Feb. 13, 1945 W. F. THIELE ET AL 2,369,378

PAPER COATING DEVICE

Original Filed May 31, 1939 2 Sheets-Sheet 1

Fig. 1.

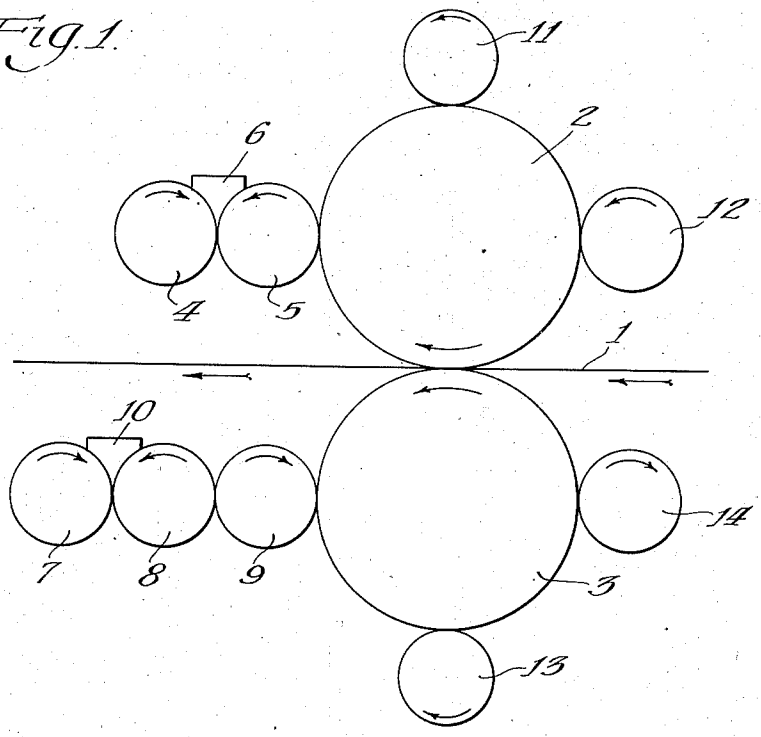
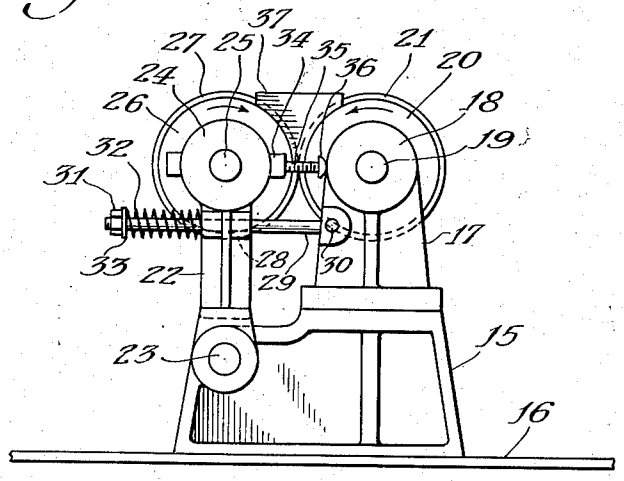


Fig. 2.



