

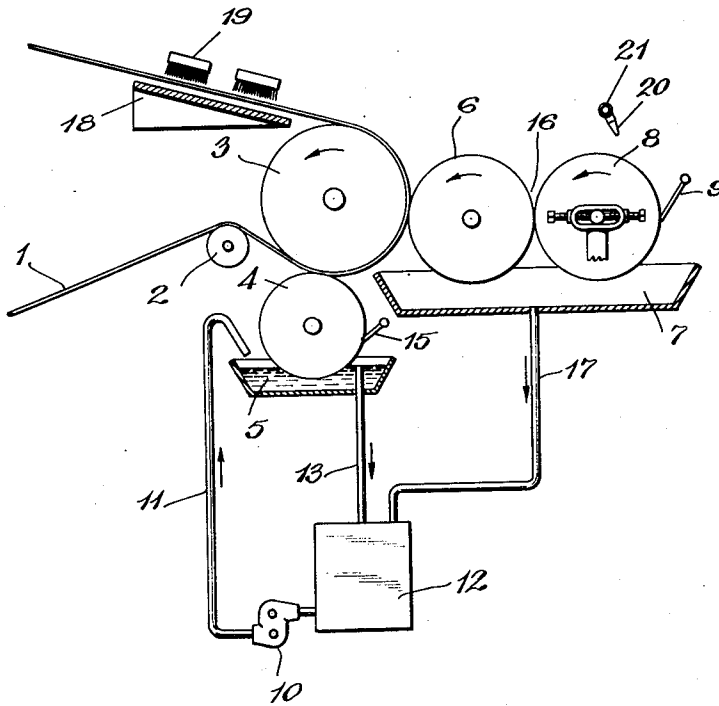
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METHOD FOR COATING PAPER AND THE LIKE

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## UNITED STATES PATENT OFFICE

1,942,383

## METHOD FOR COATING PAPER AND THE LIKE

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15 Claims. (Cl. 91—68)

This invention relates to a method for coating paper and the like.

Paper and the like is coated in various ways. One of the methods of coating paper is by a roll running in a bath and rolling the coating carried up from the bath on its surface upon the paper. Although roll coating gives a more even, smooth, uniform coating and a more readily controlled amount of coating, yet roll coating has certain difficulties such as streaking, ribbing and the like caused by the formation of thicker rings of the coating forming on the rolls and being deposited upon the paper. These rings are phenomenon and difficult to overcome. In addition, the surface of coating rolls and smoothing rolls are of extreme importance as their condition will immediately affect the coating. Not only should the smoothing roll surface be cleaned but it should also be dried to provide a smooth, uniform surface as moist spots of film will affect the results. Also in cases where the coating roll runs in a bath of the coating at high speed, foaming of the bath occurs which makes it difficult to satisfactorily apply a uniform, smooth, even coat.

One of the objects of this invention is to coat paper smoothly, evenly, uniformly and without streaking, ribbing or the like. A further object of the invention is to coat paper at high speeds by means of a roll without foaming of the coating. A still further object of the invention is the maintenance of a dry surface upon the auxiliary roll or rolls such as "doctor" or excess coating removal rolls whereby the other objects may be attained. Further objects of the invention will appear more fully hereinafter.

The figure in the drawing is a diagrammatic view showing a roll coating device embodying the principles of our invention.

In carrying out our invention, we propose to carry the web 1 of the paper over a roll 2 and about a roll 3. A fountain roll 4 rotates at relatively slow speed in coating bath 5. Roll 4, rotating at a speed slow enough not to churn or foam the coating, applies the color to the surface of web 1. The fountain roll does not apply the color to the final edge so that the color does not strike the reverse side, this is accomplished by edge doctors 15. Roll 6 then wipes off the coating from web 1, the coating then being carried around on the surface of roll 6 past doctor roll 8. Roll 8 is adjustable with respect to the distance of its axis and surface from the axis and surface of roll 6 to plane off the excess thickness of coating remaining on roll 6. At the point 16

