

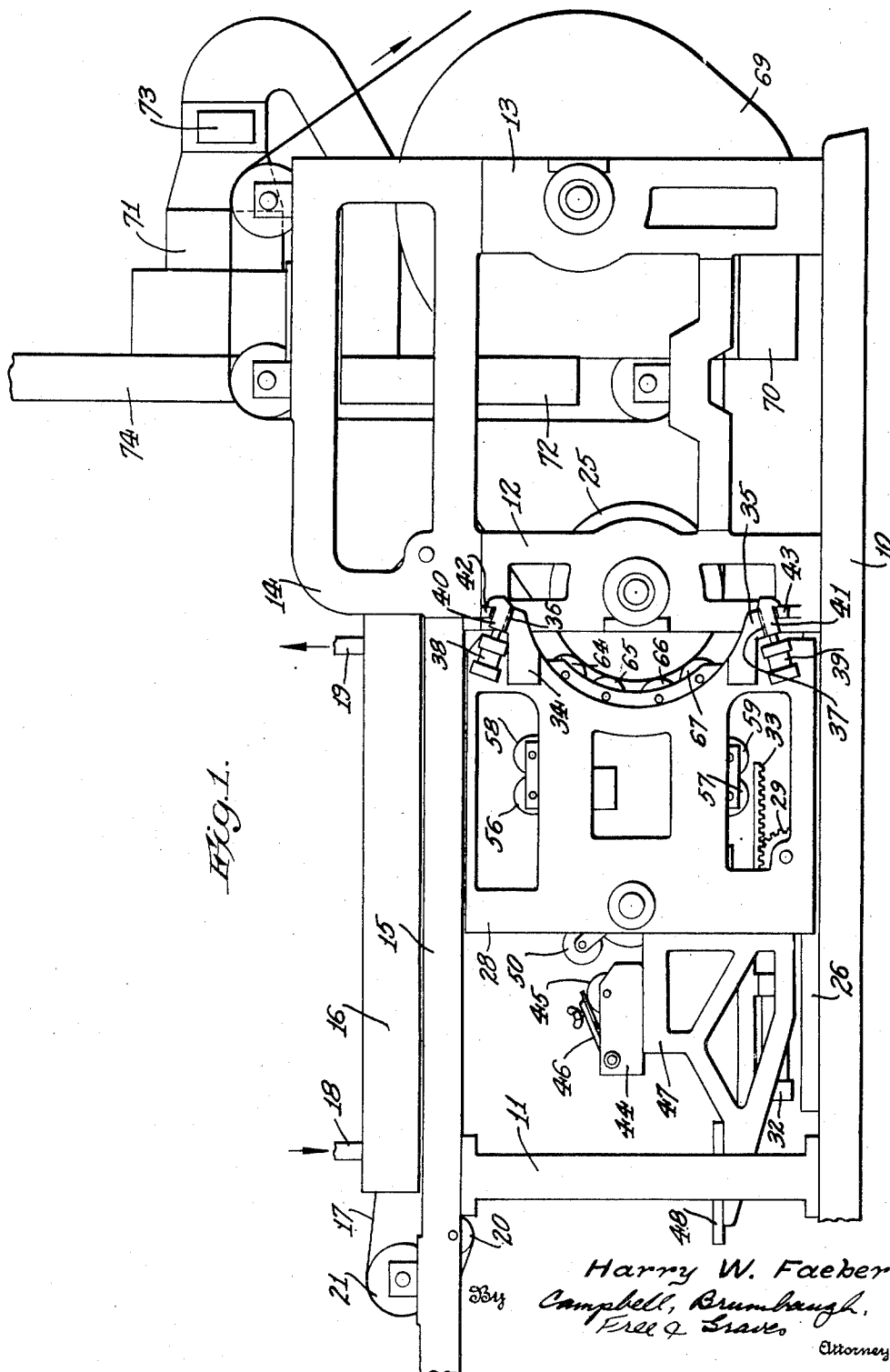
June 5, 1951

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METHOD OF COATING CONTINUOUS
WEBS OF PAPER OR THE LIKE

2,555,536

Original Filed Aug. 1, 1945

3 Sheets-Sheet 1