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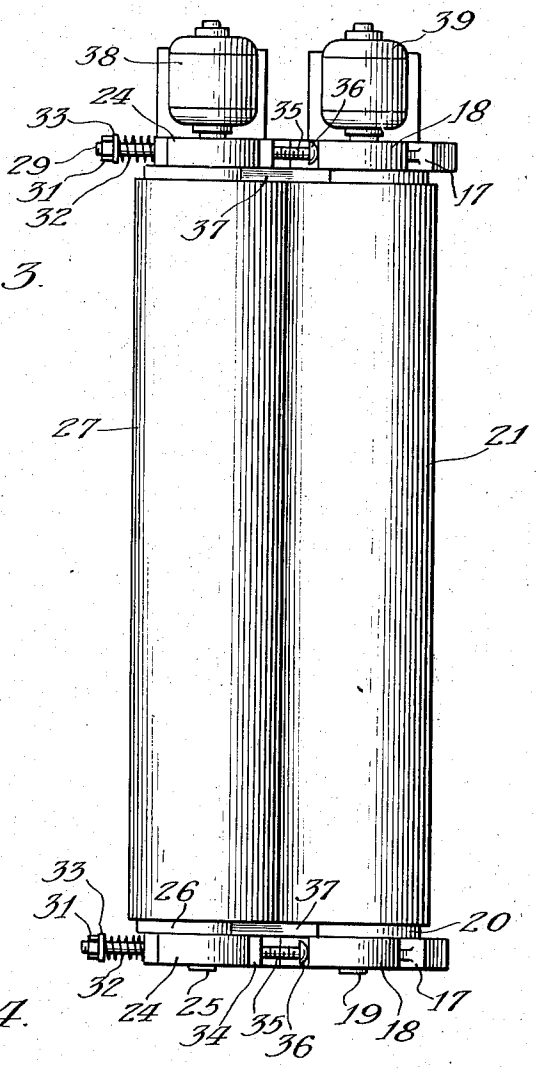
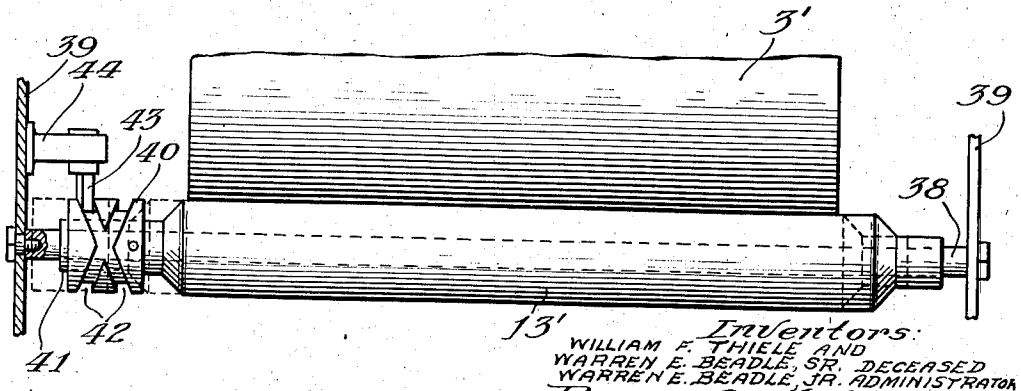


Fig. 3.

Fig. 4.



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2,369,378

PAPER COATING DEVICE

William F. Thiele, Wisconsin Rapids, Wis., and Warren E. Beadle, Sr., deceased, late of Wisconsin Rapids, Wis., by Warren E. Beadle, Jr., administrator, Biron, Wis., assignors to Consolidated Water Power and Paper Company, Wisconsin Rapids, Wis., a corporation of Wisconsin

Original application May 31, 1939, Serial No. 277,460. Divided and this application January 10, 1942, Serial No. 426,320

6 Claims. (Cl. 91—49)

This is a division of our co-pending application Serial No. 277,460, filed May 31, 1939, and relates to improvements in apparatus for coating paper to provide a desirable printing surface thereon, and refers specifically to an apparatus wherein the rate of the transfer of the coating material to the paper web can be accurately controlled.

In all coating apparatuses wherein the coating material is applied to the paper web by means of a roll, and wherein no after-operations are performed on the coated surface after the coating has once been applied, two predominant difficulties are encountered. First, the rate of passage of the coating material to the coating roll is difficult to control and it is essential that this rate be as uniform as possible; and, secondly, it is difficult to secure a coating material of uniform fine texture and free from lumps continuously passing to the coating roll.

In our invention, an apparatus is provided in which the rate of passage of the coating material to the coating roll can be minutely controlled, and the coating material is so acted upon prior and during passage to the coating roll that its texture is maintained uniform.

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

In the drawings,

Fig. 1 is a diagrammatic side elevational view of our coating apparatus.

Fig. 2 is a side elevation view illustrating the gate rolls employed in the apparatus illustrated in Fig. 1.

Fig. 3 is a top plan view of the gate rolls illustrated in Fig. 2.

