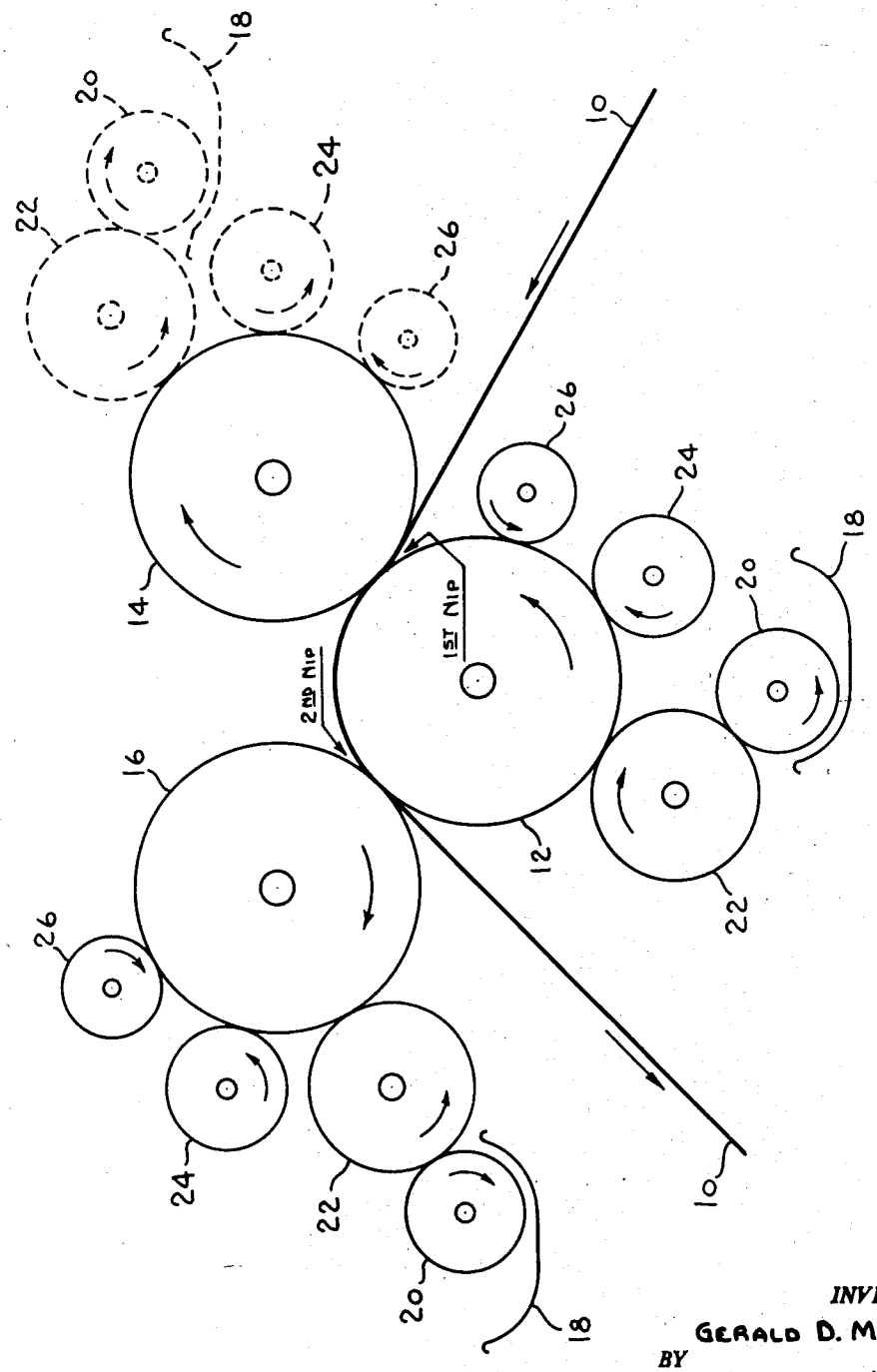
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APPARATUS FOR COATING PAPER

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APPARATUS FOR COATING PAPER

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This invention relates to improvements in the art of coating and more particularly to an improved apparatus for and method of coating paper.

In the prior patents to Gerald D. Muggleton et al., Nos. 2,398,843 and 2,398,844, there is disclosed and claimed apparatus and process of applying a coating film to the traveling web of paper passing through a paper-making machine. These patents are primarily concerned with applying films of a wide range of commercial weights which will not have an undesirable uniform pattern on the finished paper. It is suggested in Patent No. 2,398,844 that both sides of the paper may be coated by putting the accessory rolls on both the upper and lower of adjacent press rolls (designated coating rolls). This is successful only with light weight coats. The expansion of the fibrous structure of the sheet from the action of the water in the coating material and the lowering of the tensile strength of the web by such wetting prohibits the simultaneous application of heavy coats to both sides of the sheet.

It is an object of this invention, therefore, to provide apparatus for and a method of coating paper with a heavy coating applied substantially simultaneously to both sides of a traveling web of paper.

