W. A. DANIELS.

WEB COATING MACHINE.

APPLICATION FILED JAN. 28, 1909.

939,396.

Patented Nov. 9, 1909.

3 SHEETS—SHEET 1.

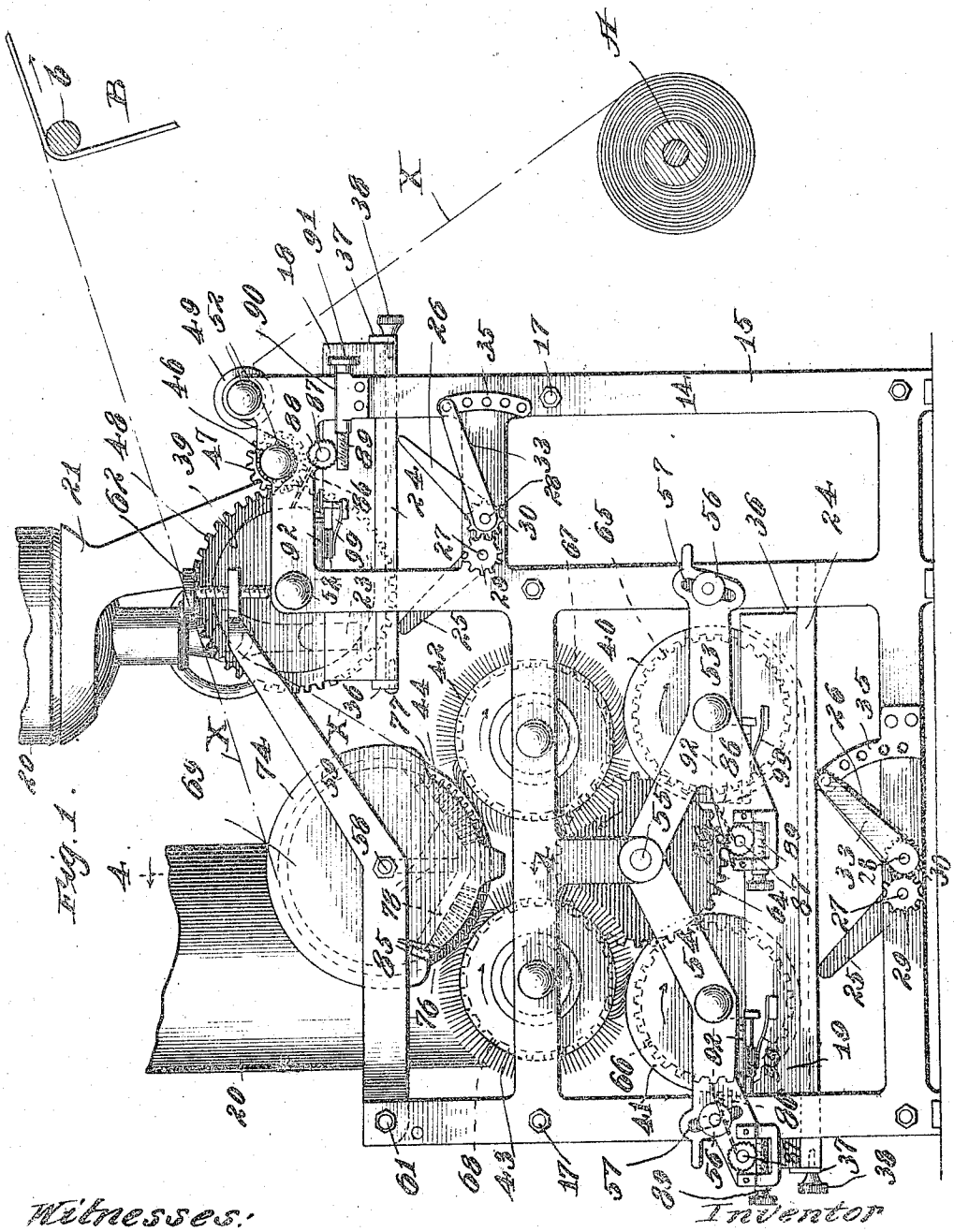

Fig. 1.

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3 SHEETS—SHEET 2.