Fig. 4 is a fragmentary elevational view of one of the longitudinally oscillating rolls in contact with a coating roll.

Referring in detail to the drawings, with particular reference to Fig. 1, a web 1 passes continuously in the direction of the arrows between coating rolls 2 and 3. The rolls 2 and 3 are preferably provided with a surface layer of medium hard rubber or other like semi-resilient material. The rolls 2 and 3 are driven by any suitable prime mover (not shown) at a peripheral speed either slightly higher or slightly lower, or equal to the translatory speed of the web 1. Preferably the peripheral speed of rolls 2 and 3 is slightly greater than the translatory speed of the paper web.

A pair of rolls 4 and 5 are disposed adjacent roll 2, rolls 4 and 5 being mounted in such a manner as to have their degree of contiguity adjustable as will be hereinafter more fully described. If desired, the rolls 4 and 5 may be made adjustable with respect to the coating roll 2. As will be hereinafter more fully described, rolls 4 and 5 may be driven independently and the relative speeds of said rolls may be changed with respect to each other, or, if desired, said rolls may be geared together to run at the same peripheral speed.

The speed of roll 5 with respect to the coating roll 2 is maintained different. A pair of dams 6 are positioned adjacent the ends of rolls 4 and 5, said dams functioning as closures at the nip of the rolls. The dams 6 may be constructed of hard rubber or any material which is frictionless in the presence of the usual coating material. We have found that the material known to the trade as "Eel-slip" operates very successfully as closure dams when utilized with coating material for the coating of paper.

A pair of rolls 7 and 8 are disposed adjacent each other and as will be hereinafter more fully described, means is provided whereby the degree of contiguity of said rolls may be controlled. A transfer roll 9 is interposed between rolls 8 and 3, and means is provided whereby rolls 7 and 8 are adjustable with respect to roll 9 so as to control the degree of contiguity between rolls 8 and 9. Rolls 7 and 8 may be driven independently so that the peripheral speeds of said rolls may be varied with respect to each other, or said rolls may be geared together to run at the same peripheral speed. Roll 9 may be driven at a peripheral speed equal to that of roll 8 and at a speed different from that of roll 3. Dams 10 are carried adjacent the ends of rolls 7 and 8 and function in a manner similar to dams 6.

Rolls 11 and 12 are positioned adjacent the periphery of coating roll 2, said rolls 11 and 12 being angularly spaced from each other a distance of approximately 90% around the periphery of roll 2.

Rolls 11 and 12 are adapted to make contact with the surface of roll 2 and are preferably longitudinally or axially reciprocated. Similarly rolls 13 and 14 are arranged in like relationship with respect to the coating roll 3. In the operation of the device, illustrated in Fig. 1, coating material is continuously fed into the nip of rolls 4 and 5 and rolls 7 and 8, and the body of the coating material is maintained in said nips by the respective dams 6 and 10. By controlling the relative speeds of roll 5 with respect to roll 2, a predetermined quantity of coating material may be applied to the surface of roll 2, and similarly, by controlling the relative peripheral speeds of

rolls 8 and 9 or 9 and 3, a predetermined quantity of coating material may be passed to the surface of the coating roll 3. Obviously all of the various contacting rolls may have their peripheral speed varied with respect to each other and a very minute control of the rate of passage of the coating material to the surface of rolls 2 and 3 is possible. By the provision of axially reciprocating rolls 11, 12, 13 and 14, the coating material applied to the surface of coating rolls 2 and 3 is smoothed and the films carried on said rolls have uniform thicknesses. The web 1 in passing between the rolls 2 and 3 picks up said films on each surface thereof, the films being laid thereon in their final form.

Referring particularly to Figs. 2 and 3, a physical embodiment of the gate rolls 4 and 5 or 7 and 8, diagrammatically illustrated in Fig. 1 is shown. With specific reference to Fig. 2, 15 indicates one side of a supporting frame which may be positioned upon floor 16, or in the case of rolls 4 and 5, said frame may be supported from a beam positioned above the path of travel of the web 1 (not shown). There is a frame 15 on each side of the machine and each frame carries a standard 17, in the upper portion of which is mounted a bearing 18. A shaft 19 is journalled at each end in opposite bearings 18, said shaft carrying a roll 20. The roll 20 is provided with a surface layer 21 which is preferably constructed of hard rubber or material which effectively resists the wearing action of paper coating materials such as the usual clay dispersions.

