April 13, 1943. W. A. NIVLING 2,316,531

SIZING AND COATING APPARATUS

Filed Dec. 14, 1940 2 Sheets-Sheet 1

Fig. 1.

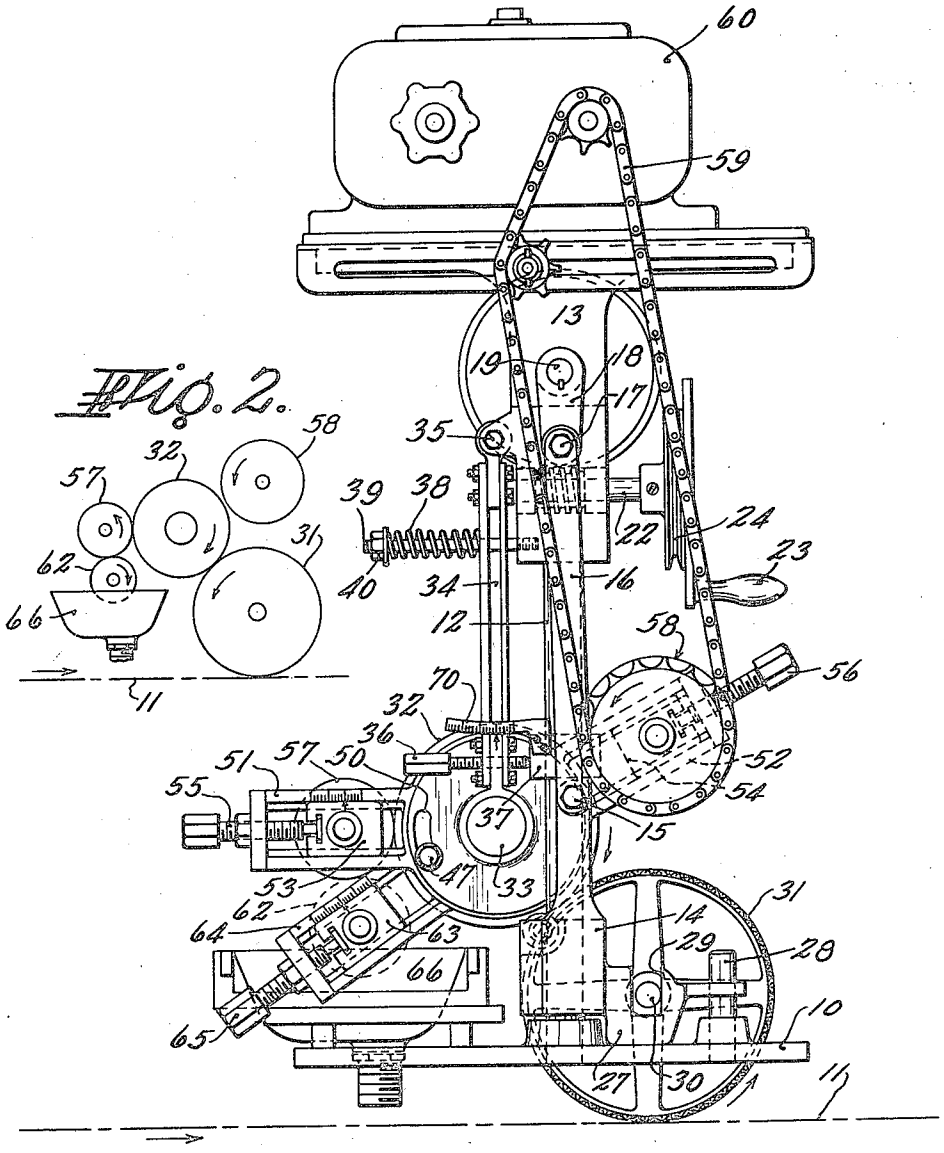


Fig. 2.

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Fig. 3.