Fig. 3

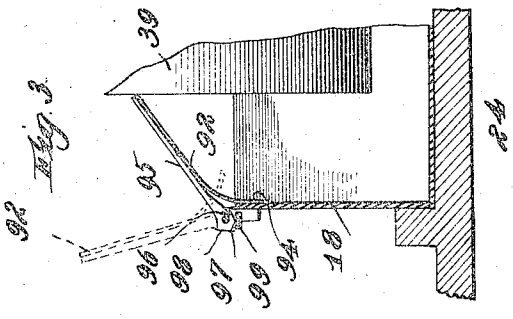
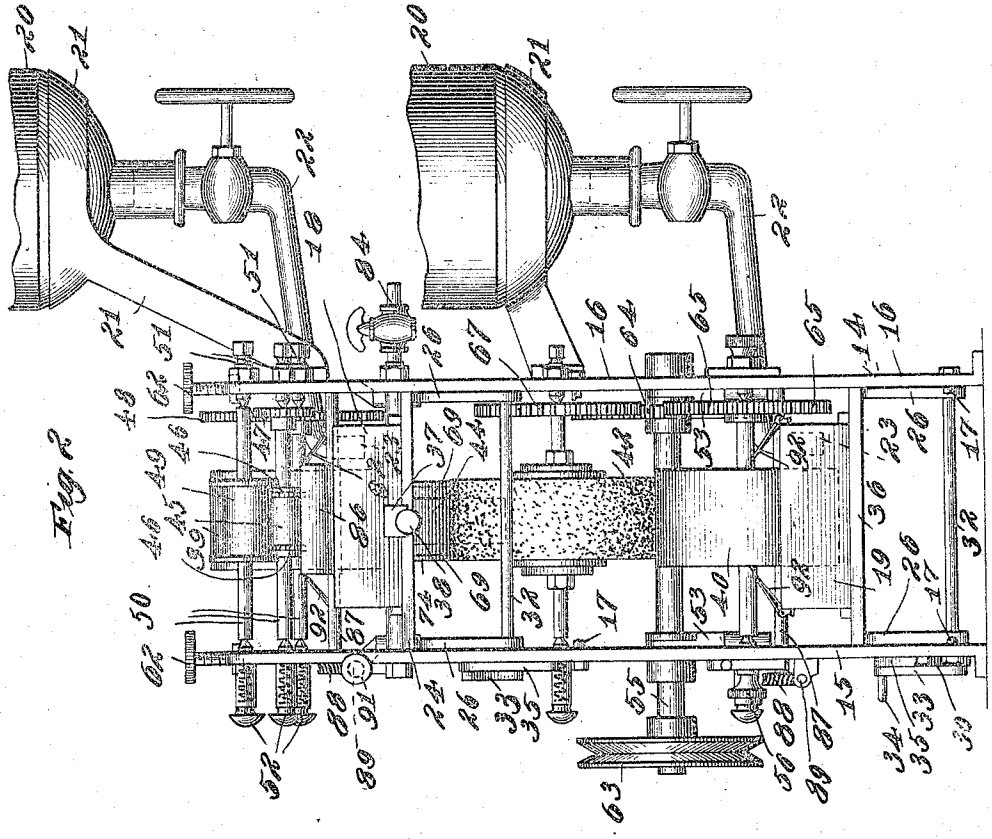


Fig. 2



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3 SHEETS—SHEET 3.

Fig. 4.

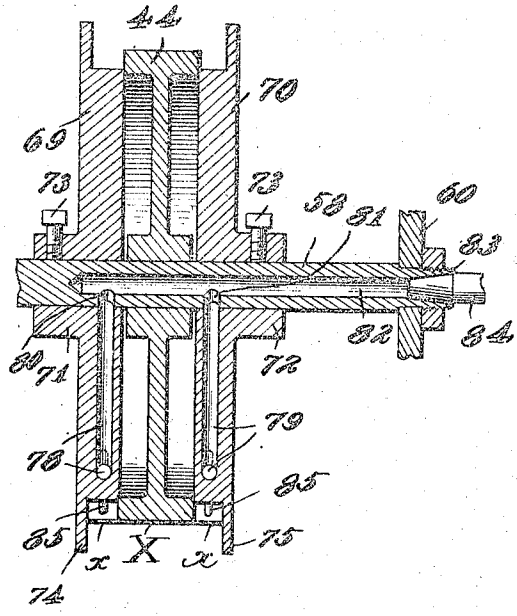



Fig. 5.

