drawing. In the drawing 1 is a roll of paper from which the paper web 2 is supplied, 3 are web guiding and tensioning rollers, 4 is a conventional web coating unit consisting of the coating container 5, the coating applicator roller 6, the air doctor 7 with its cooperating roller 8 and the spray baffle 9 which serves to return coating which is removed from the paper by the air doctor to the container 5, 10 is the casting drum with its cooperating roller 11, 12 is a roller which serves to separate the paper from the casting drum, 13 is the web wind-up roller, 14 is a valved pipe for delivering aqueous liquid on to the surface of the casting drum and 16 is the pool of liquid maintained in the nip between the casting drum and the paper web.

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The water to flood the nip can be introduced directly thereinto by any desired means as by a jet or it can be carried into the nip on the surface of the casting drum. It is both feasible and advantageous to impinge a jet of water against the surface of the casting drum somewhat in advance of the position at which the coated paper surface makes contact therewith. The latter practice is at times doubly advantageous in that besides being carried on the surface of the roll to fill or flood the nip between the drum surface and the coated paper the water may serve locally to cool the surface of the heated casting drum to prevent too violent evolution of steam when the coated paper first touches the said drum.

The size or depth of the pool of liquid in the nip may vary from a very shallow pool, e. g. one-fourth inch deep, to a relatively deep pool, e. g. one inch or more, depending upon the character of the coating and the speed of the paper. The pool should not be so deep as to wash the coating off of the paper but it should be sufficiently deep to prevent entrance of air bubbles between the roll and the paper. The slower is the speed of the paper the smaller the pool may be. Generally a pool one-fourth to one-haf inch in depth gives satisfactory results. Paper speeds commonly used in making cast coated paper may be employed.

The coating as it enters the pool of water may vary in consistency from that of a freshly applied coating coming directly from a coater and after moving only a short distance at conventional paper coating speed to that of a coating which has "set" but is still damp. The pool of water in the nip may become milky in appearance due to transfer of coating from the paper to the pool but the pool should not be permitted to become so contaminated that it is thick or viscous. This may be avoided by replacing the pool, i. e. by supplying more water than is consumed and permitting the excess to overflow from the pool or

by varying the depth of the pool or the fluidity of the coating on the paper when it enters the pool.

In practicing the invention there may be used any of the mineral-coating compositions generally useful in making cast-coated paper. Such coating compositions generally are aqueous dispersions containing mineral pigment and adhesive therefor, with preferably a small proportion of an added release agent such as a soap to facilitate release of the dried coated paper from the casting surface. A typical coating composition which has given good results is an aqueous dispersion comprising 85 parts of fine coating clay, 15 parts of fine calcium carbonate, 22 parts of low viscosity starch adhesive, 1.2 parts of dimethylolurea (to give some water-resistance to the finished coating) and 5 parts of ammonium stearate (all parts by weight). This coating composition was used at a solids content of 56% and was applied by means of a roll coater to one side of a conventional paper raw-stock in amount equal to 5 pounds dry weight per thousand square feet of paper surface coated. The wet coated surface was then immediately pressed into contact with the surface of a heated chromium-plated drum wet with sufficient water to give a small flood of water, one-fourth to one-half inch deep, at the line of contact or nip. When dry the coated paper separated easily from the chromium surface and possessed the glossy, unblemished surface characteristic of high quality cast-coated paper.

In another instance a coating was made of the following composition:

	Parts by weight, dry
Fine coating clay	85
Fine calcium carbonate	15
Casein (solvated by ammonia)	15
Ammonium stearate	5
Water to make solids 48 per cent.	

This coating composition was applied by means of an air-knife coater to one side of a conventional paper body-stock in quantity equal to about 6 pounds dry weight per 1000 square feet of surface coated. The so-coated web was then immediately pressed into contact with the surface of a heated chromium-plated drum which was wet with sufficient water to give a small flood of liquid one-fourth to one-half inch deep at the line of contact or nip. When dry the coated paper separated easily from the drum and possessed a high gloss and attractive appearance.

The preceding example was repeated except that a dilute (1%) solution of formaldehyde was used in the nip. The resulting product was indistinguishable from the preceding example in appearance, but it was superior thereto in water resistance.

In general the procedure and conditions followed in the operation of the process of the Bradner patent with respect to the paper web, the paper coating composition, the weight of coating applied to the web, the manner in which the coating is applied, the paper speed, the size and temperature of the casting drum, etc. are followed in the present invention the principal difference between the Bradner process and the process of the present invention being that a flood of water is maintained in the nip between the coated surface and the casting drum.

The process of the invention includes the following steps: (1) applying to a paper base or web a predetermined quantity of aqueous mineral-coating composition, (2) applying the wet coated surface to the surface of a heated, polished metal drum, (3) applying water or aqueous solution (free of suspended solid) to the surface of the drum in advance of the contact of the coated paper therewith in quantity sufficient to keep a flood of liquid in the nip where the said coated paper surface comes into contact with said polished metal surface, (4) drying the coating while it remains in contact with said polished metal surface, and (5) stripping the dried coated paper from the drum.

I claim:

1. Process which comprises applying to a paper base a coating of an aqueous mineral-coating composition, directly running the wet coated surface into a nip against a heated solid surface, supplying to said nip an aqueous liquid free of suspended solids and withdrawing aqueous liquid from said nip, the rate of supply of said liquid to said nip and the rate of withdrawal of said liquid from said nip being regulated to maintain a pool of liquid substantially free of said mineral coating composition in said nip, and holding said coated surface in contact with said heated solid surface until said coating composition is substantially dry.

2. Process according to claim 1 in which the aqueous liquid is water.

3. Process as defined in claim 1 in which the liquid is applied to the heated solid surface in advance of the nip.

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