It has been found that, if there is a time interval between the application of the coatings even though less than one-twentieth of a second, or if the application of the coating is first made to one side of the web while such web is being backed by a backing-up roll and then made to the other side of the web while such web is being backed up by the same roll which applied the first coating, heavy coatings may be applied resulting in smoother, better appearing coated paper having improved printability than paper coated simultaneously on both sides. In other words, two nips are formed at a single roll and the coatings applied at these spaced nips. For this application three rolls are used. One roll has a metal surface and the other two have rubber covers. The rubber covered rolls each contact the metal roll to provide two spaced nips. For applying and properly distributing the coating material there are the usual accessory rolls for the metal roll and for at least one of the rubber covered rolls. This equipment costs a little more than half the cost of the two sets of coating rolls separated by a section of drying rolls as now used to apply heavy coatings to opposite sides of the web. In addition to such reduced equipment costs, considerable operational savings are effected through the elimination of breaks and consequent loss of production by consolidating the controls at one set of application rolls.

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The novel features, which are considered characteristic of the invention, are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and its method of operation, together with additional objects and advantages thereof, will best be understood from the following description of a specific embodiment when read in connection with the accompanying drawing in which:

The figure is a diagrammatic view in side elevation of a press of rolls adapted to be incorporated in a paper-making machine and embodying the present invention for applying coating to both sides of the web of paper.

The web of paper 10 is shown as it is advanced from the wet end of a paper-making machine. Depending upon the type of machine used and the speed of the web, such web may have passed one section of the drier or a part thereof. It is only important that the web have the optimum moisture content, well known to those skilled in this art, to receive application of the coating material. The web 10 first passes through a first nip between a first coating roll 12 having a smooth metal surface and a backing-up roll 14 having a rubber cover. While this nip is shown at approximately two o'clock on roll 12, such positioning is not critical and is governed primarily by the approach of the web 10 from the preceding roll and the constructional and space limitations of the paper-making machine. The web 10 then follows around the circumference of first coating roll 12 until it passes through a second nip between the first coating roll 12 and a second coating roll 16. The roll 16 like roll 14 has a rubber cover. In the exemplification of the invention diagrammatically shown in the drawing, the second coating roll 16 is spaced angularly about 90° from the backing-up roll 14. In other words, the two nips are spaced approximately one-quarter of the circumference of the roll 12. This also is not a critical limitation and depends primarily on the physical dimensions of the rolls and the space limitation of the paper-making machine. However, it has been found that in practical usage such angular spacing must be less than 180° or the expansion of the fiber due to wetting at the first nip would cause the web to blister and separate from the surface of the roll. In other words, hydro-expansivity wrinkles would be formed which would ruin the paper.

The rolls 12, 14 and 16 are all mounted in a manner well known in this art and they are separately controlled as to speed and interroll pressures at each nip. Each of the rolls 12 and 16, in accordance with the teachings of aforesaid Patent No. 2,398,844, are provided with: an applicator consisting of a trough 18, a metering roll 20 and transfer roll 22; a pattern roll 24 for imparting a heterogeneous pattern to the film of coating; and a reverse roll 26. Thus a perfect, smooth, even, uniform film of liquid coating is established on roll 12 to be transferred to the web 10 at the first nip. This film may be a heavy (thick) film because: at the time of application the web being backed only by the backing up roll 14 is not prevented from absorbing the water in the coating; and during the application of such film air in the sheet structure may escape through the upper surface of the web. Thus there will be sufficient penetration to provide for bonding as well as for diffusion of water from the coating. At the first nip, back up roll 14 presses against the web 10 with sufficient pressure to cause the lower coating applied at the first nip to be brought in intimate and uniform contact with the web so that the fibres in the web are held in place as they expand and any distortion of the sheet is prevented. As the web travels from the first nip to the second, the surface tension of the coating film tends to hold the web in place flat on the roll 12 and prevents it from wrinkling or blistering due to expansion. During this interval an equilibrium is attained and the sheet or web is ready to receive the second or upper coating at the second nip. At the second nip the roll 12 acts as a back up roll and presses the web 10 against the coating roll with sufficient force to properly bond the second coating to the web. It has been found that any additional expansion of the fibres in this sheet structure caused by the moisture in the second coating is so little that the web is not caused to wrinkle as it passes from such second nip to the first drier of the succeeding drier section. Presumably the expansion which has taken place between the first and second nip accounts for most of the expansion that takes place as a result of both applications.

Tests have shown that paper coated on both sides by the foregoing equipment and process has a higher pick test than paper coated simultaneously on both sides at a single nip. This is commercially important because the viscous inks now being used pull off the surface of the paper in the printing thereof.