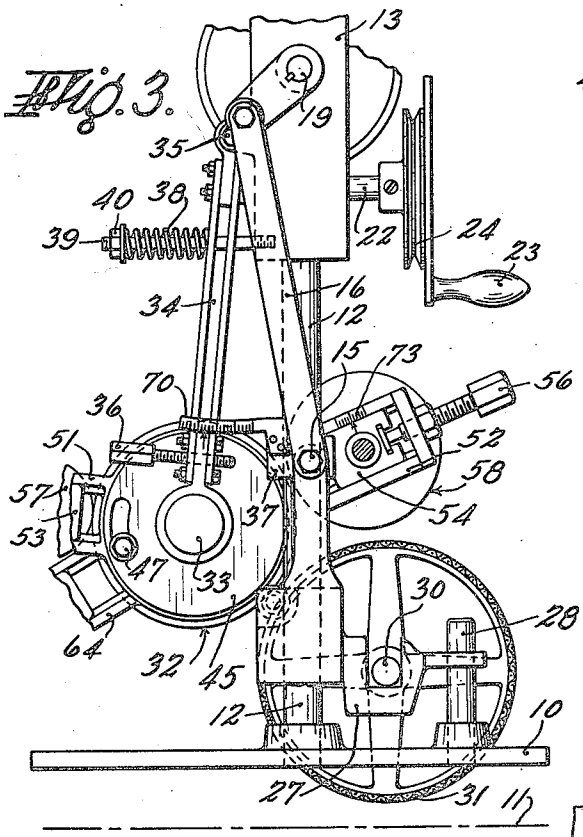


Fig. 4.

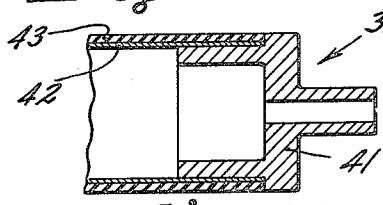


Fig. 5.

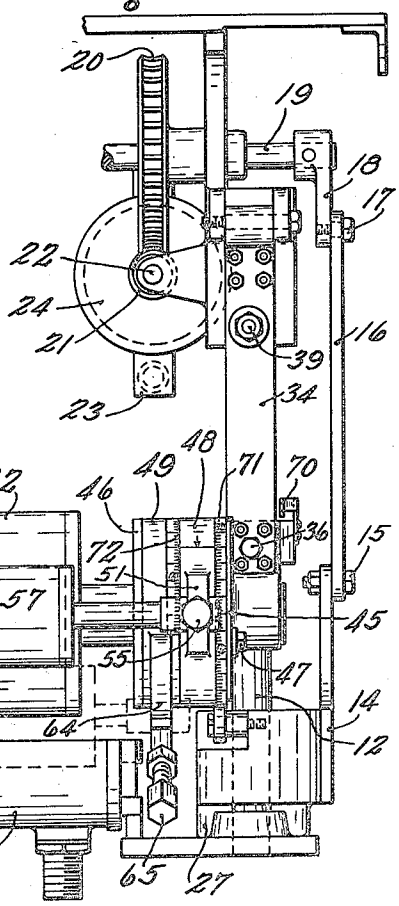
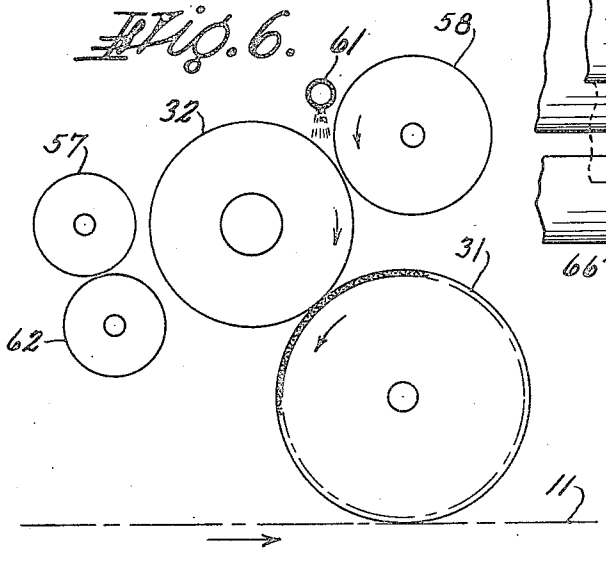


Fig. 6.



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UNITED STATES PATENT OFFICE

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SIZING AND COATING APPARATUS

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Application December 14, 1940, Serial No. 370,124

9 Claims. (Cl. 91—50)

This invention relates to improvements in devices for applying a liquid to moving surfaces, and is particularly designed for applying such liquids as sizing material or coating agents to a web of paper in process of formation upon the wire of a Fourdrinier machine. For various purposes it is desirable to apply a coating to the web while it is still upon the wire, particularly where a colloidal solution of size is to be applied to the web. Previously it has been proposed to apply this material either by spraying or by permitting it to flow down an inclined apron, but neither of these methods secures the necessary accuracy of control to secure an evenly sized web. Similarly, the application of coating materials to the web at a time when the web is sufficiently porous to permit suction to draw the coating material partially into the web substance has, to my knowledge, never before been carried on with the necessary accuracy of distribution. In accordance with the present invention the liquid material is applied to the web by a roll which for some purposes constructed similarly to a dandy roll, that is to say, with its outer surface formed of thin wire gauze. I have found that a much more accurate distribution of liquid can be obtained if it is carried in the interstices of such a wire web, although in certain applications of the invention as to coating materials it is not necessary that this wire mesh surface be employed. The detailed features by which the desired accuracy of distribution is attained, and the means by which the distribution is made reproducible, will be described below.

