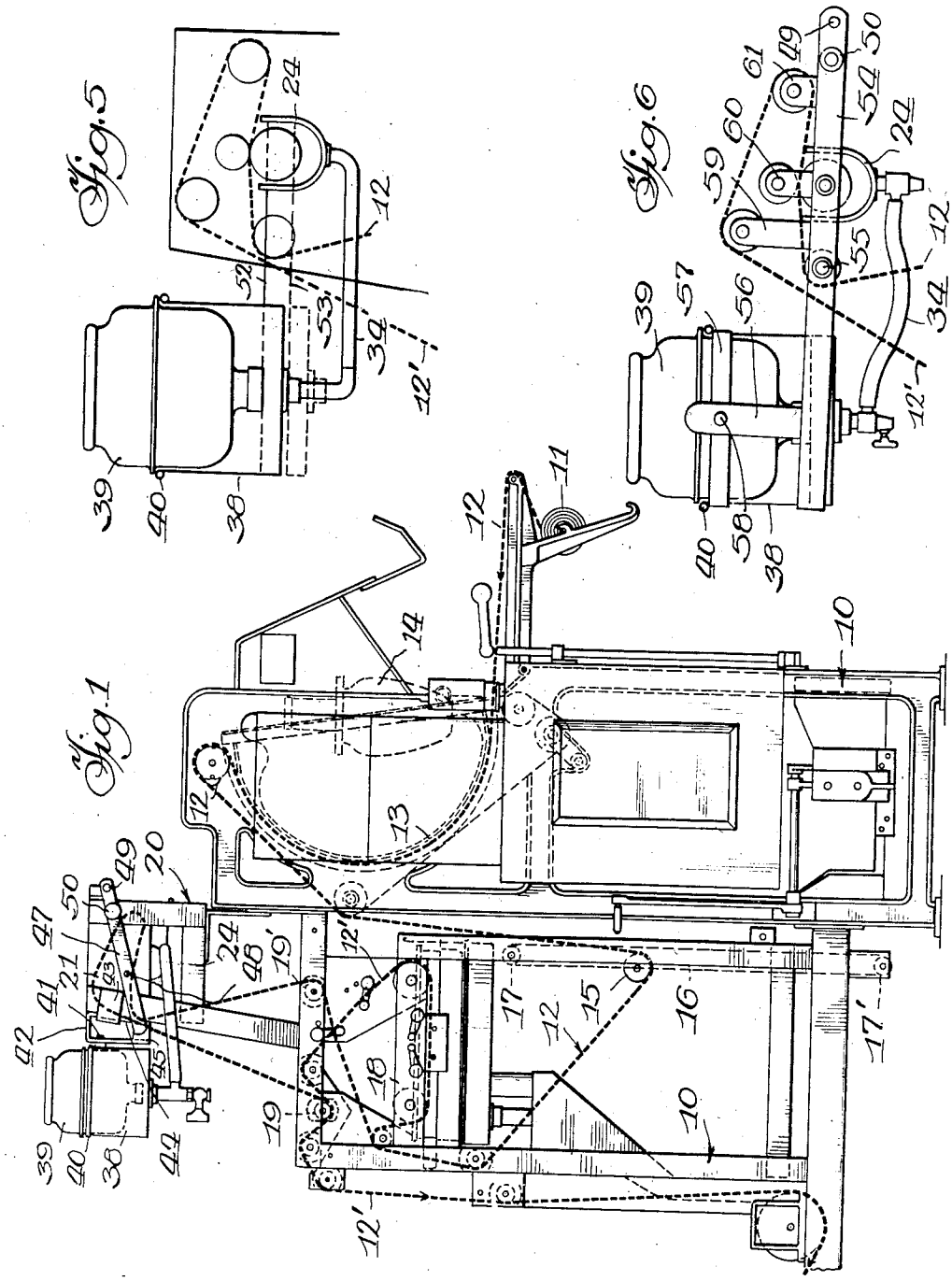
Dec. 21, 1937. H. J. BRUNK 2,102,585

MEANS AND A METHOD FOR APPLYING DEVELOPER TO A MOVING PRINT

Filed Dec. 16, 1936 2 Sheets-Sheet 1



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Fig. 4

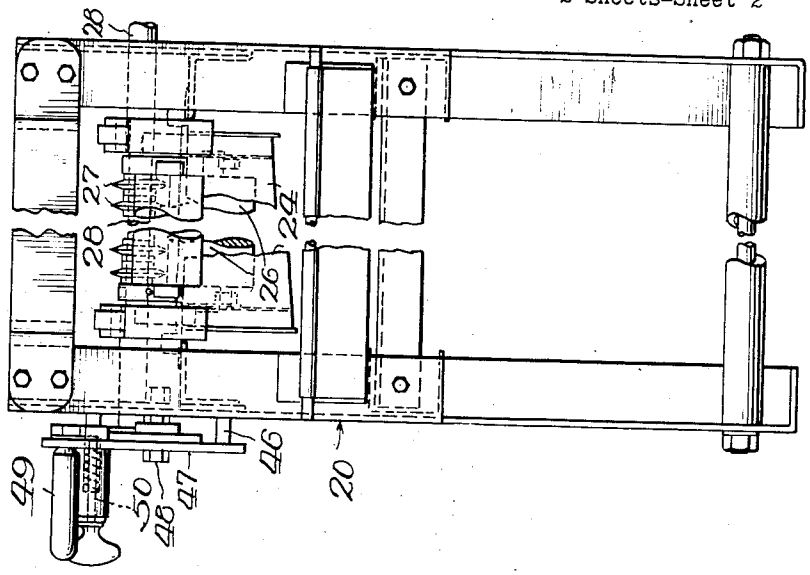