In addition to the coating of both sides of the paper at a single stack of rolls as heretofore described, such apparatus may be used for the manufacture of special papers, such as "offset" or "washable hanging" (wallpaper), which requires in addition to the coating the application of a hardening solution which makes the coating water-resistant. In such case the backing-up roll 14 is also provided with an applicator and accessory rolls identical with those shown for rolls 12 and 16 and indicated by the broken line in the drawing. Thusly equipped, there may be applied, for example, at the first nip on the top of the web 10 the usual coating material. At the bottom of the web at the first nip there could be applied a starch paste of a consistency to prevent curling, or the roll 12 may be used solely as a backing-up roll and nothing applied to the bottom of the web. As the web passes through the second nip the roll 16 applies the hardening chemical (small amount of formaldehyde) to the coating and thus such coating is made water-resistant. There are many other special papers which may be treated on this equipment as the assembly is versatile in the ways in which films may be deposited on the web.

Although only one embodiment of the invention is shown and described herein, it will be understood that this application is intended to cover such changes or modifications as come within the spirit of the invention or scope of the following claims.

I claim:

1. An apparatus for coating a traveling web of paper on both sides comprising a hard-surfaced roll, a first soft-surfaced roll forming a first nip with said hard-surfaced roll, a second soft-surfaced roll forming a second nip with said hard-surfaced roll, said first nip adapted to receive a traveling web of paper from a paper-making machine and pass said web therethrough, said hard-surfaced roll being adapted to carry said web to said second nip, said second nip adapted to receive said web and pass the same therethrough, said rolls being mounted for separate control as to speed, means for applying a measured uniform heavy film of liquid coating to said hard-surfaced roll in rotational advance of said first nip whereby said film is transferred to that side of said web facing said hard-surfaced roll at said first nip, said first soft-surfaced roll causing said film to be brought into intimate and uniform contact with said web, said second nip being angularly spaced from said first nip less than 180° whereby as said web is transferred by said hard-surfaced roll from said first nip to said second nip the formation of hydro-expansivity wrinkles is prevented, and means for applying a measured uniform heavy film of liquid coating to said second soft-surfaced roll in rotational advance of said second nip whereby said film is transferred to the other side of said web at said second nip while said web is still being supported by said hard-surfaced roll.

2. An apparatus for coating a traveling web of paper on both sides comprising a hard-surfaced roll, a first soft-surfaced roll forming a first nip with said hard-surfaced roll, a second soft-surfaced roll forming a second nip with said hard-surfaced roll, said first nip adapted to receive a traveling web of paper as it advances from the wet end of a paper-making machine and pass said web therethrough, said hard-surfaced roll being adapted to carry said web to said second nip, said second nip adapted to receive said web and pass the same therethrough, said rolls being mounted for separate control as to speed and interroll pressures at each nip, means for applying a measured uniform heavy film of liquid coating to said hard-surfaced roll in rotational advance of said first nip whereby said film is transferred to that side of said web facing said hard-surfaced roll at said first nip, said first soft-surfaced roll having sufficient pressure with respect to said hard-surfaced roll to cause said film to be brought into intimate and uniform contact with said web so that the fibers in said web are held in place as they expand to prevent distortion, said nips being angularly spaced about the axis of rotation of said hard-surfaced roll substantially 90° whereby as said web is transferred by said hard-surfaced roll from said first nip to said second nip the surface tension of said film holds said web flat on said hard-surfaced roll said film is brought to a state of equilibrium and the formation of hydro-expansivity wrinkles

in said web prevented, and means for applying a measured uniform heavy film of liquid coating to said second soft-surfaced roll in rotational advance of said second nip whereby said film is transferred to the other side of said web while said web is still being supported by said hard-surfaced roll, said hard-surfaced roll pressing said web against said second soft-surfaced roll with sufficient force to properly bond said second coating to said web.

3. An apparatus for coating a traveling web of paper on both sides comprising a first roll, a second roll forming a first nip with said first roll, a third roll forming a second nip with said first roll, said first nip adapted to receive a traveling web of paper from a paper-making machine and pass said web therethrough, said first roll being adapted to carry said web to said second nip, said second nip adapted to receive said web and pass the same therethrough, means for applying a measured uniform heavy film of liquid coating to said first roll in rotational advance of said first nip whereby said film is transferred to that side of said web facing said first roll at said first nip, said second roll causing said film to be brought into

intimate and uniform contact with said web, said second nip being angularly spaced from said first nip substantially 90° whereby as said web is transferred by said first roll from said first nip to said second nip the formation of hydro-expansivity wrinkles is prevented, and means for applying a measured uniform heavy film of liquid coating to said third roll in rotational advance of said second nip whereby said film is transferred to the other side of said web at said second nip while said web is still being supported by said first roll.

GERALD D. MUGGLETON.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
229,785	Whitney	July 6, 1880
1,203,303	Bickett	Oct. 31, 1916
1,698,544	Hicks	Jan. 8, 1929
2,291,616	Fletcher	Aug. 4, 1942
2,456,495	Faeber	Dec. 14, 1948
2,476,298	Heizer	July 19, 1949
2,580,667	Faeber et al.	Jan. 1, 1952