I will now explain the apparatus which forms the subject of the invention in connection with the accompanying drawings, in which

Fig. 1 is a side elevation of the device;

Fig. 2 is a diagrammatic view thereof illustrating the application of coating material;

Fig. 3 is a fragmentary side elevation with the parts in a different position;

Fig. 4 is a detail of one of the rolls;

Fig. 5 is a fragmentary front elevation; and

Fig. 6 is a diagrammatic view illustrating the device as applied to the application of sizing material to the web.

The device is carried upon a frame 10 which may be supported in any suitable manner beside the Fourdrinier wire here indicated at 11. From the support 10 arise posts 12 carrying at their upper ends brackets 13. Upon the lower end of the posts slide vertical members 14 pivoted at 15 to links 16, pivoted in turn at 17 to cranks 18 keyed upon a shaft 19. The shaft 19 carries a worm wheel 20 engaging a worm 21 on a cross shaft 22. The end of this shaft bears a crank handle 23 by which it may be rotated and also has a pulley 24 by which it may be rotated from any suitable source of power. As the handle is rotated the crank 18 will be turned and the members 14 raised slightly with respect to the support 10. Secured to the members 14 are journal boxes 27 preferably having bearing upon vertical posts 28 arising from the support. The journal boxes are formed with ways 29 in which the shaft 30 of a coating roll 31 is freely mounted. This coating roll is preferably formed similarly to the usual dandy roll and normally rests upon the Fourdrinier wire 11, being rotated by contact with the paper web thereon. As the member 14 is elevated by the mechanism described, the dandy roll 31 will be raised free of the web on the wire. When it is desired to stop the moving web the dandy roll 31 should be elevated to be out of contact therewith. The handle 23 may be utilized to do this manually or the pulley 24 above mentioned may be used as a remote control or automatic device by which to raise the roll 31 when the web 11 stops.

Running in contact with the dandy roll 31 is a transfer roll 32 carried by a shaft 33 journaled at the bottom of a pair of pendulum-like members 34 which are swung from pivots 35 on the brackets 13. It is necessary for the roll 32 to have an extremely accurate surface and, at the same time, to be light in construction, and for this purpose it is preferably constructed as shown in Fig. 4. As will there appear the roll has end pieces 41 which support a shell member 42, this shell member being provided with a coating 43 of hard rubber. On account of inherent strains it is impossible to grind a thin metallic shell so that it will retain permanently a high degree of accuracy, the ground shell gradually deforming due to the release of these strains. By coating the shell with hard rubber and then grinding the rubber it has been found that a degree of accuracy can be obtained comparable to that possible with heavy cast-iron rolls, which would have too much inertia for use in the present apparatus. The pendulums 34 carry stop screws 36 which rest against an abutment 37, thereby holding the roll 32 in proper spaced relation to the roll 31. Each pendulum is pressed toward the abutment as by a spring 38 carried on posts 39 extending outwardly from the bracket 13 and having a nut 40 adjustably mounted thereon. By this construction the member 14 can be raised to elevate the roll 31 without the necessity of dismounting the roll 32, the latter roll merely swinging about its pendulum mounting.

The lower end of the pendulum 34 carries a plate 45 to which a plate 46 is secured as by bolts 47. Two members 48 and 49 are clamped between the two plates, the plates and the members being suitably slotted as at 50 to permit angular adjustment of the two members with respect to each other, and with respect to the pendulum. One of the members, as 48, carries two brackets

51 and 52 in which journal boxes 54 and 53 are adjusted as by screws 55 and 56 clamped in place by lock nuts and having a T-slot connection with the bearing block. Bracket 51 carries a roll 57 and bracket 52 a roll 58, the latter roll being driven as by a chain and sprocket connection 59 from a change gear box 60 mounted on the top of brackets 13 and driven from any suitable source of power. The roll 57 is driven by contact with the roll 32 which itself is driven from the roll 31. If desired, a positive drive could also be applied to any or all of this latter group of rolls. The roll 58 is preferably formed in the same manner as the roll 32 and is adjusted so that it is spaced very slightly away from the latter roll. It is preferably driven in the direction of the arrow of Fig. 1 at a surface speed slightly higher than that of roll 32 so that there is a slip between the rolls which serves to distribute with great evenness a film of web treating liquid which may be sprayed or dripped between the rolls as by a pipe 61, Fig. 6. Fig. 6 illustrates the preferred form of apparatus embodying my invention. In this case the roll 57 is shifted away from roll 32 or may be removed from the machine as it is without function.