of planing off of the excess coating the surface of rolls 6 and 8 are passing in opposite direction although both rolls are rotating counterclockwise. Then roll 6 continuing its revolution wipes the predetermined thickness of coating back upon web 1. Roll 8 has doctor 9 to remove the coating planed off from roll 6 and to provide roll 8 with a clean surface. Although "doctor" 9 appears to clean off all the coating from roll 8, it cannot be seen nor even felt, yet some moisture remains. We have found that better results can be obtained if pressure air is directed over the cleaned area of roll 8 by means of jets 20 from air nozzle 21. The air may be heated or not as desired. As the air strikes the cleaned surface of roll 8 a cloudy film appears and then disappears as the moisture dries off. Thus a dry as well as clean surface is acting at all times giving more accurate control of the coating thickness and a more uniform smoothing action whereby a more perfect coating is formed on roll 6 to be applied to web 1 by roll 6. The coating from doctor 9 falls into drip pan 7 where it drains back into reservoir 12 through pipe 17. The coating is maintained at a constant level in bath 5 by circulating pump 10 in line 11 from reservoir 12. An overflow pipe 13 is connected to reservoir 12 from bath 5.

By our method roll 4 rotates at a slow speed in opposite direction to roll 3 which latter rotates at a much faster speed. Roll 6 rotates at the fastest speed of all the rolls and likewise in opposite direction to rolls 3 and 8. For instance, if roll 3 rotates at 400 F. P. M., then roll 4 can rotate at 100 F. P. M., roll 6 at 500 F. P. M., and roll 8 at 166 F. P. M. Variations in the speed may be made and still fall within the scope of this invention. The coating is applied in excess on web 1, then all the coating upon the surface of web 1 is removed leaving the interstices of the web filled and the surface slightly moist, then a predetermined thickness is smoothly laid upon a second coating roll 6 and wiped off upon the web 1. The coating roll 6 travelling at a predetermined faster speed assures a wiping action and complete coverage without ribbing. By coating, then removing and reapplying, a level coated surface is obtained due to all interstices having been filled before the final measured coat is applied to the surface of the web. This surface will not have "skips" in the coating such as may occur when the coating is applied to a dry sheet and the necessity of running the coating roll in the bath at high speed is avoided, thereby

permitting high speed coating to be done without foaming of the coating in the bath.

Although the device operates satisfactorily without brushes in most cases, yet on certain types of paper such as manila and rope tagstock or similar hard surface stock it may be desirable to use one or two brushes in order to rub or brush the color into the hard spots to cause the color to adhere thereto. With the method of roll coating herein shown it is entirely practical to use such auxiliary brushes. The brushes 19 may be of the ordinary reciprocating type with the usual table 18. Whereas in the standard brush coater using brushes six or seven brushes are required while in the present arrangement only one or two brushes need be used as the fountain and transfer rolls supply all the rubbing action required.

What we claim is:

1. A method of roll coating which comprises applying an excess of coating to the material by means of one roll then removing all the coating from the surface of the web by a second roll, removing the excess coating from the second roll and reapplying the coating remaining on the second roll to the material.

2. A method of roll coating which comprises applying an excess of coating by means of a fountain roll rotating at a lesser speed than the web of paper then removing all the coating from the surface of the web by a second roll rotating at a greater speed than the web and reapplying by said second roll a predetermined depth of the coating removed by said roll.

3. A method of roll coating which comprises applying an excess of coating by means of a fountain roll rotating at a lesser speed than the web of paper, then removing all the coating from the surface only of the web by a roll rotating at a greater speed than the web, then removing the excess coating from the surface of the removal roll and smoothing the same whereby said removal roll will reapply a predetermined thickness of the same coating to the web as said roll completes its revolution.

4. A method of roll coating which comprises applying a coating by means of a fountain roll rotating in a bath at slow speed to prevent foaming of the coating in said bath and at a lesser speed than the speed of travel of the web, then removing all the coating from the surface only of the web by a roll rotating at a greater speed than the speed of the web, then smoothing and predetermining the thickness of the coating on the removal roll by means of a doctor roll, and then wiping the predetermined thickness of coating back upon the web by the removal roll.

5. A method of high speed roll coating which comprises applying to a web travelling at high speed an excess of coating by a fountain roll rotating at slow speed to prevent foaming of the coating material, then removing the coating from the surface only of the web by a roll rotating at a higher speed than the web, predetermining the thickness of the coating then smoothing on the removing roll, then reapplying by the removing roll the desired thickness of the same coating back upon the web at a point adjacent the point of removal.