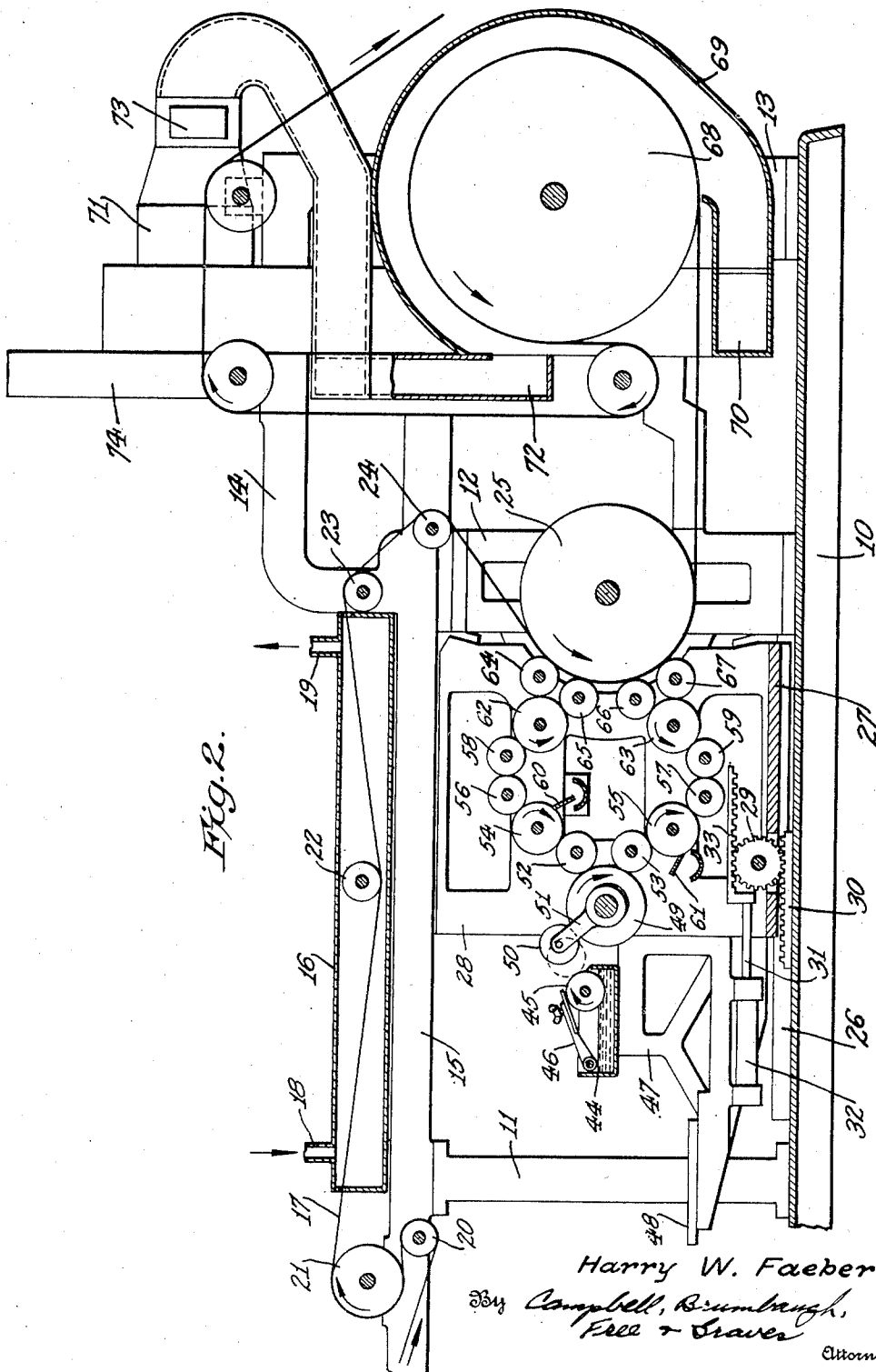
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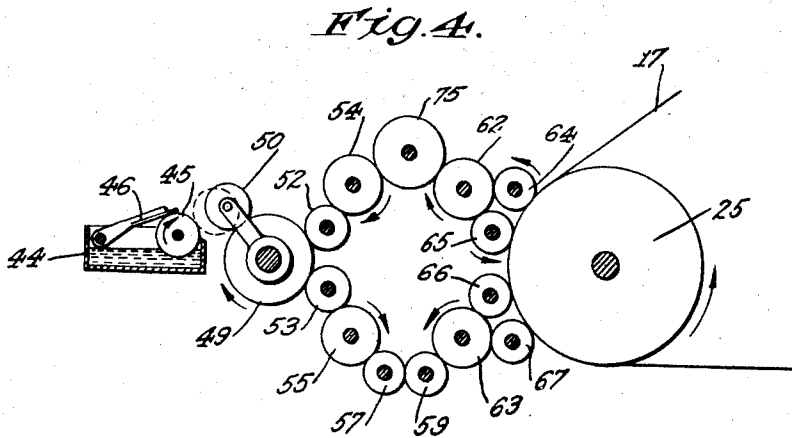
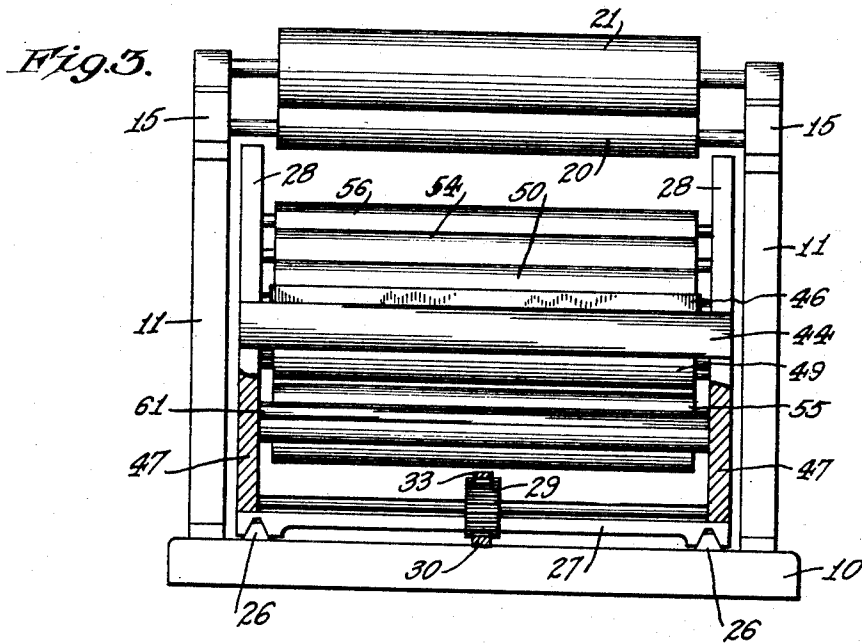
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Inventor
Harry W. Faerber

