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R. J. JACOBS ET AL

3,079,889

PAPER MACHINERY

Filed June 3, 1959

6 Sheets-Sheet 1

FIG-1

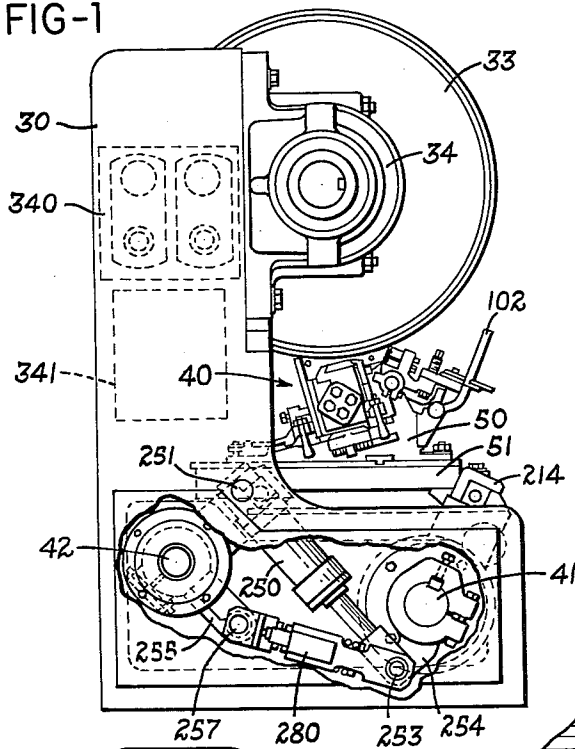


FIG-3

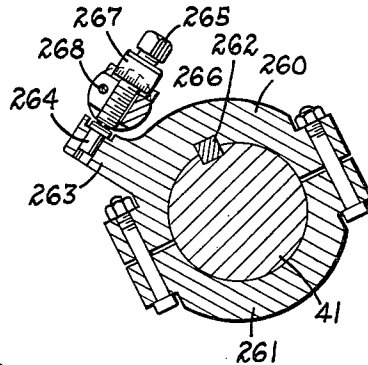
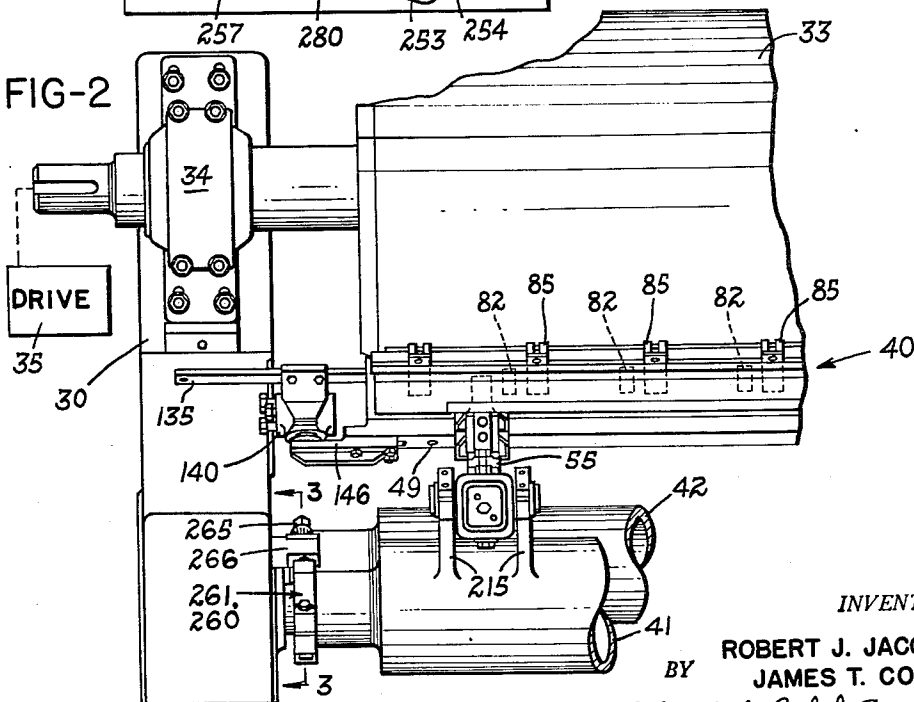


