Dec. 10, 1963 J. B. KOHLER 3,113,884

COATING MEANS AND METHOD

Filed Oct. 16, 1958 2 Sheets-Sheet 1

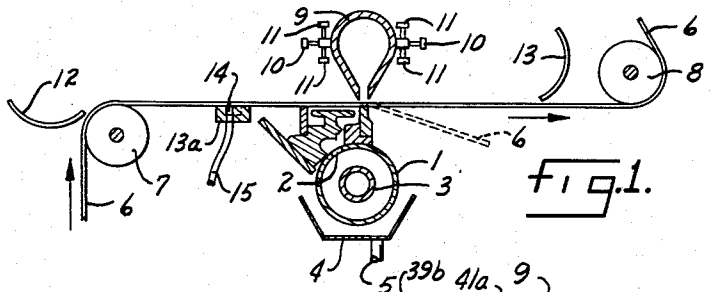

Fig. 1.

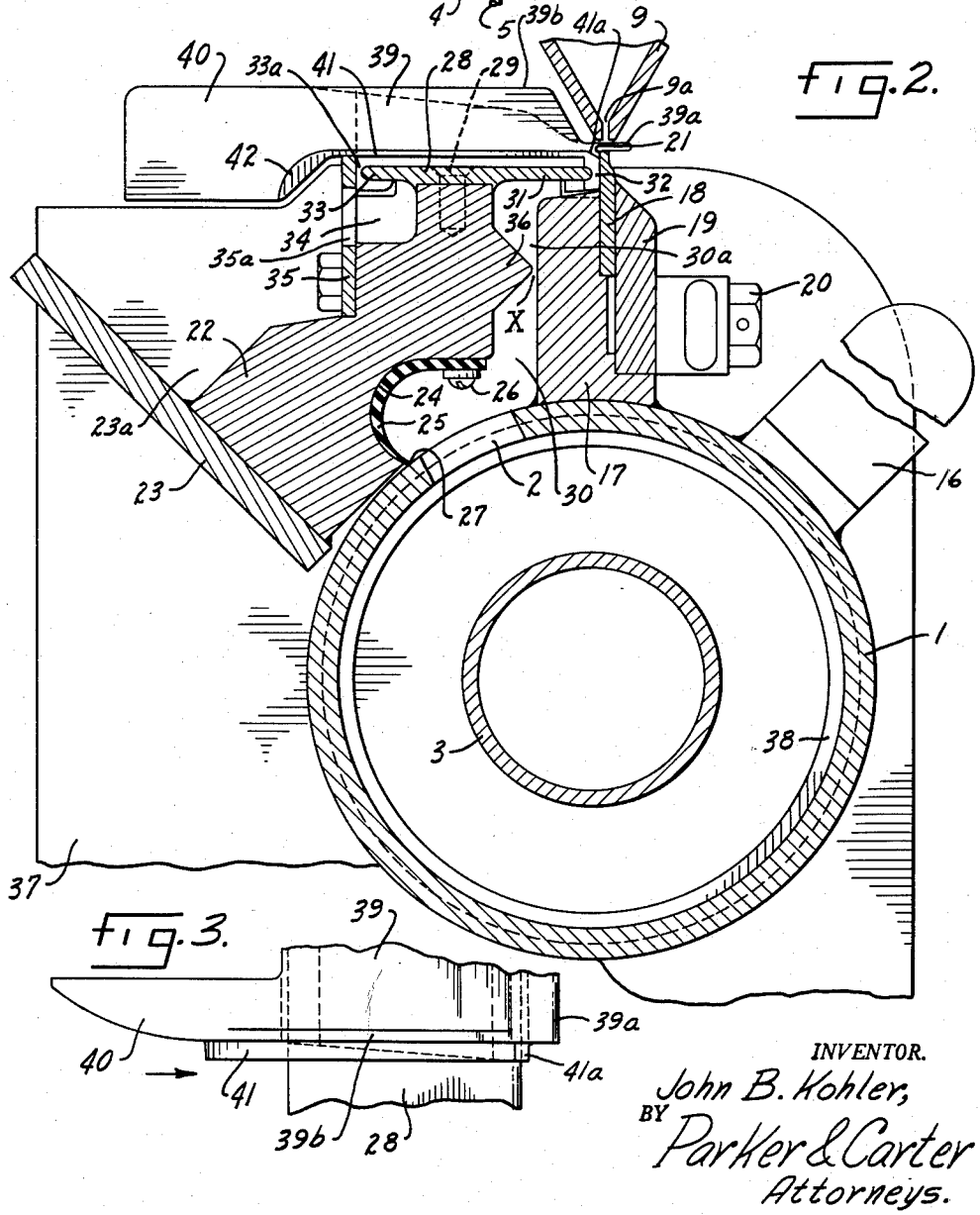

Fig. 2.

Fig. 3.

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Fig. 4.

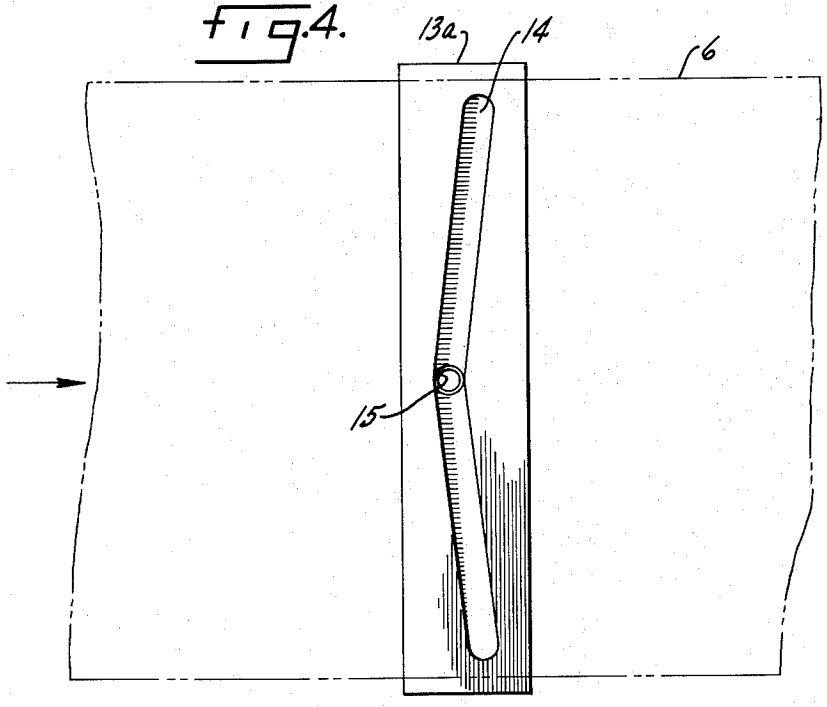
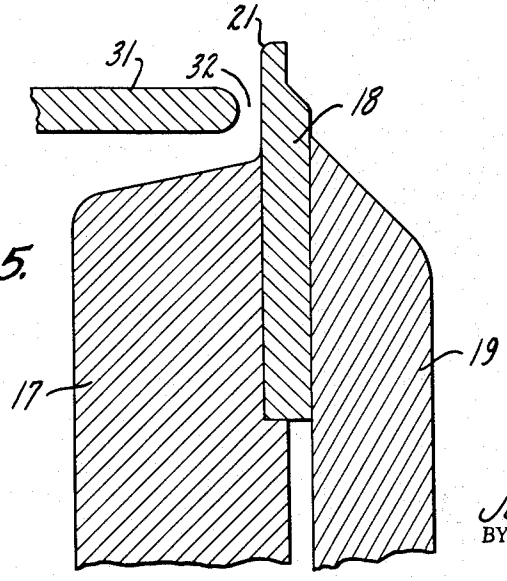


Fig. 5.



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3,113,884

COATING MEANS AND METHOD

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This invention relates to a coating apparatus and to a method of coating. It has for one object to provide a coating means for coating paper and other web material which is moved continuously past a source of coating material.

It has for another object to provide a method of applying a coating to a continuously moving web or band of material.

Another object is to provide a satisfactory method of metering and smoothing the coating material.

Other objects will appear from time to time during the course of the specification and claims.