By
Campbell, Brumbaugh, Free & Travis
Attorneys

UNITED STATES PATENT OFFICE

2,555,536

METHOD OF COATING CONTINUOUS WEBS
OF PAPER OR THE LIKEHarry W. Faerber, Larchmont, N. Y., assignor to
Time, Incorporated, New York, N. Y., a corpo-
ration of New YorkOriginal application August 1, 1945, Serial No.
608,228. Divided and this application Novem-
ber 17, 1948, Serial No. 60,605

8 Claims. (Cl. 117—152)

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The present invention relates to the art of coating and embodies, more specifically, an improved method by means of which the coating of continuous webs of paper and the like may be accomplished effectively in a continuous operation.

This application is a division of copending application Serial No. 608,228, filed August 1, 1945, now U. S. Patent 2,456,495 granted December 14, 1948.

It has long been known to coat continuous webs of paper and like material, either from a roll or rolls of paper suitably mounted at the web-feeding end of the coating mechanism, or from the delivery end or intermediate station in the paper making machine, so that the end product produced by the paper manufacture comprises a coated web. In existing coating methods, difficulty has been experienced in obtaining, at reasonably high web traveling speeds, a resulting coating having a desired uniformity of surface. The art is replete with illustrations of those existing methods and although each, whether it be air, brush, dip, or roller coating generally, possesses certain advantages, each concomitantly therewith, carries with it certain disadvantages.