Fig. 3

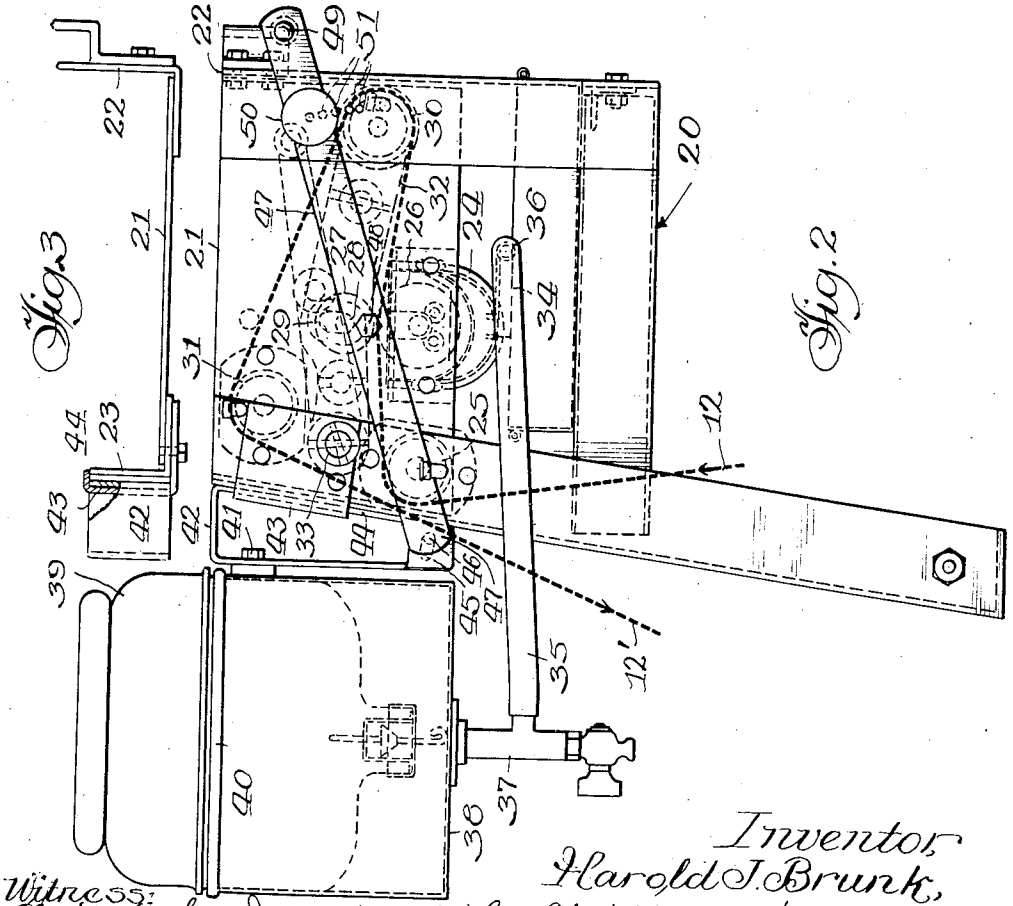


Fig. 2

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MEANS AND A METHOD FOR APPLYING DEVELOPER TO A MOVING PRINT

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13 Claims. (Cl. 95—94)