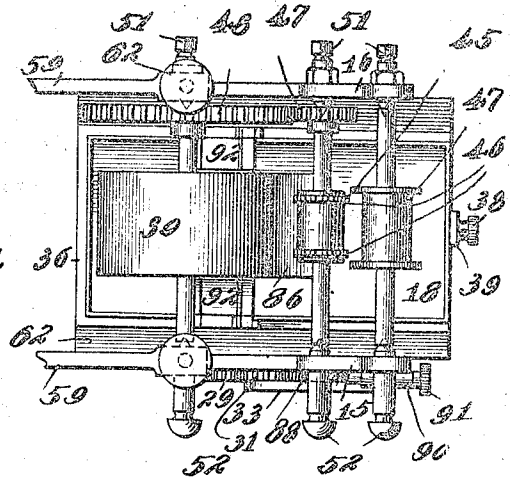



Fig. 6.

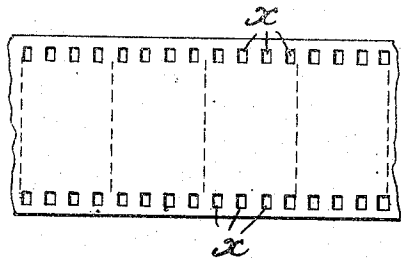
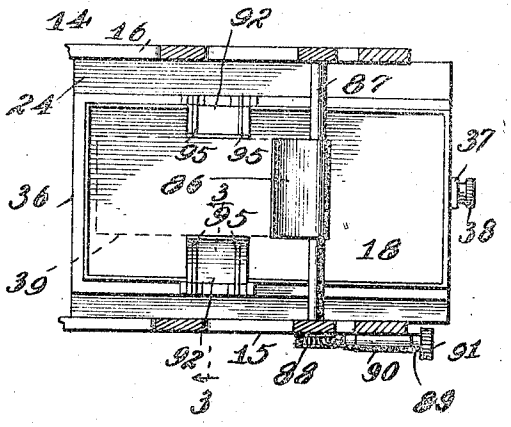



Fig. 7.

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# UNITED STATES PATENT OFFICE.

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## WEB-COATING MACHINE.

939,396.

Specification of Letters Patent. Patented Nov. 9, 1909.

Application filed January 28, 1909. Serial No. 474,816.

*To all whom it may concern:*

Be it known that I, WALTER A. DANIELS, a citizen of the United States, and resident of Chicago, county of Cook and State of Illinois, have invented certain new and useful Improvements in Web-Coating Machines, of which the following is a specification, and which are illustrated in the accompanying drawings, forming a part thereof.

The invention relates to machines for treating webbing, and more specifically to those particularly adapted for the application of a protective coating to the picture-carrying surface of films such as are employed for the projection of so-called moving pictures. These films commonly comprise a continuous web of great length formed of celluloid and carrying upon one of its faces a series of pictorial images formed in a photographic emulsion of gelatin.

The invention contemplates means for covering the gelatin surface of these films with a protective coating by applying thereto a solution of pyroxylin. Moving picture machine films as now employed are quite universally provided with marginal rows of sprocket-engaging apertures; and the object of the invention is to provide for the application of a protective coating to the surface of an apertured web without closing the apertures of the web or permitting the coating solution to flow through the apertures to the back of the web.

The invention is exemplified in the structure to be hereinafter described, and illustrated in the accompanying drawings, in which—

Figure 1 shows in side elevation a web-coating machine embodying the features of the invention, a driving pulley with which the machine is preferably provided being removed for the purpose of illustrating parts which would be otherwise concealed by it in this view; Fig. 2 is an end elevation of the same; Fig. 3 is a detail sectional view taken on the line 3—3 of Fig. 7; Fig. 4 is a detail sectional view taken on the line 4—4 of Fig. 1; Fig. 5 is a detail plan view of the machine; Fig. 6 illustrates a detail of webbing of the form which may be treated in the machine; and Fig. 7 is similar to Fig. 5, some of the parts being removed and others being shown in plan section.

The webbing adapted to be treated in the machine is designated by the letter X in the drawings and is illustrated in detail in Fig. 6. As shown, this webbing is provided with marginal rows of sprocket-engaging apertures *x*. It is preferably delivered to the machine in a continuous length from a reel, conventionally shown at A (Fig. 1), and passes out of the machine onto a drying tape, a detail of which is designated B (Fig. 1), where it is shown as turning over a guide-roller *b* suitably supported adjacent the machine. The movement of the webbing X through the machine is preferably effected entirely by pulling upon the webbing as it leaves the machine, as by movement of the drying tape B.

As shown, the parts of the machine are carried by a framework, generally designated 14, and comprising side members 15, 16, connected by tie-rods, as 17. Pans 18, 19, are supported in the framework 14 for containing the solution to be applied to the web. Preferably each of these pans is continuously supplied with solution, as from a fountain, which takes the form of an inverted bottle 20, supported in a bracket 21, secured to one of the side members, as 16, of the frame 14, and delivering to the pan through a valved pipe 22, having its mouth 23 located within the pan in such a position as to be normally covered by the solution contained therein.

