

Oct. 15, 1968

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3,406,037

MANUFACTURE OF CELLULOSIC PRODUCT

Filed Nov. 27, 1964

2 Sheets-Sheet 1

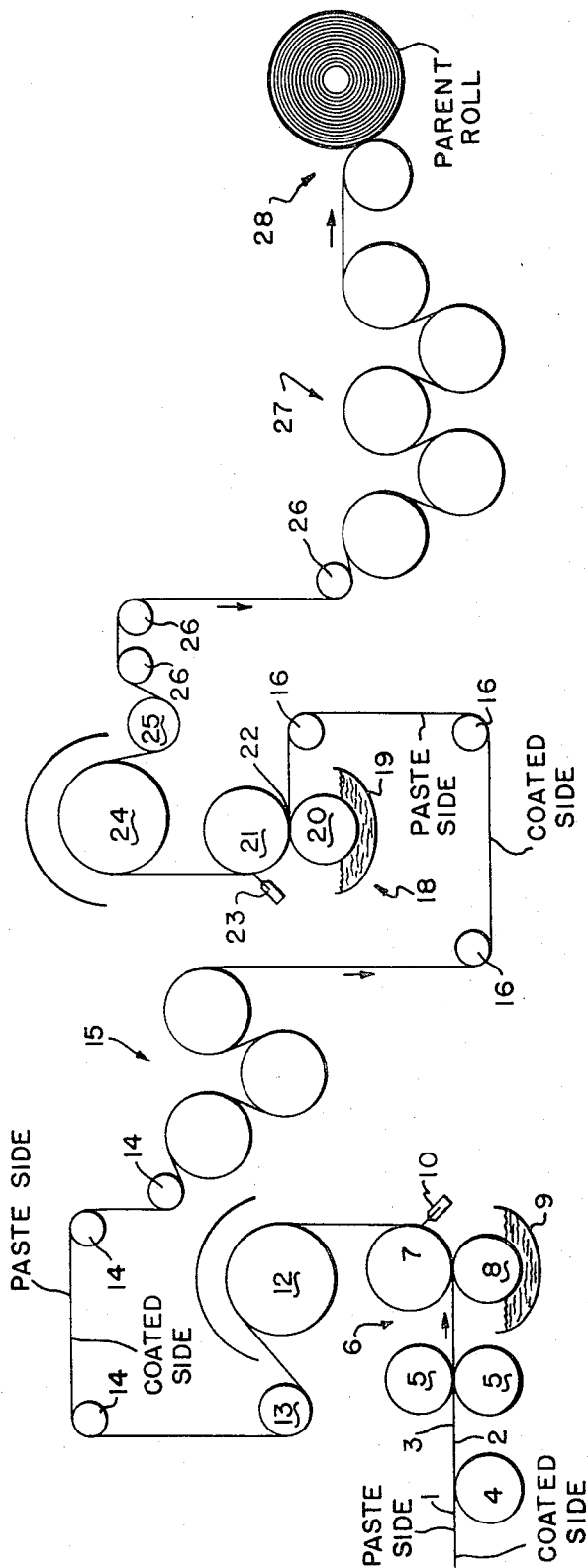


FIG. 1

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2 Sheets-Sheet 2

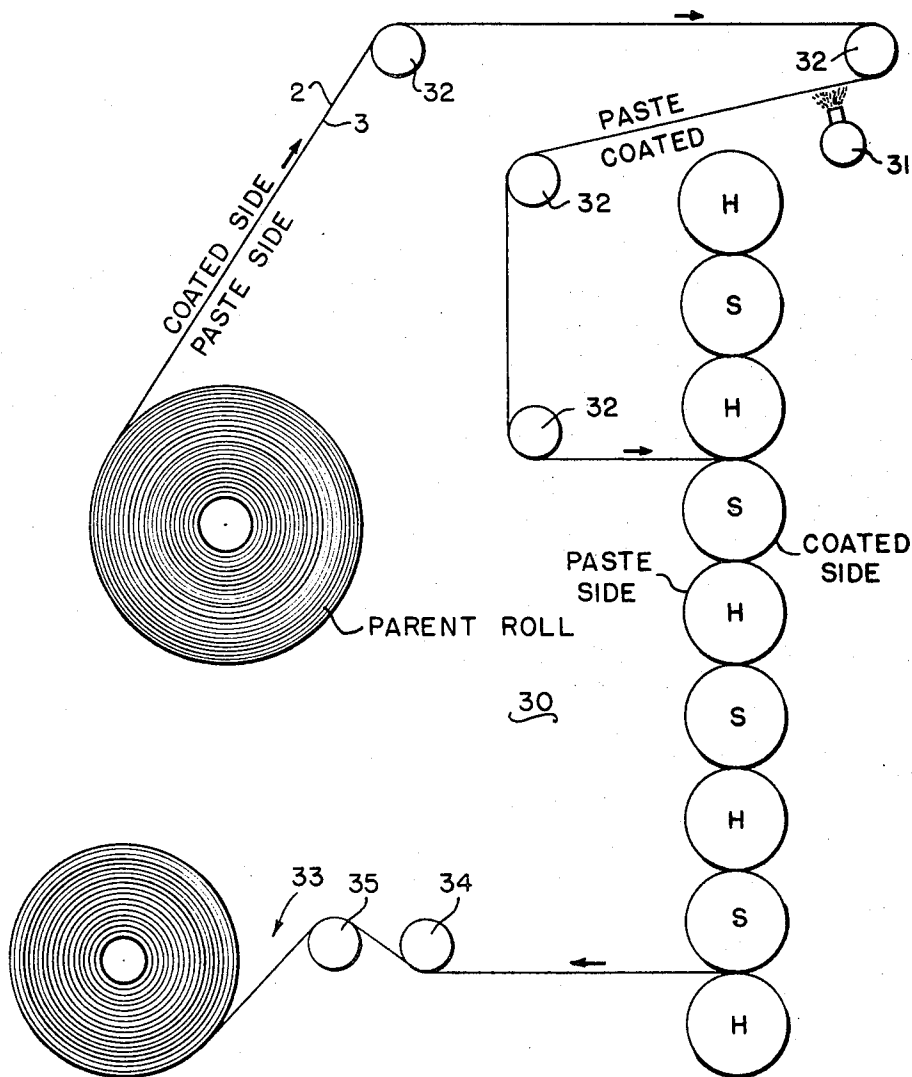


FIG. 2

MANUFACTURE OF CELLULOSIC PRODUCT
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Filed Nov. 27, 1964, Ser. No. 414,168
6 Claims. (Cl. 117—60)

ABSTRACT OF THE DISCLOSURE

A process for finishing one side coated paper to provide gloss on the coated side and a relatively low finish (dull) on the second side. The second side may be uncoated, sized or lightly coated and one common term for such second side is the paste side. To provide the finish with either a slight curl to the second side or a flat sheet but not curled to the coated side, the procedure is followed of initially providing the coated sheet with a strong curl to the second side. With the sheet so curled it is passed through a supercalender with limited moistening of the coated side sufficient to develop gloss but insufficient to cause reversal of the curl to the coated side; the second side is maintained dry in its passage through the supercalender. The sheet may be reeled as it passes from the supercalender without further moisture treatment. The procedure permits relatively low supercalendering pressures for the attainment of a given gloss level and the process is readily controllable as the required moisture treatment on the supercalender is low.

My present invention relates to improvements in the finishing of paper; more specifically, the invention relates to the simultaneous control of curl and surface gloss characteristics of one-side coated paper.

It is generally accepted that, when one surface of a sheet of paper is moistened and the moisture is evaporated from that surface, the sheet tends to curl towards the side which had been moistened. Also, paper which may be termed "one-side coated" has a tendency to curl towards one side or the other depending upon the treatment which the paper may have undergone. By one-side coated paper as used in this application I mean a paper which has one coated surface and an opposite surface which, in distinction to the first surface, is only lightly coated, or is sized, or may be free of surface treatment; this latter situation is relatively unusual commercially due to the known absorbency characteristics of paper fibers but is within the scope of application of the present invention. Accordingly, I have chosen to describe the second and opposite paper side as the "paste" side as such terminology is commonly employed in connection with label and other papers. It will, therefore, be understood that by the terminology one-side coated I mean a sheet which carries a coating on one side suitable for printing purposes, for example, and that the second or paste side carries a size or light coating and/or is receptive to application of a paste for label purposes.