My invention relates to means and a method for applying liquid to a moving sheet. It involves the use of a rotating roll dipping in a trough of liquid, picking up a certain quantity of liquid which adheres to its surface and applying said liquid in a thin layer to the surface of a sheet of material which travels over said roll in contact with the upper surface thereof. It is particularly useful when the liquid is a developing solution, applied to the under surface of a light sensitive sheet which has been exposed and requires development, such for example as the so-called Diazo prints.

Heretofore such prints have been developed by the use of developing units separate and distinct from the printing machine, i. e. the developing apparatus has been of the table model type. With such apparatus the prints are exposed separately in a printer and then fed by hand through the developing apparatus, which latter runs at some constant speed, i. e. the roll which applies the developer to the print rotates at such speed as to cause its surface to carry up just the right amount of developing solution to the surface of the print traveling thereover. The paper is passed through the developing machine merely by keeping it in contact with the applicator roll. It is essential that no slippage of the paper over the surface of the roll occur, otherwise a smearing or spotting of the paper results. It is also necessary that the speed of rotation of the roll be such that just exactly the right amount of the developing solution is applied to the surface of the paper, because too much developer causes so-called bleeding, and a scarcity of developer gives the print a mottled, spotty appearance. These conditions are met without difficulty in the case of a separate developing unit running at the proper, constant speed.

When the attempt is made to run one of these Diazo prints through a so-called continuous machine, i. e. one which prints and develops a continuous length of paper which is unrolled at one end as the machine is operating and is delivered at the other end of the machine in the form of a finished sheet of prints requiring only to be cut apart, certain difficulties are encountered. For example, the speed of development varies as the speed of the printer is varied, which latter variation is necessary whenever the original tracings or negatives vary in transparency. As an illustration, a clean, new cloth tracing might pass through the machine at the rate of ten feet per minute, whereas on the very same sensitized paper stock an old vellum tracing would necessitate a machine speed of possibly three or four feet per minute.

From this it will be apparent that, if the amount of developer carried up to the surface of the paper at the slower speed is proper for the conditions then existing, at a speed two and one-half times as fast there would be, theoretically at least, two and one-half times the desired amount of developer brought into contact with the paper and the result would be running or bleeding of the print. Regardless of the exact ratio of a liquid picked up by the surface of the revolving roll at various speeds, it will be seen that the amount of developer applied at any one speed is not satisfactory for other speeds, which makes it impossible to develop Diazo prints, among others, in a continuous machine of the general character now used successfully for the continuous printing and developing of blue prints.

The general object of the present invention is to overcome these difficulties in a continuous machine.

A contributory object is to provide means for changing the level of the liquid in the developing trough, with regard to the speed of rotation of the roll dipping therein, whereby at higher speeds less liquid is picked up and at lower speeds more liquid is picked up, for the purpose of applying a substantially uniform layer or film of liquid to the under surface of the print.

Another object is to provide means for varying the depth of immersion of the roll, to cause the same to pick up more or less developer as it rotates.

A further contributory object is to accomplish this change of level by a relative vertical movement of the reservoir in which the developer is contained, with respect to the trough with which said reservoir is connected.

A more specific object is to provide means for raising or lowering the reservoir to vary the level of the developer in the trough and hence to vary the extent to which the applicator roll is immersed in the developer.

An additional object is to provide a device of this character in the form of an attachment for an existing continuous printing and developing machine, i. e. a developing attachment wherein the depth of the liquid in the developing trough varies more or less inversely as the speed of rotation of the applicator roll, whereby the depth of immersion of said roll varies accordingly.

Other objects and advantages will be apparent from the following description.

The drawings illustrate a conventional, continuous, blue print machine having an attachment suitable for developing Diazo prints. Such machine and attachment will serve to illustrate one of a number of commercial applications of the invention.

