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APPARATUS FOR COATING PAPER

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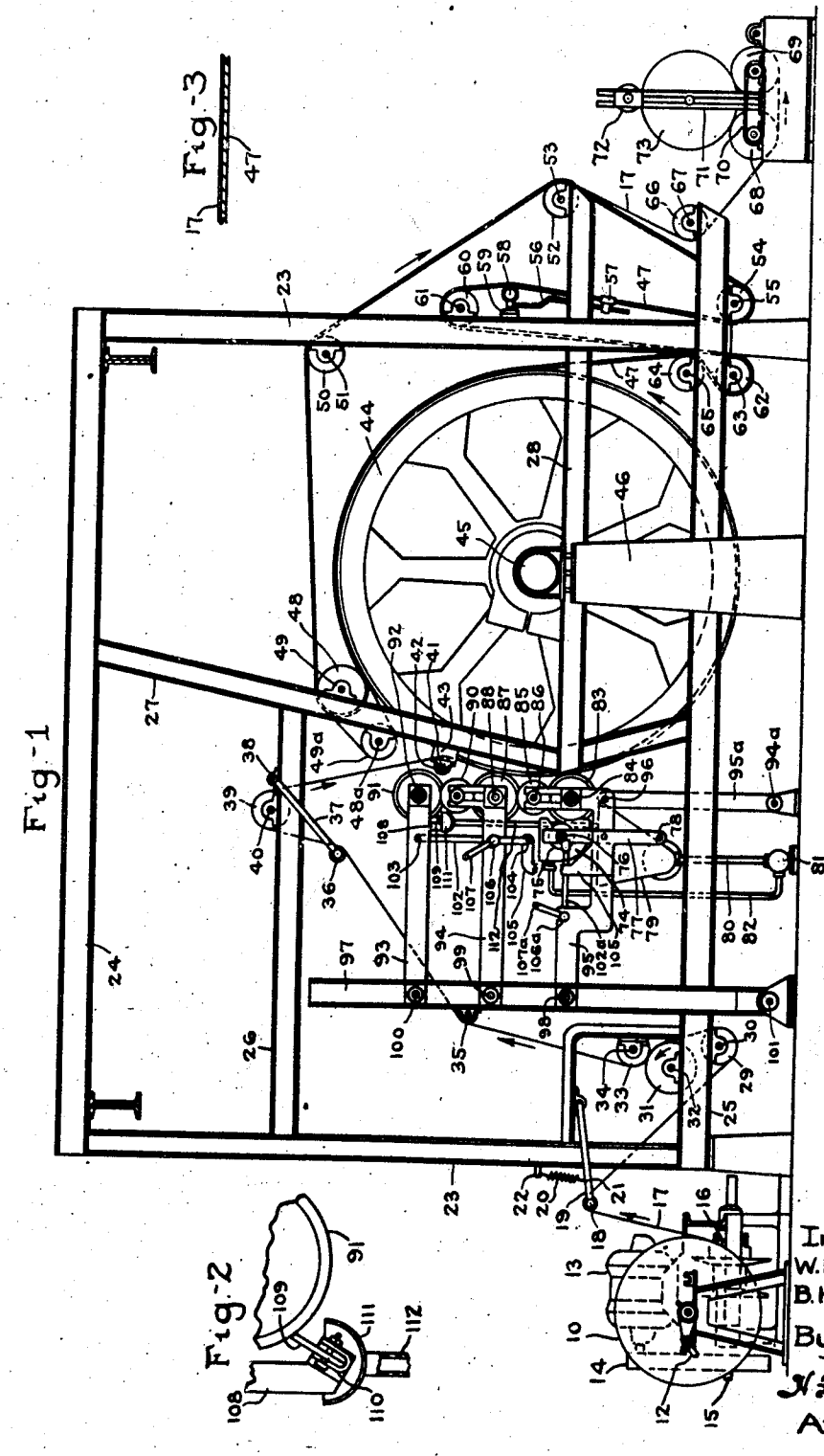

Fig. 1

Fig. 3

Fig. 2

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APPARATUS FOR COATING PAPER

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This invention relates to the art of coating and generally to the art of coating web material, and has reference more particularly to webs of paper which can be processed in a continuous manner while moving at high rates of speed.