The invention is illustrated more or less diagrammatically in the accompanying drawings wherein:

FIG. 1 is a diagrammatic showing of one form of the present mechanism;

FIG. 2 is a vertical sectional detail taken on an enlarged scale and illustrating the coating assembly of FIG. 1;

FIG. 3 is a horizontal plan view of a portion of the mechanism shown in FIG. 2;

FIG. 4 is a plan view of the chevron groove of FIG. 1; and

FIG. 5 is a detailed sectional view on an enlarged scale of dam member and associated parts shown generally in FIG. 2.

Like parts are indicated by like numerals throughout the specification and drawings.

As shown in FIG. 1, diagrammatically, a transversely positioned coating supplying container 1, which is generally of tubular form, is illustrated. It is provided with one or more outlet openings 2. These may be in the form of a plurality of holes, perforations or slots, or a single continuous slot may extend substantially from end to end of the tubular member 1.

If desired, a tube 3 extends through the member 1 and it may be used to control temperature conditions of the coating material. Thus it may be used as a heating or even as a cooling conduit for heating and cooling fluid which pass through it. Coating material is supplied to the member 1 continuously by pump or otherwise from any desired source. Since the invention is not limited to any particular supplying means for coating material, none is shown.

Beneath the member 1 is provided a troughlike device 4 into which surplus material will fall and from which it may be conducted by a pipe 5 either for wasting or for reintroduction into the member 1.

A web of paper or other material suitable to be continuously fed past the coating station is indicated in FIG. 1 by the numeral 6. It is omitted from FIGS. 2 and 3. It is arranged to be moved in the direction shown by the arrows in FIG. 1. It passes over a roller 7 on its way to the coating station and it passes over a roller 8 on its way from the coating station. The rollers 7 and 8 may be driven by any suitable means to pull the web and control the speed and tension thereof, or other web-pulling means may be provided before and after the coating station. 8 may be a suction roller.

An air or other gas nozzle 9 is provided adjacent the coating station. The orifice 9*a* of the nozzle 9 is generally of a uniform opening, extending across the width of the web, and beyond for a sufficient distance so that there are no end effects in that part of the jet impinging on the web. It is shown diagrammatically throughout.

It may be mounted for adjustment and adjusting screws 10, 10 are provided for horizontal adjustment and independently actuatable adjusting screws 11 are provided for vertical adjustment. A waste air deflector 12 is provided on one side of the coating station and a second waste air deflector 13 is provided on an opposite side of the coating station. A suction device is provided before the coating station and extends generally across the width of the web 6. This device comprises a suction housing 13*a* which is provided with a chevron-shaped groove 14 in its upper face. Suction is provided through the tube 15.

The coating container 1 is movably mounted so that it may be brought into fixed position and move from it when desired, either for adjustment, cleaning, repair or any other purpose. To this end it is provided with one or more handles 16 to which a controlling and moving device may be attached. It is also provided with a fixed dam support 17 to which a dam 18 is secured by locking means 19 which may be held permanently in place by a member 20, or otherwise secured. The dam 18 is preferably provided with a rounded edge 21, the curvature of which faces toward the oncoming web of material. The opposite edge of the dam is preferably square, and the area between the rounded edge and the square edge is preferably flat. The dam may have any other form. A variety of dams of different thickness is provided, and they may be changed. The dam to be used is selected according to the type and quantity of coating material to be applied. The dam support 17 and the dam 18 define one side of the coating outlet chamber through which coating moves from the reservoir 1 through the openings 2 and finally to the web for coating.

The opposite side of the cavity or chamber through which the coating material flows is defined by a boundary member 22 which is carried on a support 23 to which it is fixed. It is curved on its under face, as at 24, and a packing or sealing member 25 is secured in place by screws 26, or otherwise. The packing member makes a fluidtight fit where it contacts the outer surface of the member 1, as at 27. A generally flat member 28 is secured to the member 22 by screws, rivets or other members 29. It extends across the outlet passage 30, as shown at 31, approaching relatively closely to the dam 18 and defining with that dam the final outlet opening 32 for coating material. At its opposite side the member 28 extends as at 33 to overlie a transverse passage 34. This passage is partially closed by an adjustably mounted plate 35 which extends along the passage 34.

