

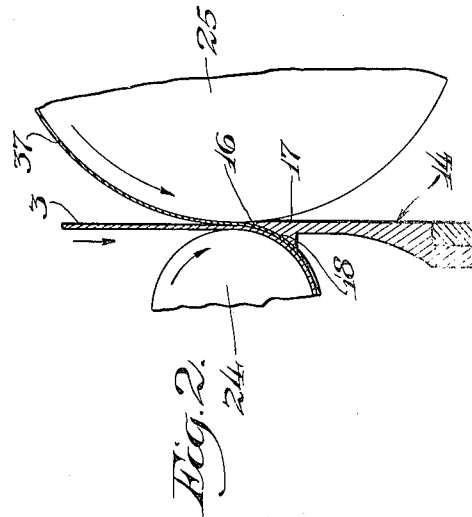
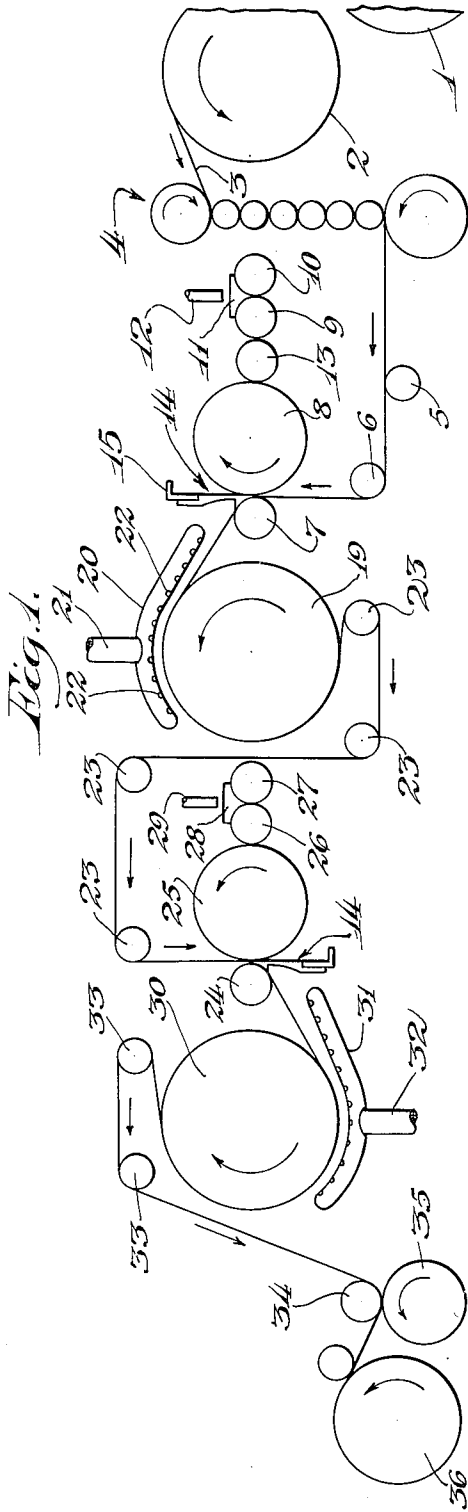
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G. D. MUGGLETON

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COATING APPARATUS

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Inventor:  
*Gerald D. Muggleton*  
By *Lee J. Gary*  
Attorney.

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## COATING APPARATUS

Gerald D. Muggleton, Appleton, Wis., assignor to Consolidated Water Power & Paper Company, Wisconsin Rapids, Wis., a corporation of Wisconsin

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2 Claims. (Cl. 91—33)

This invention relates to improvements in means for coating paper, and refers specifically to an apparatus for coating paper wherein unevenness, streaks, tracks or the like in the coating are prevented during the coating operation.

In roll coating operations, that is, operations wherein a mobile coating material is applied to the surface of a web of paper or the like by means of an applicator or coating roll, difficulty is sometimes encountered in that streaks, ridges, tracks or the like are formed in the coating film upon the web. These disfigurements appear to be due to the surface tension of the mobile coating and are frequently exaggerated by the use of binders necessary for a satisfactory coating material, and without which the coatings would not adhere to the web surface. The streaks or tracks are formed primarily when the applicator roll surface leaves the surface of the web after the coating has been deposited thereon and the disfiguration appears to be accentuated where the applicator roll surface and the web surface part in a more or less gradual manner. Where the parting of the roll surface and the coated web is more abrupt, the track formation appears to be minimized.

Briefly described, my invention contemplates the application of a fluid coating material to a web of paper by means of a rotating surface, and immediately following the initial application of the coating to the web a coating stripping blade strips coating from the rotating surface and deposits it upon the web. The coating stripping blade is so constructed and so positioned that the web immediately moves between a surface of the blade and a second rotating surface in such a manner that the coating film is smoothed by the blade surface.