One-side coated papers of the general type described have a tendency to curl in the course of their production. Also, it is desirable that the coated side have a high gloss and that the uncoated side be dull or of relatively low finish. Procedures for controlling curl, so that the finished sheet will lie relatively flat, involve usually moistening the paste side at the entrance or exit of the supercalender. Any moistening of the coated side of the sheet at the entrance to the supercalender beneficially raises the gloss of the coated side but also requires further moistening of the paste side to control curl. If the additional moisture is added to the paste side prior to entry to the supercalender, it raises the finish of the paste side which is undesirable; if the additional moisture is added at the

exit of the supercalender, the quantity required is large and difficult to control.

I have surprisingly found the control of curl in the final sheet, to provide a substantially flat finished sheet, may be achieved by a pretreatment of the one-side coated sheet, followed by a moistening of the coated side only and supercalendering. I have also found quite unexpectedly that operation in this manner, and as is to be detailed hereinafter, permits the use of lower supercalendering pressures at the same coated side gloss levels, the lower supercalender pressures contributing further to decreased paste side "finish" or gloss; by the use of lighter pressures the optical properties, such as opacity, are increased also, as are the bulk and properties commonly related to high paper bulk such as softness, printability and the like. Further, from the process point of view, the procedure is more easily controlled than simultaneous moistening of both sides, and after-treatments to minimize high paste side finish are not necessary; also, sheet moisture control and cross-deckle curl (the tendency of a sheet to curl non-uniformly across the width of the sheet) are improved.

Accordingly, a primary object of my present invention is to provide a new and improved process for the finishing of one-side coated paper by control of the curl and gloss characteristics in a novel manner.

A further object of my invention is to provide a new and improved process for the finishing of one-side coated paper in which the control of curl and gloss take place in a novel sequence of process steps.

In effect, I have found that the paper, after coating and drying and before supercalendering when the paper tends to curl to the coated side, should be so treated as to strongly reverse the curl from the coated to the paste side; this curl is then stable in the sense that the paper will remain strongly curled to the paste side while standing in roll form or upon subsequent winding operations where it may be exposed to air; also, the paper in my procedure is sufficiently strongly curled to the paste side that some moisture, an amount effective to aid gloss or finish of the coated side, may be added to the coated side before supercalendering without effecting a reversal of the curl to the coated side in the product.

The invention will be more fully understood by reference to the following detailed description and accompanying drawings wherein:

FIGS. 1 and 2 illustrate an apparatus arrangement useful in the practice of the invention.

Referring to the drawing, the numeral 1 designates a sheet of paper traveling in the direction of the arrows. The sheet has a side 2 designated as the coated side and an opposite side 3 indicated as the paste side, the side 3 being adapted to receive a paste as in the production of label paper. The sheet 1 is dry, that is, in equilibrium with the atmosphere as it passes over guide roll 4. The sheet also in this preferred embodiment is precoated on side 2 and on the paste side 3 is provided with a sizing of starch, for example. Alternatively, the paste side may be untreated, that is, free of any size or coating—the latter being of light weight when used—much lighter than the coating on side 2. At this stage the traveling sheet commonly has a definite tendency to curl toward the coated side 2. This is true regardless of the manner of production of the sheet and regardless of whether the coated side is the felt or wire side of a sheet made on a Fourdrinier paper-making machine.

The sheet 1 is directed through press rolls 5 to a blade coating device 6 for the application of additional coating to side 2. The side 2 is not necessarily pre-coated but usually is for label paper purposes. The added coating composition applied may be any suitable aqueous pigment-binder coating composition used in the paper art. Starch-

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clay, casein-clay and latex-clay binder coatings are common examples and need not be set out in detail. The coating may be identical to that initially applied to side 2 or may differ in composition. The coating device itself includes the usual backing roll 7, applicator roll 8, pond 9, and trailing blade 10 bearing on the web on the backing roll. The blade removes the excess of coating applied to the web 1 by the applicator roll 8. From the coating device 6 the web is directed over hooded drier roll 12 and drier 13; the coating is set on drier 12 so that it is unaffected by contact with drier roll 13. The coated sheet then passes over guide rolls 14 to the drier bank 15. The aqueous mineral coating, which may have a weight of 3 to 4 pounds per ream (25" x 38" x 500 sheets) is commonly subjected to drying temperatures in hooded drier 12 of about 300–350° F., and of about 250–300° F. in bank 15. The drying may be effected in any conventional manner. At the exit of the drier bank 15 the sheet is dried to a normal moisture content (4–6%) in equilibrium with the moisture content of the surrounding air and has a strong tendency to curl to the coated side.