The member 22 is shaped to provide a portion 36 which, together with the inner face of the dam support 17, provides a discharge controlling passage, which is indicated by the letter X in FIG. 2. The parts will normally be positioned, shaped or adjusted so that the passage X is narrower than the outlet opening 32. Thus impurities, foreign matter and other particles which are of a size unsatisfactory for proper coating will not pass beyond the restricted opening defined at X. Hence, clogging or blocking, or the deposition of particles of any material of too large size will not occur at the final outlet opening 32.

Since the particular details of mounting and supporting the device are not essential, only sufficient of these features will be illustrated and described as to make it clear that the coating assembly as a whole is supported adjacent the path of the web. Thus at each end of the tubular coating supply member there is provided a plate or support 37. This is laterally extended sufficiently to have secured to it the member 23. Thus the member 23 and the member 22, which will also normally be secured to each of the plates 37, form with those plates a suitable framework and this frame is mounted wherever desired adjacent the path of the web. Each plate member 37

carries a ring 38 about which the tubular member 1 is mounted for adjusting movement by means of the handle 16 or otherwise. The handle may be actuated manually or by some controlling means not shown. Packing means, not shown, are used to prevent leakage and means, also not shown, are used to hold the coating supply member 1 in adjusted position.

Positioned adjacent each end of the member 1 is mounted an end or edge paper and coating guiding member. This member is shown in elevation in FIG. 2 and in plan in FIG. 3. It comprises a blade portion 39 which is suitably shaped to engage the plate 28 or any other suitably fixed support. The entire member 39, including the portions 40 and 41, may be slid along the plate 28 to adjust its position to the particular width of web which is being operated. It is provided with a curved portion 40 which is curved away from the edge of the web. This portion is shown clearly in FIG. 3 in plan. The curved portion faces in the direction of the entering web. This direction of movement of the web with respect to the member 40 is indicated by the arrow in FIG. 3. The portion 40 extends downwardly below the line of travel of the web and is provided with an integral shelflike portion 41 which may be downwardly curved as at 42. This shelflike portion provides a surface upon which the edge of the web moves as it passes over the coating area and through the coating station. It terminates at any convenient point, but in the particular form shown it terminates against the dam 18, and its top is notched downwardly as at 41*a* adjacent the dam 18, so that the dam 18 will provide doctoring action across the full face of the web 6, including the edges which ride along the surface 41. By means of the shelflike portion 41 the web is guided along each edge as it moves to, through and past the coating station. The generally vertical or upwardly extending portion 39, 40 directs the air blast and the curved portion 40 has proven in practice to be effective in guiding away the blast of air which may carry color or other coating material. When this is accomplished, the blast of air from the nozzle 9, which may have particles or quantities of coating material in it, is directed away so that these materials are not deposited on the back of the web, that is to say on the surface of the web which is uppermost during coating. Experience has shown that under other conditions and in the absence of a guiding member such as the member 40, air will move from the nozzle along the back or upper surface of the web and will carry with it some quantity of the coating material and will thus spatter or carry coating material on the surface of the web which is not being coated deliberately and which should not receive this material at all.

Although an operative form of the device has been shown, the invention is not limited to the particular details shown. Many changes may be made in the form, shape and arrangement of parts without departing from the spirit of the invention. In particular, the invention is not limited to the precise details of the structure shown, nor to the precise manner of operation indicated. For example, the web 6, although it will normally move about a roll 8 after it has left the coating station, may be guided and directed downwardly, as indicated in dotted lines in FIG. 1. This would be accomplished, of course, by moving the roll 8 or by providing some other member which would guide and control the direction of movement of the web as it leaves the coating station. Another obvious modification is in the change of the member 24, 25. Any means might be provided at this point to seal in the coating material and to prevent its escape away from the area at which coating occurs. The device is also not limited to any particular type of fluid directing means. Any suitable means for supplying fluid pressure properly located and controlled at the point desired in the coating operation is within the contemplation of the invention. Other adjusting means may be provided for the air or fluid supply means.

The particular changes mentioned above are only typical of many structural modifications contemplated.