FIG-2



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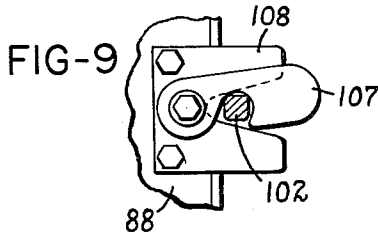
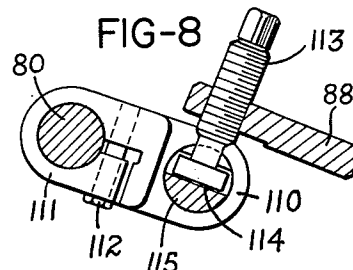
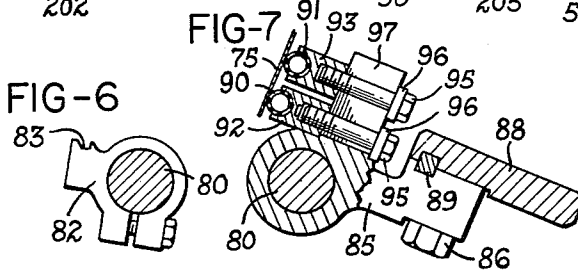
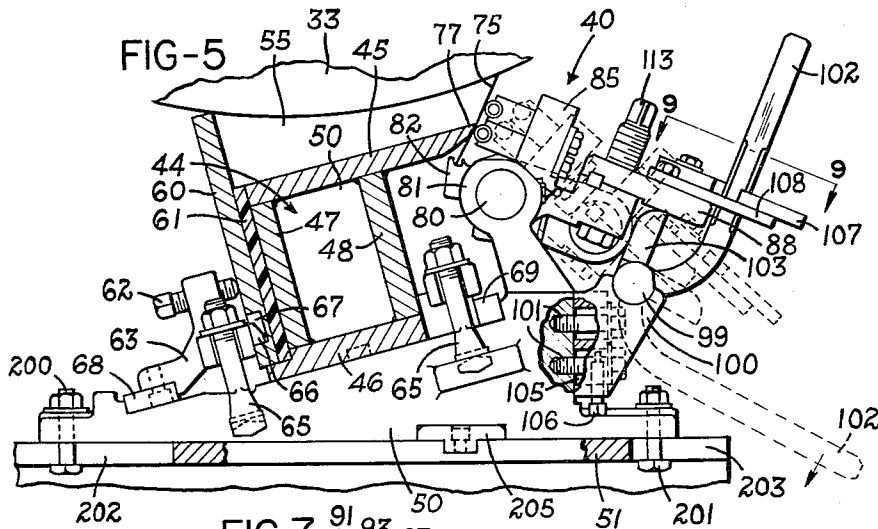
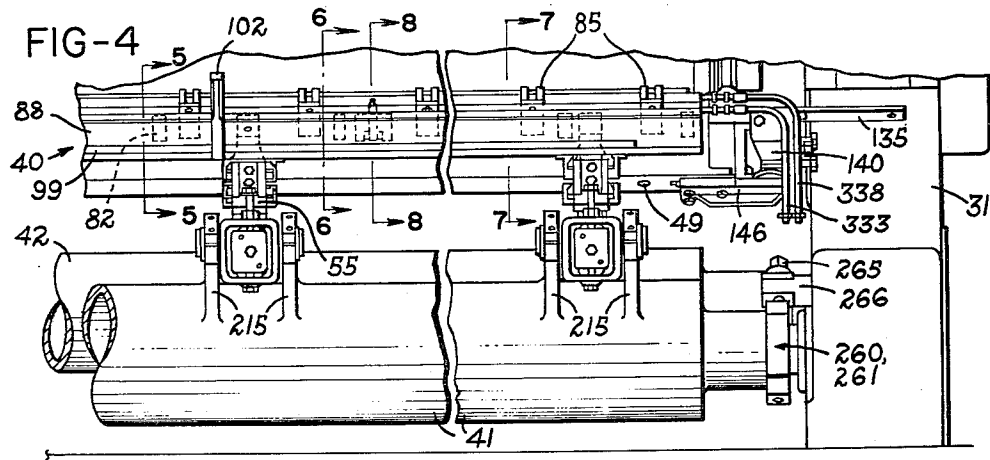
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6 Sheets-Sheet 2