One of the objects of the invention is to provide an apparatus for coating web material by which two coats of uniform and continuous films of coating material may be applied to the same side of the web in a predetermined arrangement for insuring uniform products and large quantity production.

Another object of the invention is to provide a uniform thickness and a coating of material which is durable and flexible which does not extend substantially into the structure of the paper.

The thickness of the coating on the paper or sheet material is extremely important both to the manufacturer and the user. Where the coating is for moisture proofing purposes, a coating of constant thickness will provide a finished web or sheet of known moisture proofness. For the manufacturer a variation of coating thicknesses presents more serious problems. In the first instance, a variation of thickness of the coating varies the drying time of the coated sheet. Thus, if the drier is set to dry the coating of a certain thickness, certain portions of the sheet which are lightly coated might be dried to too great an extent with a bad effect on the finished product. Other parts of the coated sheet might bear a coating of excessive thickness which might not be perfectly dry during the travel of the web or sheet, thus producing a product which is not uniform in grade.

It is often desirable to place a coating film of greater than ten pounds per ream of 25 x 28/500 sheets on one side of the sheet of paper. One of the difficulties in applying such a heavy coating is that the coating tends to crawl or in other words, form an uneven surface. It has been discovered that if the heavy coating is applied in two or more applications, the difficulties of producing an uneven finished surface is avoided.

Other objects and advantages of the present invention will be apparent from the accompanying drawings, and the following detailed description;

In the drawing forming a part of the specification, similar reference characters indicate corresponding parts in all the views. Figure 1 is a side elevational view of a coating apparatus for carrying out the process hereinafter described; Figure 2 is a sectional view with parts broken away of the top doctoring roll; and Figure 3 is a sectional

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view of the felt with a coated sheet of paper thereon.

Referring to the drawing in detail: 10 indicates a roll of raw stock or paper which is to be coated, means 12 is for controlling the tension on the paper from the unwinding roll 10. A motor 13 for driving the coating apparatus is provided and the motor drives the apparatus through members 14, 15 and 16. The web 17 as it is unwound from the roll, passes over roll 18 which is supported by arms 19 and tension is maintained on the rolls 18 by spring 20 which is attached to the frame 23 at 22 and to the arm 19 at 21. The frame for supporting the coating unit consists of upright member 23, horizontal members 24, 25, 26, and 28.

The web of paper after passing over roll 18, passes around roll 29 which is suitably secured in bearings 30. The web of paper then passes between tensioning rolls 31 and 33 which are suitably supported by bearings 32 and 34. The web of paper after passing between rolls 31 and 33 pass over roll 35 and then under roll 36. Roll 36 is mounted so that tension is maintained on the paper through the medium of arms 37 which are pivoted at point 38. The paper then passes over roll 39 which is mounted in bearings 40. This roll and its bearings are mounted on member 26 and may be adjusted on frame member 26 to a desired position. Mounted in bearings 41 is roll 42 behind which the paper passes. The bearings 41 are suitably supported on the frame member 27 by blocks 43. The paper then comes into contact with drier drum or backing member 44 which is mounted upon shaft 45. The shaft 45 is suitably supported by upright member 46. Associated with the drier drum is felt 47 which is used for the purpose of eliminating drier wrinkles. The felt 47 leaves the surface of the drier and then passes over roll 48 which is suitably mounted in bearings 49. The paper leaves the drier surface and passses over roll 49a which is suitably mounted on bearings 48a. The felt then travels with the paper over rolls 50 and 52 which rolls are respectively mounted in bearings 51 and 53. The felt then passes around roll 54 which is mounted in bearings 55. The felt then passes to the felt guide which consists of an arm 56 and felt edge contacting means, 57. The arm 56 is associated with movable roll 58 and arm 56 and roll 58 are secured to member 59.