The invention may embody a fluid jet using air or other fluid. For some commercial installations air is the preferable fluid, but the invention is not limited to the use of air or any other particular fluid. Generally, therefore, where in the specification and claims the word "air" is used, it is to be understood as meaning air or any other suitable fluid.

The use and operation of the invention are as follows:

In general the device of this invention is mounted adjacent the path of a web of material which is to be coated. It is immaterial whether the web is just moving from a point of manufacture, where it has just been made, or whether it is a web which has been previously made and rolled and is unrolled or unwound for the coating operation. In any event the web is moved to the coating means, and the coating station in particular, preferably continuously and at constant speed. The coating material is supplied to the interior of the member 1 by pumps, gravity, or otherwise, and flows outward through the opening or slot 2. The tube 3 may be used for the circulation of material which accomplishes temperature control. The coating material may thus be heated or cooled as necessary to maintain it in suitable condition for continuous application to a continuously moving web, or to control its viscosity.

Prior to operation the member 1 is adjusted to the desired position to control both the size of the passage X, which is in effect a metering passage, and the size of the passage 32 through which the material moves into the coating pool which lies above the plate 28. The slot or orifice X is preferably narrower than the opening 32 so that all material, including impurities and foreign matter of any sort, which passes the metering orifice X will flow freely through the discharge orifice or slot 32. By this means clogging of the passage 32 is prevented. Even though some clogging may occur at the orifice X, there is sufficient space in that part of the chamber 30 between restriction X and orifice 32, designated 30*a*, to permit the flow to even out in the chamber 30*a* so that the flow through the orifice 32 is always steady and uniform across the face of the web 6, as it flows into the pool of coating material which overlays the member 28.

The coating material flows across the top of the member 28, between the edge dams 39, against the movement of the web 6, and a portion drains through the orifice 33*a* into the chamber 34, which extends across the full width of the machine. The chamber 34 is formed by the members 22, 28 and 35. One or more openings 35*a* are provided in plate member 35 to take off continuous bleed from the chamber 34, but the area of the openings is less than the area of the orifice 33*a*.

The openings 35*a* drain into the trough 23*a* formed between the members 22 and 23. Additional excess coating material which may be fed from the conduit 1 will flow over the top of the member 35, which serve as a weir to control the height of the pond overlaying the member 28. This excess also drains into the trough 23*a*, from which it may be gathered by a pipe (not shown) for return to the system, or is allowed to spill into the pan 4.

By locating the openings 35*a* outside of the edge of the widest web, the height of the pond at the edges can be slightly reduced, which prevents coating from overflowing the top of the members 41, keeping the operation clean and reducing spatter.

The continuous bleed drain from the chamber 34 also has the effect of continually eliminating heavy dirt, which otherwise would accumulate in the pond. Floating dirt, bubbles, etc., are carried out with the excess flowing over the weir 35. Excess drip and spill from the trough 23*a* is caught in the pan 4, whence it is conducted by the pipe 5 either to be rescreened and returned to the coating supply system or to be wasted.

Before coating begins the air blast or nozzle means

will be adjusted as necessary, and if the member 13*a* is present it will be positioned, if desired, at a suitable point. The preferred adjustment of the parts is that wherein the rolls 7 and 8 are positioned so that the web lead between them is horizontal, and the top of the suction member 13*a*, the edge dam surfaces 41, and the top of the dam 18 or doctor blade all just touch the web line.

The nozzle 9 is so positioned that the jet issuing from the opening 9*a* impinges on the web 6 directly above the dam 18. When the parts are so adjusted, there is no component of web tension aiding or opposing the pressure force exerted by the jet, and the jet therefore completely controls the doctoring action of the dam 18.