Roll 57 is useful in cases where the apparatus is to apply coating material to the web and in this case cooperates with a roll 62 carried by journal boxes 63 in brackets 64 supported on the member 49. The journal boxes are moved laterally by a screw 65 of the type previously described. The roll 62 is set so as to dip into a trough 66 carried by the support 11 and the roll 57 is set so as to contact both it and the transfer roll 32. By this arrangement a working of the coating material is obtained during its transfer which smooths it out into a much more uniform film, the working of the material being assisted if desired by any desired agitating device within the trough 66.

One of the important features of the present invention is that it is possible to duplicate with accuracy results obtained on a given run. For this purpose the various parts are provided with suitable scales by which their relative positions may be noted and duplicated when desired. For example, the pendulum 34 is provided with a scale 70, the members 48 and 49 are provided with scales 71 and 72, and the several journal boxes with scales 73, all of these scales cooperating with an index on an adjacent part. By noting down the readings of these scales when a successful run has been carried on, it will be possible at any later time to duplicate the settings of the machine exactly.

I claim:

1. A coating machine for applying liquid to a moving web which comprises a roll running in contact with the web, a transfer roll in contact with said roll, a doctor roll spaced slightly from said transfer roll, means to drive said doctor roll positively and at a surface speed different from that of the transfer roll, and means for supplying liquid to the transfer roll.

2. An apparatus for applying liquid to a moving web which comprises a roll having its surface formed of wire mesh, a transfer roll running in contact therewith, a doctor roll spaced slightly from said transfer roll, means to drive said doctor roll positively and at a surface speed higher than that of the transfer roll, and means for supplying liquid to the transfer roll.

3. An apparatus of the class described comprising a traveling web support, a frame, a roll carried by the frame in position to run in contact with a web on the traveling support, means for raising and lowering said roll on the frame, a transfer roll, a pendulum support carried by the frame and supporting the transfer roll, and means for applying a film of liquid to the transfer roll.

4. An apparatus of the class described comprising a traveling web support, a frame, a roll carried by the frame and positioned to run in contact with a web on the traveling support, means for raising and lowering said roll on the frame, a transfer roll, a pendulum support carried by the frame and supporting the transfer roll, a doctor roll carried by the pendulum support, and means for driving said doctor roll positively.

5. An apparatus of the class described comprising a traveling web support, a frame, a roll carried by the frame and positioned to run in contact with the web on the traveling support, means for raising and lowering said roll on the frame, a pendulum mounted in the frame above the roll, angularly adjustable frames carried by the pendulum, a transfer roll and at least one roll carried by said frames and mounted for adjustment toward and away from the transfer roll, and means for clamping said frames in fixed angular position with respect to the pendulum support.

6. An apparatus of the class described comprising a traveling web support, a frame, a roll carried by the frame and positioned to run in contact with the web on the traveling support, means for raising and lowering said roll on the frame, a pendulum mounted in the frame above the roll, angularly adjustable frames carried by the pendulum, a transfer roll and at least one roll carried by said frames and mounted for adjustment toward and away from the transfer roll, and means for clamping said frames in fixed angular position with respect to the pendulum, said pendulum and said angularly adjustable frames and said roll adjustments being each provided with scales by which the positions may be determined.

7. An apparatus of the class described comprising a web support, a roll having a wire mesh surface positioned to run in contact with a web on the support, a transfer roll mounted in position to transfer liquid to the wire mesh surface of the first roll, means for supplying a film of liquid to the transfer roll, said transfer roll comprising end pieces, a thin metal shell extending between the end pieces, and a rubber coating on the shell having a ground outer surface.

8. An apparatus of the class described comprising a web support, a roll having a wire mesh surface positioned to run in contact with a web on the support, a transfer roll mounted in position to transfer liquid to the wire mesh surface of the first roll, a doctor roll, means to drive said doctor roll positively and just out of contact with the surface of the transfer roll, and means for supplying liquid between the transfer and doctor rolls, said transfer roll having a ground rubber surface.

9. A coating machine for applying liquid to a moving web which comprises a roll running in contact with the web and having its surface formed with closely spaced liquid retaining zones, a transfer roll in contact therewith, a doctor roll spaced therefrom, means to drive said doctor roll positively and at a surface speed different from that of the transfer roll, and means for supplying liquid to the transfer roll.

WALTER A. NIVLING.