The purpose of the felt guide is to aid in maintaining the felt in position on the drier drum 44. The felt then passes over roll 60 mounted in

suitable bearings 61 and then surrounds rolls 62 and 64, back into contact with the drier surface. The rolls 62 and 64 are mounted in bearings 63 and 65 which may be moved along the frame members 25 and 23 so as to vary the contacting of the felt with the drier surface. The paper after passing over the roll 52 passes in contact with roll 66 mounted in suitable bearings 67 and then to the wind-up stand. The wind-up stand consists of rolls 68 and 69 arranged to be driven at the same speed by belt-like member 70. The roll 73 indicates the coated paper being wound up. The purpose of the roll 72 is to prevent to an excessive, movement of the roll of paper during a wind up.

The coating unit consists of a fountain 74 in which is mounted metering roll 75. The roll 75 is mounted in bearing 76 which is supported by arm 77 which is pivoted at 78 so that the hard surfaced metering roll 75 and the fountain can be moved away from the applicator roll 83. Positioned below the fountain 75 is coating supply tank 79. The coating from the fountain 77 flows over the back of the fountain 74 into the supply tank 79. The supply tank 79 is furnished with a coating material from a suitable source not shown. The coating material is withdrawn from the coating container 79 through pipe 80 by pump 81 and forced through pipe 82 into the fountain near the top thereof. Rotating into one side of the fountain is roll 83 which is mounted on suitable bearings 84. Positioned above the roll 83 in suitable bearings 86 is hard surfaced doctor roll 85. The doctor roll 85 is preferably hard surfaced material such as stainless steel, while the applicator roll 83 is preferably of a yieldable material such as rubber. Positioned in contact with the doctor roll is resilient surfaced roll 87 which is mounted in suitable bearings 88. This roll is of similar material to that of roll 83, and transfers one coat of the coating material to the paper. Positioned above roll 87 is hard surfaced roll 90 for doctoring the surplus coating from the surface of the applicator roll 87. This doctoring roll is wiped clean by a resilient surfaced roll 91 suitably mounted in bearings 92. Bearings 92 are supported by member 93 while roll 87 is supported by arm member 94 and the applicator roll 83 is supported by arm member 95a. The arm 95 is pivotally connected to member 95a which member in turn is pivotally connected at 94a so that the applicator roll and the doctor rolls can be moved toward and from the backing roll or drier surface. The arms 93, 94, and 95 are pivotally connected to upright member 97 at 100, 99, and 98. The upright member 97 is pivotally connected at 101 so that the coating and doctoring rolls may be moved (by any desired means not shown) away from and toward the drier or backing member to provide means for varying the pressure between the doctoring rolls and applicator rolls. A member 102 is connected to arm 93 at 103 and to member 105 at 104. An eccentric 106 is positioned in arm 94 and connected to the member 102. The eccentric is provided with a handle 107 for varying the pressure between the rolls 83, 85, 87 and 91. Member 105 is connected to member 102 at 104 and to member 95 to control the amount of coating material on applicator roll 83. An eccentric 106a is connected to the frame member carrying the metering roll 75 through member 102a. The eccentric 106a has connected therewith handle member 107a. To remove the coating material from the surface of the doctoring roll 91, doctor blade 109 is adjustably positioned against the surface. This doctoring blade is suitably supported by member 108. The surplus coating material removed from the roll 91 is returned through trough 111 and pipe 112 to the coating container 79.

In operation, the coating material is fed to the fountain 74 near the top thereof, and an excess of coating material is forced between the applicator roll 83 and the metering roll 75. A predetermined amount of coating material is left upon the surface of the roll 83 by the metering roll 75. The doctor roll 85 removes a predetermined amount from the applicator roll 83 and the remainder of the coating on the applicator roll after it has been smoothed and the surplus removed by roll 85 is applied to the web of paper which is supported by the backing roll 44. The coating material now on the surface of the doctoring roll 85 is transferred to the surface of the applicator roll 87. The coating material on the applicator roll 87 is then smoothed and the surplus removed therefrom by doctor roll 90. The coating material removed from the surface of the applicator roll 87 is then transferred to the surface of the web of paper which is supported by the backing roll 44. The coating material removed by the doctor roll 40 is removed by resilient covered doctor roll 91 and then the doctor blade removes the coating material from the doctor roll 91 and the coating is returned to the coating container.