A standard 22 is pivotally connected as at 23 to each of the frames 15, each of said standards carrying a bearing 24 at the upper end thereof. A shaft 25 is journalled at each end in one of the bearings 24, said shaft carrying a roll 26. The roll 26 is provided with a surface layer 27 which is preferably constructed of hard rubber or material such as the layer 21.

Each of the standards 22 is provided with an aperture 28 through which a link 29 is adapted to freely pass. One end of each link 29 is pivotally connected to a standard 17 at each end of the roll 20 as shown best at 30 in Fig. 2. The opposite end of each link 29 carries a nut 31 which is threadedly engaged on the end of said link and serves to confine coil spring 32 between the standard 22 and a washer 33 disposed adjacent nut 31.

A boss 34 is integrally formed upon each bearing 24 and is internally threaded to receive a screw 35 having a hemispherical head 36.

The arrangement is such that screw 35 may be so adjusted as to determine the minimum clearance between the surfaces of rolls 20 and 26 when standards 22 are urged toward standards 17 by means of springs 32. It can readily be seen that the hemispherical heads 36 carried by screws 35 abut against bearings 18 and thus limit the degree to which roll 26 may approach roll 20.

The surfaces 21 and 27 upon rolls 20 and 26 respectively, terminate short of the ends of the respective rolls, and at each end of the surface layers 21 and 27, a dam 37 is positioned which functions as a closure at the nip of the rolls. The dams 37 may be constructed of hard rubber or any material which is frictionless in the presence of the usual coating material as has been hereinbefore described with respect to dams 6 and 10.

The rolls 20 and 26 correspond to rolls 7 and 8 illustrated in Fig. 1 and a similar arrangement is contemplated with respect to rolls 4 and 5, that is, similar means is provided for controlling the degree of contiguity of rolls 4 and 5.

Referring particularly to Fig. 3, a motor 38 is directly connected to shaft 25 and a motor 39 is directly connected to shaft 19. A similar arrangement is contemplated in conjunction with rolls 7 and 8 and rolls 4 and 5. By the provision of separate driving means for the rolls 4 and 5 and the rolls 7 and 8, the amount of coating material passed from the nips of the rolls 4 and 5 and 7 and 8 may be controlled by varying the peripheral speeds of, for instance, the roll 4 with respect to the roll 5, or by varying the peripheral speed of the roll 7 with respect to the roll 8. In addition, by properly adjusting the screws 35 which control the degree of contiguity of the gate rolls, the amount of coating material which is delivered from the nips of the gate rolls may be controlled. It can readily be seen that if the screws 35 are so adjusted as to decrease the clearance between the two gate rolls, a lesser amount of coating material will be passed forwardly to the coating rolls 2 and 3.

Referring particularly to Fig. 4, a coating roll 3' is illustrated which may correspond to the coating roll 3 or the coating roll 2. A roll 13' is disposed adjacent the surface of roll 3' in a manner contemplated in conjunction with the relationship of rolls 11 and 12 with respect to the coating roll 2 and the rolls 13 and 14 with respect to the coating roll 3.

The roll 13' may be slidably positioned upon a shaft 38 which, in turn, may be rigidly secured at its opposite ends to a frame 39. At one end of the roll 13', a cam 40 may be positioned, said cam being rigidly secured to a restricted portion 41 of the roll 13'. The cam 40 is provided with cam slots 42 into which a guide member 43 is adapted to be positioned. The guide member is carried by a standard or bracket 44 which is rigidly affixed to frame 39.

The rolls 11, 12, 13 and 14 during rotation, as has been hereinbefore described, are axially reciprocable whereby the coating material carried upon rolls 2 and 3 is rendered smooth and of even thickness. It is to be understood, of course, that the means for reciprocating the roll 13' forms no part, per se, of our invention and that said rolls 11, 12, 13 and 14 may be reciprocated axially by any conventional roll reciprocating means.