In the drawings:

Fig. 1 is a side elevation of a continuous printing and developing machine, somewhat diagrammatic in its showing;

Fig. 2 is an enlarged side elevation of the developing attachment;

Fig. 3 is an incomplete top view of part of the same;

Fig. 4 is a front elevation thereof;

Fig. 5 is a diagrammatic showing of the developer reservoir, the developer trough, and associated parts; and

Fig. 6 is a diagrammatic showing of a modified arrangement of these parts.

As shown in Fig. 1, the machine comprises a suitable frame 10, which at the front end supports a roll 11 of sensitized paper, i. e. a roll of Diazo print paper which, when the machine is operating, is unwound slowly as the paper is fed to the machine in the form of an endless span 12. The tracings are laid on this span before the latter passes around the curved sheet of glass 13 where the paper is exposed to a suitable source of light such as a series of arc lamps 14. After leaving the printing section, the paper passes over a series of rolls, arranged in a well known manner, and then down over a floating roll 15 which is supported by a chain 16 passing over pulleys 17 and 17' and suitably counterbalanced, if necessary, whereby the weight of the roll 15 is sufficient to take up the slack in the paper and maintain the desired tension thereon, the roll being supported in the loop formed in the paper, as shown.

The machine, assuming that it is the standard printer used for blue prints, contains a developing trough 18, to which the span of paper 12 would be fed from the various rolls shown, and after passing through this developer said span of developed paper 12' passes over or under additional rolls, including roll 19, and thence downwardly in a substantially vertical span, to the drying section of the machine, not shown. In the case of a Diazo print the span of paper 12, instead of entering the bath 18, passes upwardly around roll 19' to the special developing attachment indicated generally by reference 20.

The developing attachment comprises metal side plates 21 having angle irons 22 and 23 at the front and rear, as shown in Fig. 3. The developing trough 24 is supported between said side plates. The exposed but undeveloped span of paper 12 passes over the idler roll 25, and over the roll 26, which is preferably mounted in fixed relation to the trough, the arrangement being such that part of the roll dips into the developing solution therein. The roll 26 is made preferably of stainless steel and is driven by the paper passing thereover so that it turns exactly at the paper speed. Above the applicator roll 26 is a series of beveled discs 27 mounted on a suitable shaft 28, which latter is journaled at each end in an elongated recess 29, as shown in Fig. 2, whereby said shaft may raise and lower somewhat. The beveled discs rest on the span of paper as it passes over the applicator roll and serve to hold said paper in contact with said roll. As the applicator roll turns, a certain quantity of the developer adheres to its surface and is applied to the under surface of the moving span of paper. As previously stated, when the roll rotates at a higher rate of speed, more developing solution is applied to the paper than when the roll rotates at a slower speed.

The span of paper passes from the applicator roll, under the roll 30 and thence over the roll 31 and downwardly under the roll 19 previously referred to, and thence to the drying section. The roll 30 is mounted on an arm 32, which is pivoted at 33, whereby said arm may be raised to lift the span of paper out of contact with the applicator roll when the machine is not operating.

Developing liquid is supplied to the trough through a pipe 34 or rubber hose, from a suitable reservoir. In the present instance the pipe 34 is connected to another pipe 35 by means of a transverse joint 36, permitting relative, angular movement between said pipes. The inlet end of the pipe 35 is connected to a T 37 which communicates with the bottom of a suitable receptacle 38 containing the developer. The developer may be supplied in a bottle 39, which, when inverted, rests on the bead 40 at the upper end of the container, the mouth of the bottle being somewhat above the bottom of said receptacle whereby a constant level is maintained in said receptacle as the developer is withdrawn through the pipe connections or hose, as will be understood. The level of the liquid in the trough 24 is the same as the level of the liquid in the container 38. When the printing operation requires more time and hence a slower travel of the Diazo print paper through the machine, the container 38 is raised to raise the level of the liquid in the trough and hence increases the amount of developer applied to the under side of the paper traveling over the applicator roll.