The paper to be coated preferably contains a moisture content of not more than about ten percent at the time the first coat of coating material is applied, and the coating material used preferably should have a solid content of greater than sixty percent. The apparatus hereinbefore described may be used with hot melt coating material, and in such a case the backing member or roll 44 is provided with a cooling medium. Where the coating is of the material-adhesive such as starch clay or similar material, the backing means is heated to dry the coating material applied to the paper.

Another feature of this invention is the application of a wet film of coating material over another wet film of coating material. This is termed wet trapping. For the purpose of this application, wet trapping is defined as the application of a wet film of coating material over another wet film. It is possible in this application to wet trap without changing the viscosity of the coating material.

What we claim:

1. An apparatus for coating a sheet or the like surface, comprising a container for a bath of coating material, a rotatable depositing roll dipping into the said bath, a metering roll mounted in the bath at a selected distance from the depositing roll, a doctor roll for removing a portion of the coating material from the said depositing roll and smoothing in substantially even film the coating material remaining on the said depositing roll, a second depositing roll wiping said doctor roll's periphery to remove substantially all the coating material therefrom, a second doctor roll wiping the periphery of said second depositing roll so as to leave a measured quantity of coating material on said periphery, a roll for removing substantially all the coating material from said second doctor roll, and means for removing the coating material from the roll wiping the second doctor roll.

2. An apparatus for depositing a flowable adhesive coating to a sheet or the like surface in a

substantially even smooth film, comprising a container for a bath of coating material, a rotatable depositing roll dipping into the bath of coating material, a metering roll mounted in the bath at a selected distance from the depositing roll, a doctor roll for removing the coating material from the said depositing roll and smoothing in a substantially even film the coating material remaining on the said depositing roll, a second depositing roll wiping said doctor roll's periphery to remove substantially all coating material therefrom, a second doctor roll wiping the periphery of said depositing roll so as to leave a measured quantity of coating material on said periphery, a roll for removing substantially all the coating material from said second doctor roll, means for removing the coating material from the roll wiping the second doctor roll, and backing means for carrying the sheet material to which the coating material is supplied.

3. In combination with a backing roll, an apparatus for coating a web comprising a fountain for coating material, a resilient surfaced applicator roll dipping into the coating material in said fountain, a hard surfaced metering roll mounted in said fountain at a selected distance from said applicator roll, a hard surfaced doctor roll for removing a part of the coating material carried by the applicator roll, a second resilient surfaced applicator roll for removing the coating material from the surface of the doctor roll, a second hard surfaced doctor roll for removing a portion of the coating material carried by the second applicator roll, a resilient surfaced roll for removing the coating from the second doctor roll and means for supplying coating material to the fountain.

4. An apparatus for coating a moving web of paper, comprising a container for a bath of coating material, a rotatable applicator roll dipping into the said container, a metering roll mounted in the said container at a selected distance from the applicator roll, a doctor roll for removing a portion of the coating material from said applicator roll, a second applicator roll wiping substantially all the coating material from the periphery of the doctor roll, a second doctor roll for removing a portion of the coating material from the said second applicator roll, means for removing the coating material from said doctor roll, and means for varying the pressure between the applicator rolls and the doctor rolls.

5. An apparatus for coating a moving web of paper comprising, a container for a bath of coating material, a rotatable applicator roll dipping into the said container, a metering roll mounted at a selected distance from the applicator roll, a doctor roll for removing a portion of the coating material from said applicator roll, a second applicator roll wiping substantially all the coating material from the periphery of the doctor roll, means for removing a portion of the coating material from said second applicator roll, and means for varying the pressure between the applicator rolls and the doctor rolls.

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