An object of the present invention, accordingly is to provide a method by means of which a coating material may be applied to a continuously rapidly moving web of paper or the like in such fashion as to afford a desired uniformity in the resulting coated surface.

Another object of the invention is to provide, in a method of the above character, means whereby a coating material can be applied to a continuously rapidly moving web of paper or the like without impairing the character of the web. The foregoing objects are attained by applying a plurality of layers of coating material successively and in relatively close adjacent stations to the web material as it passes through the coating material.

Other and further objects of the invention will appear as it is described in greater detail in connection with the accompanying drawings, wherein:

Figure 1 is a view in side elevation, showing a coating mechanism constructed in accordance with the present invention;

Figure 2 is a view in vertical section, taken on a plane passing longitudinally through the coating machine of Figure 1, and showing the details of the coating mechanism embodied therein;

Figure 3 is a view in end elevation of the mechanism shown in Figures 1 and 2; and

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Figure 4 is a partial view, somewhat diagrammatic in nature, similar to Figure 2 and showing a modified form of distributing mechanism.

Referring to the above drawings, the coating machine will be seen to be formed of a base 10 having an end frame member 11 and side frame members 12 and 13 on each side of the base. Supported on the end and side frame members is a top frame member 14 formed with an elongated element 15 upon which a tunnel 16 is mounted. The tunnel provides a means within which the web 17 can be suitably conditioned prior to coating, as, for example, by means of the introduction of moisture-laden air or other atmosphere through a conduit 18 and its discharge through a suitable connection 19.

In order that the web may be properly guided through the conditioning mechanism and to the coating station, receiving rollers 20 and 21 are provided, over which the web travels in its movement into the conditioning chamber 16 in which a roller 22 is provided to insure a proper span of the web in its continued movement to guide rollers 23 and 24. From the guide roller 24 the web travels to a supporting roller 25 upon which the web is coated in the manner now to be described.

Upon the base frame 10 there are provided longitudinally extending ways 26 upon which a carriage 27 is slidably mounted as illustrated in Figure 3. The carriage 27 is provided with side frame members 28 between which a plurality of distributor rollers is mounted, as will be hereinafter described. The motion of the carriage 27 on the ways 26 is controlled by means of one or more gear wheels 29 mounted upon the side frame members 28 and engaging with stationary racks 30 formed upon the base member 10. A piston rod 31 received within a suitable hydraulic cylinder 32 is provided with a movable rack 33 which engages the gear wheel 29 and thus, when the piston rod 31 is moved in either direction, corresponding motion will be imparted to the carriage 27.

The motion may be controlled by any well known hydraulic control mechanism, the details of which form no part of the present invention, and the carriage may thus be moved into the coating position, as illustrated in Figure 2, or into a retracted position in which the mechanism may be readily inspected, maintained and repaired.

In order that the carriage may be locked effectively in its coating position, the carriage is provided with shoulders 34 and 35 having angularly disposed supporting surfaces 36 and 37, respectively. Adjacent the shoulders 34 and 35,

hydraulic cylinders 38 and 39 are respectively mounted. The respective cylinders are provided with pistons carrying slidable latches 40 and 41, these latches being adapted to engage over the respective shoulders 42 and 43. When the pistons in the cylinders 38 and 39 are moved outwardly and away from the cylinders, the latches 40 and 41 disengage the respective shoulders 42 and 43, and thus the carriage is unlocked and free to move into its retracted position. Movement of the latches in the opposite directions after the carriage has been returned to its coating position causes the carriage to be locked effectively in such position.

In order that the web may be effectively coated in accordance with the improvement of the present invention, a supply of coating material is maintained within a fountain 44. A fountain roller 45 is journaled to rotate in the fountain and receive, on its peripheral surface, a supply of the coating material. A doctor 46 may be provided to control suitably the quantity of coating material picked up by the fountain roller 45, and suitable mechanism may be provided to maintain the fountain roller in the direction of the arrow indicated in Figure 2.

The fountain 44 may be mounted upon supporting frame members 47 which are provided with a platform 48 upon which the attendant may stand to observe the operation of the fountain and cooperating mechanism.