The means for raising and lowering the container 38 or developer reservoir will now be described. The container 38 is bolted at 41 to a bracket 42. The frame of the developing attachment, shown in Fig 3, has an angle iron 43 bolted thereto with one flange spaced from the flange of the adjacent angle iron 23 whereby a slot is provided between the two. The downwardly inclined leg 44 of the bracket 42 passes through this slot whereby the reservoir, including the container 38 and the glass bottle 39 therein may be moved up and down as a unit. At the lower end of the bracket is a plate 45 having a slot therein which receives a pin 46 mounted on a lever 47. This lever is pivoted at 48 and is used to accomplish the vertical adjustment of the reservoir. Said lever 47 has a handle 49 at the front end and is equipped also with a spring plunger 50 and projecting end of which may be fitted into any one of a series of holes 51 whereby the handle may be swung downwardly, the reservoir raised and the lever and associated parts locked in any one of a number of different positions. This permits adjustment of the level of the liquid in the reservoir at any desired point within the limits of the apparatus.

Fig. 5 illustrates diagrammatically this adjustment just described. The horizontal line 52 indicates the level of the liquid in the reservoir when the bottle is in one of its uppermost positions, said level being substantially in the plane of the mouth of the bottle and above the middle of the applicator roll. The lowermost position of the reservoir is shown in dotted lines and the additional line 53 indicates the lower level of the liquid, the lower part of the roll preferably just touching the liquid, in this position.

Fig. 6 shows diagrammatically a somewhat modified arrangement for varying the liquid level, wherein the developing trough 24 and the reservoir 38 are both mounted on an arm 54, which is pivoted at 55 between its ends so that when one end is lowered slightly the other end will be raised. This arm, which would be constructed as a double arm or frame, has upright supports 56 near one end, to which a ring or band 57 is pivotally mounted at 58. The receptacle 38 fits within said band and the bottle 39 is supported on the bead, as in the form previously described. However, the weight of the bottle and container causes the same to hang in substantially vertical position regardless of slight deviations in the position of the arm 54 from horizontal position. Suitable supports 59, 60 and 61 are mounted on the arm near the other end thereof to support the several rolls over and under which the paper passes, in the manner previously described. Thus when said arm is swung to some new position of adjustment, the relation of the several rolls mounted thereon remains fixed and any tendency to pull the span of paper upwardly toward the developing attachment or to lower the same is compensated for by the roll 15 which rests in the loop of paper shown in Fig. 1 and previously described. The right hand end of the lever or frame 54 may constitute the handle and may have the same spring pressed plunger 50 thereon, shown in the other figures. The weight of the reservoir is offset by the weight of the rolls mounted on the frame and an additional counterbalancing weight may be mounted on the frame on either side of the pivotal support as may be necessary, to facilitate adjustment of the reservoir and trough up and down with respect to each other to change the level of the developer.

It will be apparent that automatic means may be provided for raising or lowering the reservoir, in either of the two arrangements described, as the speed of the continuous printing machine is changed, as for example a simple governor may be used in conjunction with a motor or solenoid. The depth of immersion of the applicator roll may be otherwise varied.

The equipment shown and described makes it possible to operate the machine at various speeds and at the same time apply the proper amount of developing solution to the print. The invention is not limited to use with a continuous machine only although it finds a special field of usefulness with machines of this type. However, the same means for varying the level of the developer more or less inversely as the speed of rotation of the applicator roll, may obviously be used in a separate developing machine or separate table model unit. Various other changes may be made in the construction and arrangement of parts, as will be understood.

Furthermore, the invention is not limited in its application to the use of developing solutions but is applicable with other liquids and in diverse fields of service.

I claim:

1. Apparatus for applying liquid to a traveling sheet of material, comprising a receptacle for liquid, a roll mounted to dip in said liquid and to contact with said traveling sheet, whereby rotation of said roll results in conveying a layer of liquid to said traveling sheet at the line of contact with said roll, and means for raising and lowering the level of the liquid in said receptacle substantially inversely as the speed of rotation of said roll, to insure the application of a substantially uniform layer of liquid to said sheet, regardless of variations in the rate of travel thereof.

2. Apparatus for applying liquid to a traveling sheet of material, comprising a receptacle for liquid, a roll partly immersed in said liquid, means for causing said sheet of material to travel over said roll and rotate the same at the surface speed of said sheet, thereby causing said roll to pick up and apply to the under side of said sheet a thin layer of liquid, and means for varying the depth of immersion of said roll in said liquid, substantially inversely as the surface speed of said roll and said span.