We claim as our invention:

1. A device for coating a paper web which comprises a rotating coating roll, means for controllably passing coating material in predetermined amount to the surface of said roll in the form of a film, an axially reciprocating roll disposed adjacent said coating roll and rotatable therewith with its surface in contact with the coating material upon the coating roll and positioned with respect to the coating roll to contact and smooth said coating material thereon after application thereto and render the film uniform in thickness before transfer to the web, and means for passing a paper web into contact with the film of coating material on the coating roll to transfer said film to the surface of the web.

2. A device for coating a paper web which comprises a rotating coating roll, means for controllably passing coating material in predetermined amount to the surface of the said roll in the form of a film, means for passing a paper web into contact with the film of coating material on the coating roll to transfer said film to the surface of the web, and an axially recipro-

cating roll disposed adjacent said coating roll and rotatable therewith with its surface in contact with the coating material upon the coating roll to smooth said coating material and render the film uniform in thickness, said reciprocating roll being so positioned with respect to the coating roll as to contact the film thereon after said film has been applied thereto and before the film is transferred to the web.

3. A device for coating a paper web which comprises a rotating coating roll, means for controllably passing coating material in predetermined amount to the surface of the said roll in the form of a film, means for passing a paper web into contact with the film of coating material on the coating roll to transfer said film to the surface of the web, and a plurality of axially reciprocating rolls disposed adjacent said coating roll and rotatable therewith with their surfaces in circumferentially spaced contact with the coating material upon the coating roll to smooth said coating material and render the coating film uniform in thickness, said reciprocating rolls being so positioned with respect to the coating roll as to contact the film thereon after said film has been applied to said coating roll and before the film is transferred to the web.

4. A device for coating a paper web which comprises a rotating coating roll, means for controllably passing coating material in predetermined amount to the surface of said roll in the form of a film, comprising a pair of juxtaposed gate rolls adapted to carry a quantity of coating material in their nip, means for rotating said gate rolls, one of said gate rolls being in contact with said coating roll to transfer coating material from the nip to the coating roll surface, an axially reciprocating roll disposed adjacent said coating roll and rotatable therewith with its surface in contact with the coating material upon the coating roll to smooth said coating material and render the film uniform in thickness, and means for passing a paper web into contact with the film of coating material on the coating roll to transfer said film to the surface of the web, said reciprocating roll being so positioned with respect to the coating roll as to contact the film thereon after said film has been applied thereto and before the film is transferred to the web.

5. A device for coating a paper web which comprises a rotating coating roll, means for controllably passing coating material in predetermined amount to the surface of said roll in the form of a film, comprising a pair of juxtaposed gate rolls adapted to carry a quantity of coating material in their nip, means for rotating said gate rolls, a transfer roll disposed between said gate rolls and said coating roll, said transfer roll being in contact with said coating roll and one of said gate rolls to transfer coating material from said gate roll to the coating roll, an axially reciprocating roll disposed adjacent said coating roll and rotatable therewith with its surface in contact with the coating material upon the coating roll to smooth said coating material and render the film uniform in thickness, and means for passing a paper web into contact with the film of coating material on the coating roll to transfer said film to the surface of the web, said reciprocating roll being so positioned with respect to the coating roll as to contact the film thereon after said film has been applied thereto and before the film is transferred to the web.

6. A device for coating both surfaces of a continuously passing paper web which comprises, a pair of juxtaposed rotating coating rolls, means for controllably passing coating material in predetermined amount to the surface of each of said coating rolls in the form of a film, an axially reciprocating roll disposed adjacent each of said coating rolls and rotatable therewith with its surface in contact with the coating material upon the respective coating roll to smooth said coating material and render the films on each coating roll uniform in thickness, and means for passing a paper web into contact with the films of coating material on the coating rolls to transfer said films to the surfaces of the web, said reciprocating rolls being so positioned with respect to the coating as to contact the film thereon after said film has been applied to said coating roll and before the film is transferred to the web.

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