Most desirably the pans 18 and 19 are each mounted in the framework 14 for vertical adjustment. To this end each of the pans rests upon a table 24, which in turn rests upon the ends of lever arms 25, 26, provided in pairs, the members of each pair being preferably located adjacent the sides of the frame 14, and the two pairs of arms being mounted for vertical swinging movement in opposite directions, as by being secured to shafts 27, 28, respectively, journaled in the side members 15, 16, of the frame 14, and each having upon one of its ends a gear pinion, as 29, 30, which intermesh. The table 24 and pans, as 18, 19, carried thereby, are vertically adjusted in the frame 14 by swinging the pairs of lever arms 25, 26, in

opposite directions as by means of a crank-arm 33, applied to the shaft 28 and having at its outer end a pawl 34, which plays over a notched quadrant 35, preferably also secured to the frame member 15.

Each of the pans 18, 19, is removably secured against endwise movement on the corresponding table 24 by lugs 36, 37, one of which, as 36, is fixed to the table at one of its ends, and the other of which, as 37, is removably secured to the opposite end of the table as by means of a thumb-screw 38.

Feed rollers, as 39, 40 and 41, turn in the pans 18, 19, for the purpose of picking up the solution contained therein. As shown, the web X receives an initial application of the coating solution from the pan 18 by direct contact with the feed roller 39. Further applications of the coating solution are applied to the web X through brushes, as 42, 43, which are moistened from the solution contained in the pan 19 by means of the feed rollers 40 and 41, respectively. In its passage through the machine the web X preferably turns over the feed roller 39 and then over a supporting roller 44, by means of which its surface is successively presented to the brushes 42, 43.

Provision other than the frictional contact of the face of the webbing with the periphery of the feed roll 39 is most desirably made for turning the feed roll 39 at such a rate that its surface speed will be identical with that of the web X. As shown, it derives this turning movement from the travel of the web through the machine, as by causing the web to turn over a roller 45, provided with sprocket teeth 46 for engaging the marginal rows of sprocket apertures $x$ of the webbing, and having a gear connection 47, 48, with the feed roll 39. For insuring a proper engagement of the web X with the sprocket roller 45, a flanged guide roller is preferably provided. As shown, the guide roller 49, sprocket roller 45, and feed roll 39 are removably journaled in the frame 14 of the machine, as by being provided with spindles 50, which have a rotatable support at one end upon set-screws, as 51, secured in the side member 16, and at the other end upon spring lugs, as 52, secured by the frame member 15.

Provision is preferably made for adjustably determining the pressure of engagement between the brushes 42, 43, and feed rolls 40, 41, respectively, and of the engagement between the brushes 42, 43, and the web X, as it turns over the supporting roller 44. As shown, the brushes 42, 43, are removably journaled in the frame 14, preferably in the same manner adopted for supporting the feed roll 39, sprocket roller 45, and flanged guide roller 49. The adjustment of pressure between the brushes 42, 43, and feed rollers 40 and 41, and between the brushes 42, 43, and guide roller 44, is provided for adjustably supporting the feed rollers 40 and 41, and the guide roller 44. As shown, each of the feed rolls 40 and 41 is removably journaled, according to the manner adopted for supporting the feed roll 39, in bracket-arms 53, 54, respectively, pivotally supported at one end upon a shaft 55, which extends through the frame 14, and adjustably secured to the frame at the other end, as by means of a set-screw 56, which enters one of the side members, as 15, of the frame 14 through a slot 57 in the bracket arm.

The supporting roller 44 turns about a non-rotatable spindle 58, which has its ends secured in lever arms 59, 60. To permit of a raising and lowering of the supporting roller 44 upon the brushes 42, 43, and to preferably also permit of the supporting roller 44 being raised entirely out of contact with the brushes in order that they may be conveniently accessible, the lever arms 59, 60, extend across the top of the frame 14, each being pivotally supported, as at 61, in one of the frame members 15, 16, respectively, adjacent one of its ends, and carrying at its other end a vertically-disposed set-screw 62, which bears upon the top of the frame.