3. Apparatus for applying liquid to a traveling span of material, comprising a receptacle for liquid, a roll mounted to dip in said liquid and to contact with said traveling span, whereby rotation of said roll results in conveying a thin layer of liquid to said traveling span at the line of contact with said roll, and means for raising and lowering the level of the liquid with respect to said roll, substantially inversely as the speed of rotation of said roll, to apply a substantially uniform layer of liquid to said span at different speeds thereof.

4. Apparatus for applying liquid to a traveling span of material, comprising a receptacle for the liquid, a roll dipping in said liquid and in contact with said span, a reservoir for said liquid communicating with said receptacle, means for varying the relative heights of said receptacle and reservoir to raise and lower the level of the liquid in said receptacle substantially inversely as the speed of rotation of said roll.

5. Apparatus for developing continuous lengths of sensitized material, comprising a trough to contain a developer, a roll mounted in fixed relation to said trough to dip below the surface of said developer, means for causing a span of sensitized paper to travel over an unsubmerged part of the periphery of said roll, a reservoir for said developer in communication with said trough, and means for raising and lowering said reservoir to vary the level of the developer in said trough, whereby said roll is caused to apply a substantially uniform film of developer to said span of sensitized material as it travels at various speeds, over said roll.

6. Apparatus for developing continuous lengths of sensitized material, comprising a trough to contain a developer, a roll mounted in fixed relation to said trough to dip below the surface thereof, means for causing a span of sensitized paper to travel over an unsubmerged part of the periphery of said roll, a receptacle for developer communicating with said trough, means for maintaining a constant level of developer in said receptacle and means for raising and lowering said receptacle to vary the level of the developer in said trough.

7. An attachment for a printing machine for light sensitive sheets, comprising a trough, a container for liquid developer communicating with said trough, means for maintaining a constant level of developer in said container, supporting means for said container adjustable vertically with respect to said trough and means for raising and lowering said supporting means to vary the level of the liquid in said trough.

8. A developing attachment for continuous printers of light sensitive sheets, comprising a frame, rolls mounted therein over which a span of sensitized paper may travel in a substantially

horizontal span, an additional roll mounted beneath said span in contact therewith, a trough in which said roll dips to apply developer to the underside of said span, a vertically slidable bracket on said frame, a reservoir for said developer mounted on said bracket, an inverted container in said reservoir to maintain a constant level of developer therein, a conduit connecting said container with said trough to maintain a supply of developer therein, and a lever mounted on said frame and connected to said bracket to raise and lower the latter and hence vary the level of the developer in said trough.

9. Apparatus as in claim 8 with the addition of a locking device to hold said lever in various positions of adjustment.

10. In a blue print machine and the like, a source of light, means for conveying a continuous print past said light source with negatives interposed between the two, means for varying the rate of travel of said print to permit a proper length of exposure for tracings of different degrees of transparency, a roll past which the exposed print travels, and means for applying a developing liquid to said roll in variable quantities dependent on the rate of travel of said sheet, to insure the application to said sheet of a uniform quantity of developer per unit of length.

11. In a blue print machine and the like, a source of light, means for conveying a continuous print past said light source with negatives interposed between the two, means for varying the rate of travel of said print to permit a proper length of exposure for tracings of different degrees of transparency, a printing station past which the exposed print travels, and means for applying to said print a uniform amount of developing liquid per unit of area thereof, regardless of variations in the rate of travel thereof.

12. Apparatus for applying liquid to a traveling sheet of material, comprising a receptacle for liquid, a roll partly immersed in said liquid, means for causing said sheet of material to travel over said roll and rotate the same, flanged members rotatably mounted above said roll to press said sheet against said roll and insure against slippage, whereby the surface speed of said roll is the same as that of said sheet, the said rotating roll picking up and applying a thin layer of liquid to the under side of said sheet, and means for varying the depth of immersion of said roll in said liquid, substantially inversely as the surface speed of said roll and said span.

13. The method of applying a substantially uniform film of a solution to the surface of a sheet of material, passing tangentially over a roll at variable surface speeds, which consists in partly immersing said roll in the solution and varying the depth of immersion of said roll to cause less of said solution to adhere to it at higher rates of rotation and more of said solution at lower rates of rotation.

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