With these adjustments and those previously mentioned accomplished the device is ready for use and with coating material flowing to the pool formed above the plate 23 the web is caused to move over the top of the pool and is brought into contact with the upper surface of the coating pool. The web moves in the direction of the arrows of FIG. 1, that is to say to the right, and comes in contact with the dam member 18 and moves over that dam member. It is to be noticed that the upper surface of the blade 18 is rounded on the left side, which is the side against which the moving web moves. On the right or "away side" of the member 18 the surface is sharp and angular. Thus the upper edge or surface of the member 18 has a flat area aligned with the web and the path of the web movement. This flat surface is rounded as at 21 and is sharp on the opposite edge. The rounded edge has among its advantages the fact that it permits the entry of dirt or coating particles should they be present and they can readily be carried over the blade, and any tendency for such particles to hang on the blade and scratch the coating is avoided. The sharp rear or exit edge of the blade 18 prevents the formation of a pattern in the coating, avoids meniscus formation and provides for a sharp line of cleavage. The plate 35 preferably has its upper edge slightly lower than the upper edge of the blade 18 by an amount less than the height of a free standing meniscus of the coating material. The web line is preferably horizontal and the web contacts the coating throughout the area of the coating pool or pond.

Since the surface of the coating pool is fairly extensive, the web will be in contact with a substantial area of coating material as it moves across the coating pool from the plate 23 to the blade or dam 18, and thus the coating material will be picked up by or applied to the web over a substantial area, except for the edge surfaces moving over the surfaces 41. When the member 13*a* is present with its chevron groove 14, the point of the chevron extends toward the oncoming web. The tub 15 is connected to a source of negative pressure and thus suction is effected on the oncoming web to control its positioning and hold it against "flutter" or chatter so that it moves smoothly toward the coating station and is thus held properly at the time that it is in contact with the coating material. At the same time the angular sides of the slot have a spreading action on the web and prevent and eliminate wrinkling therein. Under some conditions the device composed of the members 13*a*, 14 and 15 may be omitted.

As the web moves in the direction of the arrows in FIGS. 1 and 3, it passes over the upper edge of the plate 35 and across the top of the coating pool and is thus brought in contact with the coating material which is constantly moving upwardly from the space within the supply pipe 1, through the chamber 30, past the metering slot X, through the outlet orifice 32, and into the pool space above the plate 23. Thus, as the web moves steadily across the coating pool the coating material rises steadily to meet the web and the web is in contact with the coating material over a considerable area.

As the web reaches the doctoring member 18, which has also been called a dam since it serves as a dam to define one wall of the coating pool chamber, the web

encounters first the rounded edge of the plate 18. It is held or pressed against this edge by the air means 9. As the web moves beyond the member 18, beyond its curved edge and onto its generally flat top edge, a doctoring effect is accomplished by the cooperation of the member 18 and the air which moves from the member 9 onto the upper and uncoated side of the web. This effect is accomplished whether the web moves relatively straight from the blade 18, as shown in full lines in FIG. 1, or is directed downwardly from the member 18, as indicated in dotted lines in FIG. 1. The air nozzle 9 is preferably a little wider than the web so that it projects beyond the web along each side of the web. This insures a fully active uniform jet over the full width of the web. The conformation of the end dam members 39, particularly the lip 39*a*, and the fin 39*b* divert the unused portion of the jet outside of the area of the web.

The web in its movement through the coating station at its edges passes over the portions 41 of the two members 39. There is thus a portion of the under or coated surface of the web which remains uncoated, or substantially so because it does not come into direct contact with the coating material in the coating pool. Another result accomplished by the members 39, 40, 41 is the prevention of spattering or other deposition of coating material on the upper, and therefore uncoated, surface of the web. Inevitably, and particularly in high speed operations, some coating material will escape and could fall on the upper surface of the web. The likelihood of this is increased by the presence of the air blast or air jet emerging from the member 9. This jet impinging on the top surface of the web 6 is divided and diverted to flow outwardly from the nozzle opening 9*a* along the web, a portion blowing forward in web direction, and a portion blowing backward opposite to web direction.

The vertical face of member 39 confines this latter portion of the flow, but since it has a relatively high speed, it tends to create a low pressure area at the edges of the web where the web overlays the flat surfaces 41. This tends to pull some of the coating material out under the edges of the web, where it is picked up by the stream of air or other fluid in the form of droplets.

It is undesirable to have any coating material deposited upon the upper surface of the web. The outward flare of the member 40 in cooperation with the air blast or air jet so directs the current of air that it carries away the drops and droplets of the coating material which have escaped and which might otherwise fall upon and be retained by the upper surface of the web.