The thus coated dried paper, in the practice of this invention, is directed over guide rolls 16 to a moisture metering device 18 similar in structural arrangement to the coating device 6 but provided to apply moisture to the side 3 of the sheet. For this purpose the pond 19 contains water into which applicator roll 20 dips. The applicator roll 20 and backing roll 21 form an applicator nip 22 at which the water is applied to the paste side 3 of the traveling sheet. Excess water is removed from the paste side by blade 23. The amount of water added to the sheet by the metering device depends naturally to some extent upon the receptivity of the sheet to moisture pickup. Such is determined by the nature of the paste side including the type of furnish forming the sheet and the amount and nature of any sizing or like coating if the sheet is untreated. In any event the paste side is well wetted sufficient to provide, upon drying, the desired strong curl to the paste side. The blade metering device is very effective for the purpose but other water metering devices may be employed. Also, the water might contain added components for application to the paste side but such is not important or necessary to the purpose of this invention.

The traveling sheet, water wetted on its paste side 3, as it leaves the moisture metering device 18 and before drying, has an even stronger tendency to curl to the coated side. This is due to the wetting of the fibers of the paste side 3, which fibers consequently relax and become temporarily limp and very flexible; that is, the bonds retaining the fibers are in considerable measure released by the water addition.

The traveling web is directed from the moisture metering device 18 to hooded drier 24 and then over the drier 25 and guide rolls 26 to the bank of shell driers 27. The evaporation of the water by the action of the driers causes the fiber bonds in the paper sheet to be reformed and to simultaneously shrink the side 3 differentially to cause a strong curl to the paste side. The sheet is dried to the extent that the moisture content and that of the air are in equilibrium—usually 3 to 6% moisture by weight on the bone dry weight of the sheet.

A strong curl to the paste side in label paper and the like is not desirable; preferably the sheet has a light curl to the paste side or is substantially flat. The strong curl provided by my arrangement overcomes the necessity for again wetting the side 3, or paste side, during supercalendering since only the coated side 2 need now be wetted to reverse the curl to a large degree or completely. Further, since the paste side is presented to the supercalender in a dry state, the paste side will have a dull finish.

As illustrated in the drawings, the sheet passing from the sheet driers 27 may be reeled as at 28 into a parent roll; alternatively, though not customarily in practice, the sheet may be fed to the supercalender without reeling.

Whether from a reel or otherwise presented to the

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supercalender 30, the web 1, on its coated side 2, is exposed to a steam shower 31 as it moves toward the supercalender over suitably positioned guide rolls 32. The moisture added to the coated side by the steam shower is very light, sufficient only to provide for gloss attainment and reduced supercalender pressure; an excess of moisture is not beneficial as it leads to picking of the coating on the supercalender. The desired moisture for any given sheet and coating is readily determinable by those skilled in the art—moisture application at this point is not in itself new, although related differently in my procedure to the other procedural steps. No moisture is applied to the paste side 3 at the entrance to the supercalender. The web 1, with the coated side somewhat wetted, is directed to the supercalender 30 so that the coated side contacts the hard rolls H and the paste side contacts the soft rolls S. The application of steam by shower 31 is controlling of the curl of the finished supercalendered sheet and is effective to largely reverse the curl from the paste side so the finished sheet has only a slight curl to the paste side or is flat. Additionally, the presence of the moisture permits the attainment of a given gloss level on the coated side at reduced calender stack pressure and permits a lower back (paste) side finish while eliminating the necessity for control of curl with moisture on the paste side ahead of the supercalender. Unexpectedly also, the opacity of the sheet produced as described is enhanced over that of attempting to control curl by moisture addition to both sides at the supercalender. Also, a roughening effect occurs on the side 3 which assists in both the prevention of sticking or blocking when sheets are stacked. Further, the bulk of the sheet is improved since less pressure is required for a given product.