From the fountain roller 45, the coating material is transferred to a distributor roller 49 by means of an oscillator ductor roll 50 carried upon arms 51 and oscillated by suitable mechanism not illustrated. It thus follows that the ductor roller 50 will intermittently contact with the fountain roller 45 and distributor roller 49 in order to transfer the coating material to the distributor roller 49.

In order to accomplish the more perfect uniformity of coating applied to the web, in accordance with the present invention, the coating material is carried to the web in a plurality of paths. The application of the coating material to the web in a plurality of films accomplishes a great improvement in the smoothness of the surface of the coated web. It is believed that the principal reason for this improvement lies in the fact that a subsequently applied film of coating material tends to fill in the valleys formed in a previously applied film of coating material, thus providing a finished coating having a surface of greater smoothness than surfaces heretofore produced.

In accordance with the foregoing, the distributor roller 49 rotates in contact with rollers 52 and 53. Because roller 52 is the first to engage the distributor roller 49 in the rotation of the latter away from the ductor roll 50, the roller 52 removes a greater quantity of coating material than the roller 53, and thus starts a path of coating material which will apply a greater quantity of the material to the web than the path supplied by the roller 53. Rollers 54 and 55 transfer the coating material from the respective rollers 52 and 53 and apply it to distributing rollers 56 and 57, respectively, which, in turn, transfer the coating to distributing rollers 58 and 59.

Cleaning mechanisms, such as wiping blades 60 and 61, remove the coating material from rollers 54 and 55 which is not transferred to the respective rollers 56 and 57, and thus insure the

transference of a uniform quantity of material to the rollers 56 and 57.

Rollers 58 and 59 transfer the coating material on the surface thereof to the respective rollers 62 and 63 which run in contact with the respective applicator rollers 64, 65 and 66, 67, respectively. The applicator rollers run in contact with the web 17 upon the surface of the drum 25, and it will thus be seen that four successive films of coating material are applied to the web, the first two films applying coating material received from the path supplied by the roller 52, and the second two films with coating material supplied by the roller 53. Because the first roller in contact with rollers 62 and 63 in the direction of rotation thereof removes a greater quantity of coating material than the second roller in contact therewith, applicator roller 65 will apply the thickest film of coating material to the web while applicator roller 66 will apply the thinnest film to the web. Rollers 64 and 67 will thus apply films of intermediate thicknesses, and the result will be that the web 17 will have applied thereto successively a plurality of films of coating material, thus to accomplish the desired result hereinabove mentioned. It is contemplated that one or more of the applicator rollers 64, 65, 66, and 67 may be driven in such fashion that they rotate at different peripheral speeds than the speed of the web.

The rollers in the distributing mechanism above mentioned are preferably formed hollow in order that they may be supplied with water or a similar fluid to control the temperature of the coating material in its path over the rollers. If desired, certain of the rollers may be reciprocated, the better to distribute the coating material transversely of the web, and the relative speeds of certain of the rollers may be varied, if desired, in order to increase the mixing or distributing action of the coating material along the rollers.

From the supporting roller or drum 25, the coated web is carried to a drying mechanism, including a drying drum 68 adapted to be supplied with a heating medium at a suitable temperature. A shell 69 is provided around the drum 68, and drying air is introduced into the shell 69 by means of a duct 70 which receives air from a fan 71. If desired, the air furnished by the fan may be taken from a duct 72 at the discharge end of the shell or drying chamber 69 and heated in a suitable furnace 73. A stack 74 may be provided to discharge moisture-laden air, if it is desired to discharge such air to atmosphere rather than to re-heat it. To accomplish this, suitable valves and other connections may be provided whereby the duct 72 may discharge directly into the stack 74.

In accordance with the present invention it is also contemplated that the application of the successive films of coating material to the web may take place in such fashion that one or more of the applicator rolls may rotate in a direction counter to the direction of motion of the web. For example, with reference to Figure 4, the distributing rollers 56, 58 in the form of the invention shown in Figure 2 have been replaced by a single roller 75. As a result, the rollers 64 and 65 rotate in a direction opposite to the direction of movement of the web 17 as it moves over the roller 25. This produces a rubbing and ironing effect which tends to apply the films of coating material to the web in a highly effective fashion. The subsequent rollers 66 and 67 which engage the web with purely rolling contact thus apply

their films of coating material to the previously applied films from the rollers 64 and 65 to smooth out the coating material and render it highly uniform in its surface characteristics.