The brushes 42, 43, and feed rolls 40 and 41, are rotated by power preferably so applied that the brushes, in contacting with the web X as it turns over the supporting roller 44, will move in the reverse direction from the movement of the film, and that in contacting with the feed rollers 40, 41, they move in the reverse direction from the movement of the feed rolls. As shown, this power is transmitted through the shaft 55, which also serves for supporting the inner ends of the bracket arms 53, 54. A pulley 63 is mounted on the end of the shaft 55 outside of the frame 14, and within the frame the shaft 55 carries a gear 64, which meshes with gears 65, 66, 67 and 68, which are carried, respectively, by the spindles of the feed rolls 40 and 41, and brushes 42 and 43.

Preferably provision is made for directing an air blast through the apertures $x$ of the web X during the application of the protective coating thereto. As shown, this air blast is only directed through the apertures $x$ during the application of the coating by means of the brushes 42 and 43, that part of the coating put on by the roller 39 being too thin and too small in quantity to bridge over the apertures or flow through them to the back of the web.

Most desirably the supporting roller 44 is of less width than the web X, as shown in Fig. 4 of the drawings, and chambered disks 69, 70, are mounted on the spindle 58 at each side of the roller 44. These disks, as shown,

are provided with hubs 71, 72, and are rigidly secured to the non-rotatable spindle 58 as by means of set-screws 73, extending through the hubs 71, 72. The disks 69, 70, are also provided with peripheral flanges 74, 75, for guiding the web X over the roller 44, but as shown at 76, 77 (Fig. 1), these flanges are omitted adjacent the brushes 42, 43, to prevent the coating solution from being deposited on them by the brushes. The chambers 78, 79, of the disks 69, 70, communicate, as at 80, 81, with an air channel 82, extending through the spindle 58 from one of its ends, as 83, which is adapted for connection with a suitable source of supply of compressed air, as by having a valve coupling 84 for a flexible hose (not shown) attached thereto.

A series of nipples 85, communicating with the air chambers 78, 79, of the disks 69, 70, are mounted in the periphery of the disks adjacent the brushes 42, 43. These nipples register with the sprocket apertures $x$ of the web X as it passes over the roller 44 in contact with the brushes 42, 43, and direct jets of air through these sprocket apertures to prevent the apertures from being bridged over by the coating solution, and to prevent any of the solution from passing through the apertures to the back of the web.

In order that the amount of the solution carried out of the pans 18, 19, by the feed rolls 39, 40 and 41, may be adjustably regulated, vanes 86, which wipe the periphery of these rollers, are provided. One of these vanes is illustrated in detail in Fig. 7 of the drawings. As there shown it is carried by a spindle 87, which extends across the frame 14 and is journaled in the side members 15, 16, of the frame. Means are provided for angularly adjusting the spindle 87 to cause the free edge of the vane 86 to bear with more or less force upon the periphery of the adjacent feed roll. To this end a worm wheel 88 is mounted upon one end of the spindle, and a worm shaft 89, rotatably mounted in a bracket 90 secured to the adjacent side member of the frame and having a knurled head 91, coöperates with the worm wheel 88. The vanes 86 provided for wiping the periphery of the feed rolls 40 and 41, are identical in construction with that provided for wiping the periphery of the feed roll 39, and shown in detail in Fig. 7 of the drawings, except that the corresponding spindles 87 and worm shafts 89 are carried by the bracket-arms 53, 54, as shown in Fig. 1, instead of by the frame members 15, 16.

Means are also desirably provided for wiping the coating solution from the sides of the feed rolls 39, 40 and 41. For this purpose yielding angularly-adjustable vanes 92, 93, are mounted on the side walls of the pans, as 18 (Figs. 3 and 7), for bearing upon the sides of the feed rolls, as 39. As shown, each of these vanes is formed of sheet metal, having its lower edge downwardly curved into the pan, as at 94 (Fig. 3), and is carried by hinge brackets 95, pivotally mounted upon the edge of the pan. Preferably the base of each of the hinge brackets 95 is made angular, as shown at 96, 97, 98 (Fig. 3), and a leaf spring 99, extending along the edge of the pan, bears upon the angular base of the hinge bracket to cause the vane to yieldingly engage the adjacent side face of the feed roll, as shown by full lines in Fig. 3, or to support the vane in the upright position shown by dotted lines in Fig. 3 when it is desired to remove the feed roll from the pan.

In beginning the operation of the machine the end of a web X carried by the reel A is drawn through the machine, either by hand or by attaching it to the end of a web which has preceded it, until a sufficient length has been drawn out to reach the traveling drying tape B. The end of the web is then attached to the drying tape B, and the movement of the tape causes the web to be continuously drawn through the machine. Movement of the webbing over the sprocket roller 45 causes a rotation of the feed roll 39, which by constantly dipping in the solution contained in the pan 18 applies an initial coating of the solution to the face of the web.