Importantly, however, the procedure is easy to control and results in less need for constant attendance to provide optimum and uniform cross deckle curl—in contrast to supercalendering with moisture present on both sides to effect curl control.

From the supercalender 30 the paper is reeled directly at 33, the sheet being passed from the supercalender over guide roll 34 and roll 35 to windup, there being no need for further treatment.

It is to be particularly noted that the sheet treated as described is of particular utility for label papers. Such paper, as illustrated in roll form at 33 in the drawings, is commonly submitted to a printer for the application of printing material to the coated side; this normally is followed by a varnishing over the printing. Letterpress printing of the sheet (before varnishing) has little or no effect on the curl although lithographic printing may tend to bring the sheet curl to the coated side. A slight curl to the paste side as provided by my procedure is beneficial both to the printing and to restraining the tendency to curl to the coated or coated printed varnished side.

Some label printers may apply glue to the paste side of the printed sheet in sheet form, or the printed sheet may be first die cut and then delivered to a labeler, who applies the glue to the separate sheets. In instances where the die cutting takes place prior to the gluing, the sheet preferably is flat or has a slight curl to the paste side in order that it may be readily machine handled for the gluing operation and my procedure facilitates the attainment of this condition.

The application of glue to the whole sheet, of course, distorts the sheet curl; and the sheet commonly, in such instances, is subjected to a breaking bar action to provide the sheet in a flattened form, after which the sheet is die cut.

It will be understood that this invention is susceptible to modification in order to adapt to different usages and conditions and, accordingly, it is desired to comprehend such modifications within the invention as may fall within the scope of the appended claims.

What is claimed is:

1. In a process for finishing one side coated paper in which process gloss is developed on the coated side by passing the sheet with the coated side in moistened condition through a supercalender with the coated side in contact with the hard rolls of the supercalender, the improvement which comprises causing the sheet to curl strongly to the second and opposite side prior to the moistening of the said coated side and prior to the passage of the sheet through the supercalender, passing the sheet through the supercalender with the coated side in contact with the hard rolls of the supercalender, maintaining the said second side of the sheet dry and in contact with the soft rolls of the supercalender in the passage of the sheet through the supercalender, and moistening said coated side prior to the passage of the sheet through the supercalender sufficiently to develop in the passage of the sheet through the supercalender gloss on the coated side but insufficiently to cause the reversal of curl to the coated side.

2. The process as claimed in claim 1 and in which the second side of the sheet is sized and receptive to the application of a paste.

3. The process as claimed in claim 1 and in which the second side of the sheet is essentially untreated and is receptive to application of a paste.

4. The process as claimed in claim 1 and in which the second side of the sheet has a coating which is light in weight relative to the said one side and the second side is receptive to the application of a paste.

5. A process for surface finishing paper which comprises applying a coating to one side of a sheet of paper, drying the sheet to cause the sheet to curl toward the coated side, water wetting the sheet on the second and opposite side only, drying the sheet to cause a reversal of the curl toward the second side, subjecting only the coated side of the sheet to moistening while retaining the second side substantially dry, said moisture addition to the coated side being insufficient to influence reversal of

the curl to the coated side but sufficient to provide for gloss finishing of the coated side upon supercalendering, and passing the sheet through a supercalender with the coated moistened side facing the hard rolls and the dry second side facing the soft rolls of the supercalender whereby gloss is produced on the coated side, the uncoated side is dull, and the sheet is substantially flat or has a slight curl to the second side leaving the supercalender.

6. The method of producing a sheet of one-side coated paper of improved surface finish, bulk and printability, which method comprises applying a coating to one side of a sheet of paper and substantially completely drying the sheet to cause the paper to curl to the coated side; water wetting the second side of the sheet to cause the fibers of the sheet to debond, relax and become more flexible whereby the tendency of the sheet in the wet state to curl to the coated side increases; drying the sheet by evaporating the water from the said second side to cause the fiber bonds to reform and the sheet to shrink differentially to cause a strong curl in the sheet to the second side; moistening only the coated side and to an extent which is sufficient to provide for gloss finishing of the coated side but insufficient to provide for a reversal of the curl to the coated side upon drying; and passing the sheet through a supercalender with the coated moistened side facing the hard rolls and the dry second side facing the soft rolls of the supercalender, and reeling the sheet as it passes from the supercalender without further moisture treatment of the sheet.

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