While for some purposes the coating device may be so made that it will require no adjustment, generally it is preferable to make it so that adjustment may be accomplished. By this means the device may be adjusted to handle webs of different thickness or different materials and to handle different types of coating materials. With some web materials, such as open mesh textiles, it may be undesirable to use the fluid jet to control doctoring pressure on the dam 18. In this case, by lowering the roll 8 or interposing another web directing means, the web can be directed generally downward after passing over the dam 18, as shown in dotted lines in FIG. 1.

When so operated, the doctoring action is dependent on web tension, and can be controlled by controlling web tension or by changing the angle of "break" over the dam 18. Such operation does not, however, give the same degree of control as does the use of the jet, as web tension varies not only totally, but also locally within a running web.

The nut 20 may be backed off to release the member 19 from the blade 18 which may be removed for cleaning, for substitution or adjustment. If the blade becomes worn or broken or otherwise unsatisfactory, a new blade is supplied. If a thicker or thinner blade is required, it may be supplied. Blade 18 may be adjusted up and down with respect to the member 17 and is held in place by the member 19 when the nut 20 is tightened.

Should clogging or blocking develop, the machine may be stopped and the barrel or tube 1 may be rotated by the handle 16. When it is rotated, for example, clockwise from the position of FIG. 2, it carries with it the abutment 17 and all the parts which are secured to it. This moves the member 17 away from the nose portion 36, and also moves the blade 18 away from the portion 31. This movement is carried sufficiently to permit cleaning of the parts. Thereafter the rotation of the member 1 is carried out in a counter-clockwise direction and the parts are brought back again to the desired adjusted position in which the orifices X and 32 are of desired size. Thus the mechanism shown provides means for adjusting the orifices, for adjusting the doctor blade 18, and for moving the parts away from each other for cleaning, repair and inspection. The precise means for holding the tube 1 in adjusted position are not shown and their details form no essential part of the present invention. The tubular member 1 is mounted for rotation about rings 38, as mentioned earlier. The rings are fixed to the plates 37 and furnish a bearing for the tube 1.

I claim:

1. In combination in a coater, means for applying a coating material to a running web, means comprising a blade for smoothing and metering said coating, means for applying gaseous pressure against the uncoated side of said web in juxtaposition to said smoothing and metering means, and means comprising a suction box for controlling and stabilizing the position of said web against the fluid flow emanating from said pressure applying means, said suction box being ahead of said means for applying coating.

2. In combination in a coating machine, means defining a pond of coating material for contact with a running web, means comprising one transverse boundary of said pond arranged effective to attenuate the coating material into a film upon the surface of the web, means comprising a jet of air impinging upon the back of said web in juxtaposition to said attenuating means for the purpose of controlling the action of said attenuating means and for controlling the resultant thickness of the coating film, and means for controlling the web as it approaches the pond to prevent its displacement by fluid pressure from the pond.

3. In combination in a coating machine, means defining a pond of coating material for contact with a running web, means comprising one transverse boundary of said pond arranged effective to attenuate the coating material into a film upon the surface of the web, means comprising a jet of air impinging upon the back of said web in juxtaposition to said attenuating means for the purpose of controlling the action of said attenuating means and for controlling the resultant thickness of the coating film, and suction means for controlling the web as it approaches the pond to prevent its displacement by fluid pressure from the pond.

4. In combination in a coating machine, means defining a pond of coating material for contact with a running web, means comprising one transverse boundary of said pond arranged effective to attenuate the coating material into a film upon the surface of the web, means comprising a jet of air impinging upon the back of said web in juxtaposition to said attenuating means for the purpose of controlling the action of said attenuating means and for controlling the resultant thickness of the coating film, suction means for controlling the web as it approaches the pond to prevent its displacement by fluid pressure from the pond, and web-spreading means active on the web as it approaches the pond, and comprising a chevron groove.

5. In combination in a web coating machine, means defining a pond of coating material adapted to be in contact with a horizontally running web, means comprising one transverse boundary of said pond arranged to attenuate the coating material into a film upon the surface of the web, and gaseous pressure means acting upon the back of said web opposite said attenuating means.