It will be apparent that the result above described in connection with the form of the invention shown in Figure 4 can also be accomplished in the structure shown in Figure 2 by providing positive roller driving mechanism for certain of the rollers in either or both of the trains to drive them positively in such direction as to result in a counter-movement of the applicator rollers with respect to the web traveling thereunder on the supporting roller 25.

While the invention has been described with specific reference to the structure shown in the accompanying drawings, it is not to be limited save as defined in the appended claims.

I claim:

1. A method of coating a web of paper or the like with a plurality of films of coating material to form a composite, uniformly distributed layer of coating material upon said web, which comprises forming first and second films of coating material, said second film being thinner than said first film, uniformly and separately distributing said first and second films, dividing said first film into a third film and a fourth film, said fourth film being of lesser thickness than said third film, applying said fourth and third film successively to said web, and finally applying said second film to said web.

2. A method of coating a web of paper or the like with a plurality of films of coating material to form a composite, uniformly distributed layer of coating material upon said web, which comprises forming a plurality of films of coating material from a common source of coating material, uniformly and separately distributing said plurality of films and applying said films successively to said web.

3. A method of coating a web of paper or the like with a plurality of films of coating material to form a composite, uniformly distributed layer of coating material upon said web, which comprises forming first and second films of coating material from a common source of coating material, said second film being thinner than said first film, uniformly and separately distributing said first and second films, and applying said first and second films successively to said web.

4. A method of coating a web of paper or the like with a plurality of films of coating material to form a composite, uniformly distributed layer of coating material upon said web, which comprises forming first and second films of coating material from a common source of coating material, said second film being thinner than said first film, uniformly and separately distributing said first and second films, dividing said first film into a third film and a fourth film, said fourth film being of lesser thickness than said third film, applying said fourth and third films successively to said web, and finally applying said second film to said web.

5. A method of coating a unidirectionally moving web of paper or the like with a plurality of films of coating material to form a composite, uniformly distributed layer of coating material upon said web, which comprises forming first and second films of coating material, said second film being thinner than said first film, uniformly and separately distributing said first and second films, dividing said first film into a third film and a fourth film, said fourth film being of lesser

thickness than said third film, applying said fourth and third films successively to said web, and finally applying said second film to said web, at least one of said second, third and fourth films being applied in a direction counter to the motion of said web.

6. A method of coating a web of paper or the like with a plurality of films of coating material to form a composite, uniformly distributed layer of coating material upon said web, which comprises forming first and second films of coating material, said second film being thinner than said first film, uniformly and separately distributing said first and second films, dividing said first film into a third film and a fourth film, said fourth film being of lesser thickness than said third film and said second and fourth films being of substantially equal thickness, initially applying one of said second and fourth films to said web, then applying said third film to said web, and finally applying the other of said second and fourth films to said web.

7. A method of coating a web of paper or the like with a plurality of films of coating material to form a composite, uniformly distributed layer of coating material upon said web, which comprises forming first and second films of coating material, said second film being thinner than said first film, uniformly and separately distributing said first and second films, dividing said first film into a third film and a fourth film, said fourth film being of lesser thickness than said third film, dividing said second film into a fifth film and a sixth film, said sixth film being of lesser thickness than said fifth film, and applying said fourth, third, sixth, and fifth films successively to said web.

8. A method of coating a unidirectionally moving web of paper or the like with a plurality of films of coating material to form a composite, uniformly distributed layer of coating material upon said web, which comprises forming first and second films of coating material, said second film being thinner than said first film, uniformly and separately distributing said first and second films, dividing said first layer into a third film and a fourth film, said fourth film being of lesser thickness than said third film, dividing said second film into a fifth film and a sixth film, said sixth film being of lesser thickness than said fifth film, and applying said fourth, third, sixth, and fifth films successively to said web, at least one of said third, fourth, fifth and sixth films being applied in a direction counter to the motion of said web.

HARRY W. FAEBER.

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