Two important features are inherent in my invention; one, by stripping the coating from the applicator roll a comparatively abrupt separation of the web surface from the applicator roll surface is brought about, and in addition a greater quantity of coating material can be applied to the web surface per pass, and; two, the coating carried by the web is smoothed before the fibrous web has an opportunity to absorb the liquid portions of the coating material, that is, before the coating material partially sets or loses a portion of its mobility.

Other objects and advantages of my invention will be apparent from the accompanying drawing and following detailed description.

In the drawing,

Fig. 1 is a diagrammatic view of suitable apparatus for carrying out my invention.

Fig. 2 is an enlarged detailed view of the coating stripping blade in operative position.

Referring in detail to the drawing, 1 and 2 indicate the last two drier drums of a battery of driers which comprises the dry end of the usual paper machine (not shown). A web of paper 3, passed from the wet end of the paper machine is trained around the drier drums comprising the drying section of the machine and is passed from the last drier drum 2 to a calender stack 4 which comprises a plurality of superimposed rolls between which the web 3 passes and the surfaces thereof are smoothed.

After leaving the calender stack 4, the web is passed over guide rolls 5 and 6 carried between rolls 7 and 8. Roll 8 is a coating roll or applicator roll and roll 7 is a bed roll. Roll 8 is preferably constructed of metal and has a relatively highly finished surface, and the surface of roll 7 is preferably constructed of rubber or other resilient material.

A pair of osculating rolls 9 and 10, having their axes disposed in substantially the same horizontal plane, are positioned adjacent roll 8. A dam 11 is positioned at each end of the nip formed by the rolls 9 and 10 and extends into said nip to prevent mobile coating material, passed to the nip through pipe 12, from leaking out at the ends of the nip. This arrangement of rolls is well known to the art and is frequently referred to as a metering or gate roll arrangement. A transfer roll 13 is in osculating relationship with rolls 8 and 9 and serves to convey coating material from the surface of roll 9 to the surface of the applicator roll 8.

As a feature of my invention, I position in the exit nip of the rolls 7 and 8, a coating stripping blade 14. The member 14 is supported by a portion of the frame of the machine (not shown) to which a bracket 15 is attached. The opposite end of the member 14 is brought to a relatively sharp edge, as indicated at 16 in Fig. 2. The member 14 extends the length of the roll 8 and the edge 16 bears upon the surface of said roll. On one side of the edge, that is, the side adjacent the applicator roll, the member 14 is flat, as shown at 17 in Fig. 2, but on the opposite side of the edge the member is curved in substantial conformity with the bed roll, as shown at 18 in Fig. 2.

As will be hereinafter more fully described a portion of the coating material carried upon the surface of roll 8 contacts and is deposited upon a surface of the web 3 in a manner quite similar to the operation of conventional roll coaters.

However, as the web proceeds further into the nip of rolls 7 and 8, the edge 16, in contact with the surface of roll 8 strips substantially all of the coating material upon the surface of roll 8 and diverts it into contact with the web surface. The coated web then passes between the curved surface 18 and the surface of roll 7 wherein the coating is smoothed.

The web 3 after passing between the curved surface 18 and roll 7 is carried around a heated drier drum 19. A chest 20 is positioned over the freshly coated side of the web 3 during its travel from roll 7 to drum 19 and during a portion of its travel over the surface of drum 19. Air under pressure, preferably heated air, is introduced into the chest 20 through conduit 21 and the chest is provided with a plurality of apertures 22 whereby air under pressure is blown upon the freshly coated surface. The combination of the heated drum 19 and the air blown upon the freshly coated surface of the web causes the coating material carried by the web to set whereby said web may be trained around guide rolls 23 with the coated side in contact with the guide roll surfaces without marring said coated surface.

The web 3 after leaving the last guide roll 23 is carried into the nip of rolls 24 and 25, roll 24 being a bed roll similar to roll 7 and roll 25 being a coating or applicator roll similar to roll 8. A pair of gate rolls 26 and 27 are disposed adjacent roll 25, said gate rolls carrying a dam 28 adjacent each end of the nip formed by said rolls. Coating material is introduced into the nip of the gate rolls by means of pipe 29, the arrangement being similar to that comprising rolls 9 and 10, dam 11 and pipe 12, hereinbefore described.

A coating stripping blade 14 is positioned in the exit nip of rolls 24 and 25 and functions in a manner hereinafter more fully described. The web 3 after leaving the roll 24 wherein it was confined between the surface of said roll and the curved surface 18 of the member 14, is passed to the surface of a drier drum 30. A chest 31 is positioned beneath the coated surface of the web 3 during its passage from roll 24 to drum 30 and during a portion of its passage over the surface of said drum. The chest 31 is provided with a plurality of apertures whereby air under pressure, preferably heated air, passed into the chest 31 through conduit 32, is discharged into contact with the freshly coated surface of the web 3. The combination of the heated drum and the air discharged from the chest 31 tends to set the coating on the web and permits the web to be trained around the guide rolls 33 with its coated surface in contact with the surfaces of the guide rolls.