6. In combination in a web coating machine, means defining a pond of coating material in contact with a running web, means comprising one transverse boundary of said pond arranged to attenuate the coating material into a film upon the surface of the web, means comprising a jet of gas impinging upon the back of said web in juxtaposition to said attenuating means to control the action thereof and the resultant thickness of the coating film, and edge dams forming the sides of said pond, each including a flat portion outside of and adjoining the pond mounted to be overlaid by the web to provide a dry edge, each also including a perpendicular surface with an outwardly curved extension effective to divide the effluent of the jet into a center zone and end zones and to guide a portion of the effluent of said jet laterally outward away from said jet, to carry any superfluous coating discharge harmlessly away from said web.

7. The method of coating a running web of flexible material with a liquid coating material, said method comprising the steps of continuously supplying an excess of coating to a pond with uniform flow across the width of the web to be coated, continuously bleeding off from both the top and the bottom of the pond and simultaneously controlling the level of said pond, controlling the position of the running web to cause it to be wetted evenly by the coating material in the pond, moving the web, opposite to the liquid flow, across the pond, keeping the edges of the web dry, and removing any superfluous coating material which may work under said edges, and pressing the web by gaseous pressure uniformly against a member comprising the downstream boundary of the pond respective to web flow, so that the web and the boundary member attenuate the coating into a film upon the surface of the web by hydraulic wedge action.

8. The method of coating a moving web of flexible material with a liquid coating material embodying the steps of establishing a pond substantially the width of the running web, providing uniform flow of the coating material into and through the pond, controlling the position of the running web and smoothing it just before it contacts the pond, pulling the web across the pond so that the web is completely wetted by the coating material, except at its edges, metering and smoothing the coating material at its point of departure from the pond by a properly shaped member comprising one boundary of the pond, pressing the web against said boundary member by gaseous pressure acting on the back of the web opposite said boundary member in such manner that absorption into the web is minimized and the film deposited upon the web is substantially of the thickness determined by the hydraulic wedge action of the liquid coating between the web and the metering and smoothing member.

9. The method of coating a moving web of flexible material with a liquid coating material embodying the steps of establishing a pond substantially the width of the running web, providing uniform flow of the coating material into and through the pond, controlling the position of the running web and smoothing it just before it contacts the pond, pulling the web across the pond so that the web is completely wetted by the coating material, except at its edges, metering and smoothing the coating material at its point of departure from the pond by a properly shaped member comprising one boundary of the pond, and pressing the web against said boundary member by a jet of gas impinging on the back of the web opposite said boundary member in such manner that absorption into the web is minimized and the film deposited upon the web is substantially of the thickness determined by the hydraulic wedge action of the liquid coating between the web and the metering and smoothing member.

10. The method of coating a web of flexible material with a liquid coating material, including the steps of controlling the viscosity of the liquid, controlling the speed

of the web, wetting the web with the liquid in immediate proximity to a rigid doctor blade so that the soaking time for absorption prior to doctoring is minimized, and pressing the web against the edge of the doctor blade by controlled and uniform gaseous pressure on the back of the web so that the web and the edge of the doctor blade attenuate the coating into a film by hydraulic wedge action.

11. The method of coating a web of flexible material with a liquid coating material, including the steps of controlling the viscosity of the liquid, controlling the speed of the web, wetting the web with the liquid in immediate proximity to a rigid doctor blade so that soaking time for absorption prior to doctoring is minimized, and pressing the web against the edge of the doctor blade by controlled and uniform gaseous pressure on the back of the web so that the web and the edge of the doctor blade attenuate the coating into a film by hydraulic wedge action, wherein the thickness of the film so formed is a function of the thickness of the doctor blade, the pressure exerted on the back of the web, the viscosity of the liquid, and the running speed of the web.

References Cited in the file of this patent

UNITED STATES PATENTS

1,391,281	Snyder	Sept. 20, 1921
2,195,101	Swab	Mar. 26, 1940
2,251,264	Berch et al.	Aug. 5, 1941
2,252,345	Johnson	Aug. 12, 1941
2,309,981	Randall	Feb. 2, 1943
2,356,666	Hamilton	Aug. 22, 1944
2,464,771	Van Guelpen	Mar. 15, 1949
2,534,320	Taylor	Dec. 19, 1950

FOREIGN PATENTS

91,762	Norway	May 27, 1958