The feed rolls 40 and 41, and brushes 42 and 43, are continuously rotated by means of power applied to the driving pulley 63. The rotation of the brushes 42, 43, causes them to be continuously supplied with coating solution delivered to them from the pan 19 by the feed rolls 40 and 41, and this solution may in turn be applied to the face of the web X, giving it a smooth coating. If the nipple 84 be connected to a suitable supply of compressed air, air jets will constantly issue from the nozzles 85, and in passing through the sprocket apertures $x$ of the web X as these apertures pass in front of the nozzles during the turning of the web over the supporting roller 44, accumulation of the coating solution in the sprocket apertures will be prevented. The amount of solution delivered to the web X by the feed roll 39, and delivered to the brushes 42, 43, by the feed rolls 40 and 41, may be accurately regulated by a turning of the screw-shafts 89 to cause the vanes 86 to more or less closely engage the peripheral surface of the corresponding feed roll. The elevation of the pans 18, 19, may be regulated to cause the feed rolls 39, 40 and 41 to dip into the solution contained in the pans to the desired depth, through a use of the crank arms 33.

For causing the brushes 42, 43, to bear upon the surface of the feed rolls 40 and 41 with more or less force, the elevation of

the feed rolls may be secured in any adjusted position by means of the set-screws 56, bearing upon the bracket arms 53, 54. As the bracket arms 53, 54, swing about the shaft 55 which carries the driving gear 64, as a center, the adjustment of the feed rolls 40 and 41 does not interfere with the engagement between the gears 65, 66, and the driving gear 64. The degree of force with which the brushes 42, 43, bear upon the surface of the web X as it turns over the roller 44, may be adjusted by a use of the set-screws 62, which determine the elevation at which the bracket arms 59, 60, are supported.

The machine as organized will effectually apply a solution of pyroxylin to the gelatin surface of a moving picture machine film, thereby causing the gelatin to be protected upon both sides by a web of substantially the same character. The various parts of the machine are so disposed that they are conveniently accessible for cleaning and for renewal and repair.

I claim as my invention—

1. The combination with means for applying a liquid to the surface of an apertured web, of means for directing an air blast through the apertures of the web.

2. In a machine for coating the surface of an apertured web, in combination, a liquid-applying brush, an air nozzle directed toward the brush, and means for causing the travel of the web between the brush and nozzle.

3. In a machine for coating the surface of a web having a marginal row of apertures, in combination, a rotatable roller support for the web, the face of the roller being of less width than the web, a liquid-applying brush roller rotatably mounted in front of the support, and a stationary nozzle located at the side of the roller support, such nozzle being directed radially outward.

4. In a machine for coating the surface of a web having a marginal row of apertures at each side, in combination, a rotatable roller support for the web, the face of the roller being of less width than the web, a stationary tubular spindle for the roller, a chambered disk fixed to the spindle at each side of the roller, the chambers of the disks being in communication with the passage through the spindle, outwardly-directed apertures in the periphery of the disks, and liquid-applying means operating in front of the roller and disks.

5. In a machine for coating the surface of a web having a row of sprocket-engaging apertures, in combination, a liquid-applying roller engageable with the face of the web, a sprocket wheel engageable with the sprocket apertures of the web, and spur gear connection between the liquid-applying roller and the sprocket wheel.

6. In a machine for coating the surface of a web having a row of sprocket-engaging apertures, in combination, a liquid-applying roller and a sprocket roller each engageable with the web, gear connection between the said rollers, and means other than the sprocket roller for advancing the web.

7. In a machine for coating the surface of a web having a row of sprocket-engaging apertures, a liquid-applying roller, a sprocket roller and a brush roller each engageable with the web, gear connection between the sprocket roller and the liquid-applying roller, power-driving means for turning the brush roller, and means for advancing the web.

8. In a web-coating machine, in combination, means for advancing the web, a liquid-applying roller, a guide roller adapted to be rotated by contact with the moving web, and gear connection between the liquid-applying roller and the guide roller.

9. In a web-coating machine, a brush roller engageable with the web, a liquid container, a roller dipping into the container, the periphery of the brush roller and the second-named roller being in contact, a pivotally-supported arm carrying the second-named roller, a gear mounted coaxially with the pivot of the arm, and pinions on the roller spindle and the brush spindle respectively, engageable with the gear.

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