6. A method of roll coating which comprises initially applying by a fountain roll an excess of coating to a travelling web of material, then transferring the coating off the surface of the material being coated upon a second roll and re-

applying a portion of the same coating back upon the material by the second roll.

7. A method of high speed roll coating which comprises initially applying by a fountain roll operating at a slow speed to prevent foaming an excess of coating, then wiping the coating off the surface of the material by a second roll rotating at a higher speed than the speed of travel of the material, then smoothing and wiping a predetermined portion of the coating back upon the material by the second roll.

8. A method of roll coating which comprises first the deposition of coating upon one side of a web of material, secondly the removal of the coating from the surface of the web by a transfer roll and the smoothing and removing of any excess of coating on the transfer roll by an adjustable cleaned doctor roll whose surface at the point of removal is moving in the opposite direction to the surface of the transfer roll, thirdly the transfer back upon the web of the smoothed coating remaining on the transfer roll.

9. A method of roll coating which comprises initially applying to a web of material on a rotating material roll a coating by a fountain roll rotating at a lesser speed than the rotating material roll, wiping off the color on the surface of the web by a transfer roll rotating at higher speed than the material roll and whose surface is moving in the opposite direction, smoothing and removing the excess coating to the desired thickness on the transfer roll by a cleaned doctor roll whose surface is moving in the opposite direction to the surface of the transfer roll and at a slower speed and reapplying the smoothed coating upon the transfer roll to the web.

10. A method of roll coating which comprises initially applying to a web of material on a rotating material roll a coating by a fountain roll rotating at a lesser speed than the rotating material roll, wiping off the color on the surface of the web by a transfer roll rotating at a higher speed than the material roll and whose surface is running in the opposite direction, removing from the transfer roll the excess coating and smoothing the surface to the desired thickness remaining on the transfer roll by a cleaned doctor roll whose surface is moving in the opposite direction to the transfer roll at the point of contact and at a slower speed, and reapplying the smooth coating left on the transfer roll to the surface of the web by a wiping action.

11. A method of roll coating which comprises applying an excess of coating to the material by means of a roll, then removing all the coating from the surface of the web by a second roll, then removing the excess coating from the second roll and smoothing the coating remaining by a third cleaned and dried roll and reapplying the coating remaining on the second roll to the material.

12. A method of roll coating which comprises applying an excess of coating to a web by a roll, then removing the coating from the surface of the web by a second roll, then removing the excess coating from the surface of the second roll by a third roll, continuously cleaning by a doctor and drying the surface of the third roll by pressure air and reapplying the coating remaining on the surface of the second roll back upon the web.

13. A method of roll coating which comprises applying an excess of coating to a material by a fountain roll, then removing all the coating from the surface only of the material by a second roll, then removing the excess coating from the

surface of the second roll by a third roll, then cleaning the excess material from the third roll and drying the cleaned surface by a jet of air, then reapplying the coating remaining on the surface of the second roll to the material as the second roll completes its revolution.

14. A method of roll coating which comprises applying an excess of coating to a material by a fountain roll rotating at a speed slow enough to prevent foaming of the coating material of the bath, then removing all the coating from the surface only of the material by a roll rotating at a greater speed than the material, then removing the excess coating from the surface of the removing roll by a doctor roll rotating at a lesser speed than the removing roll, then cleaning the excess material from the doctor roll and drying the cleaned surface by a jet of air, then reapplying the smoothed coating remaining on the surface of the removing roll to the material as the said roll completes its revolution.

15. A method of roll coating which comprises initially applying to a web of material on a rotating material roll a coating by a fountain roll rotating at a lesser speed than the rotating material roll, wiping off the color on the surface of the web by a transfer roll rotating at a higher speed than the material roll and whose surface is running in the opposite direction, removing from the transfer roll the excess coating and smoothing the surface to the desired thickness remaining on the transfer roll by a cleaned doctor roll whose surface is moving in the opposite direction to the transfer roll at the point of contact and at a slower speed, drying the cleaned surface of the doctor by an air jet and reapplying the smooth coating left on the transfer roll to the surface of the web by a wiping action.

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