After passing around the last guide roll 33 the web is carried between draw rolls 34 and 35 and subsequently wound upon the reel 36.

Although my invention has been described as a continuous operation in step with the making of paper upon a paper machine, it is to be understood that the coating unit, hereinbefore described, may be operated as a separate, independent unit.

Referring particularly to Fig. 2, it will be noted that a film 37 of coating material is carried upon the surface of the applicator roll 25 on the entrance side of the nip formed by rolls 24 and 25. It will also be noted that the web 3 contacts said film as the web 3 enters the nip. If the web 3 were carried through the nip without the use of the member 14, the web would be separated from

the surface of the roll 25 at the exit side of the nip. Inasmuch as the coating film 37, at the nip, would divide itself, a portion adhering to the web and a portion remaining on the roll surface, the separation of the web from the roll surface would be attended by a pulling or stringing of the coating material, due primarily to its surface tension. When the elastic limit of the coating material was reached the coating film upon the web would be marked with ridges or tracks, as would also the coating material remaining on the roll surface.

However, by employing the member 14, the sharp edge 16 thereof strips substantially all of the coating from the roll 25 before the web begins to separate from the surface of the coating roll, in effect simultaneously stripping the web and coating material from the surface of the roll 25 and effecting a comparatively clean and abrupt separation of the web from the coating roll. In this manner the pulling or stringing of the coating material is eliminated and hence streaks or tracks are prevented from forming.

It is of advantage, in roll coating, to use a coating material having as high a solids content as possible, preferably a coating having over 50 percent solids, since subsequent drying of the coating is thereby facilitated. It is also of advantage to apply as heavy a coating on a web in a single operation as possible. With my invention both of these advantages are attainable since the application of the coating material to the web is not dependent only upon the amount of coating which will adhere to the web by absorption, but an additional amount is mechanically lifted from the coating roll and applied to the web surface.

In addition, by the peculiar formation of the curved surface 18, that is, the surface 18 has a radius of curvature approximating the radius of curvature of roll 24 and substantially concentric with said roll, a smoothing operation is performed upon the coating on the web. This operation is not intended to remove streaks or tracks incident to the application of the coating material since the edge 16 eliminates these disfigurations. However, unevenness in the surface of the paper itself or protruding fibres will cause a disfigured coating, but by the smoothing action of the curved surface these disfigurations are removed.

It will be noted that the coating upon the web 3 is brought into contact with the smoothing surface 18 immediately after its application to the web surface and before the fibrous web has had time to absorb an appreciable quantity of the liquid content of the coating. In other words, the coating is still in a desirably fluid state whereby smoothing may be accomplished most effectively. This factor is also conducive to the use of a coating material having a relatively high solids to liquid ratio.

While my invention is particularly suited to the coating of paper webs with mineral coating, it can be adapted to the application of substantially any surface modifying liquid material wherein the separation of the filmed surface from the applicator surface can be performed with advantage by mechanically cutting the bond between the film and the applicator surface without disturbance to the surface to which the film is applied.

I claim as my invention:

1. A device for coating paper which comprises, a rotating coating roll, means for continuously applying a coating material to the surface of

said roll, a rotating bed roll in substantially  
 osculating relationship with said coating roll,  
 said rolls rotating in opposite angular directions,  
 means for passing a web of paper into the nip  
 of said rolls in the direction of rotation of said  
 roll surfaces whereby a portion of the coating  
 material carried upon the coating roll is trans-  
 ferred to a surface of the web, means for sup-  
 porting said web upon said bed roll, a coating  
 stripping blade positioned adjacent the exit side  
 of said nip, said blade having an edge in contact  
 with said coating roll to strip coating material  
 from said coating material and apply the same  
 to said web, and means carried by said stripping  
 blade for smoothing said coating on said web  
 while the same is supported upon said bed roll.  
 2. A device for coating paper which comprises,  
 a rotating coating roll, means for continuously  
 applying a coating material to the surface of  
 said roll, a rotating bed roll in substantially oscu-

lating relationship with said coating roll, said  
 rolls rotating in opposite angular directions,  
 means for passing a web of paper into the nip  
 of said rolls in the direction of rotation of said  
 roll surfaces whereby a portion of the coating  
 material carried upon the coating roll is trans-  
 ferred to a surface of the web, means for sup-  
 porting said web upon said bed roll, a coating  
 stripping blade positioned adjacent the exit side  
 of said nip, said blade having an edge in contact  
 with said coating roll to strip coating material  
 from said coating material and apply the same  
 to said web, and means carried by said stripping  
 blade for smoothing said coating on said web  
 while the same is supported upon said bed roll,  
 said means having a curved base substantially  
 concentric with said bed roll between which and  
 the bed roll said web passes.

GERALD D. MUGGLETON.