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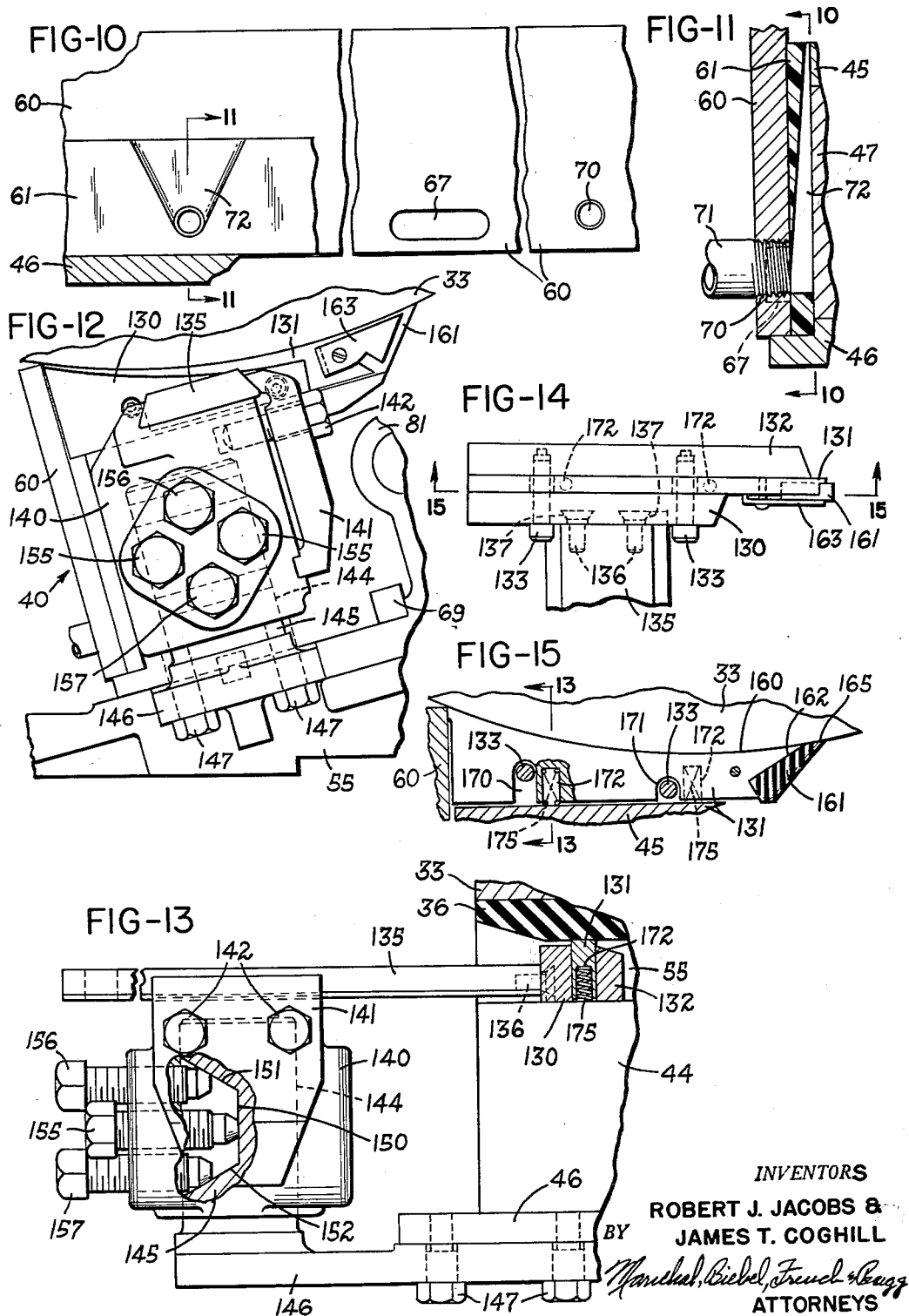
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6 Sheets-Sheet 3



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3,079,889

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FIG-16

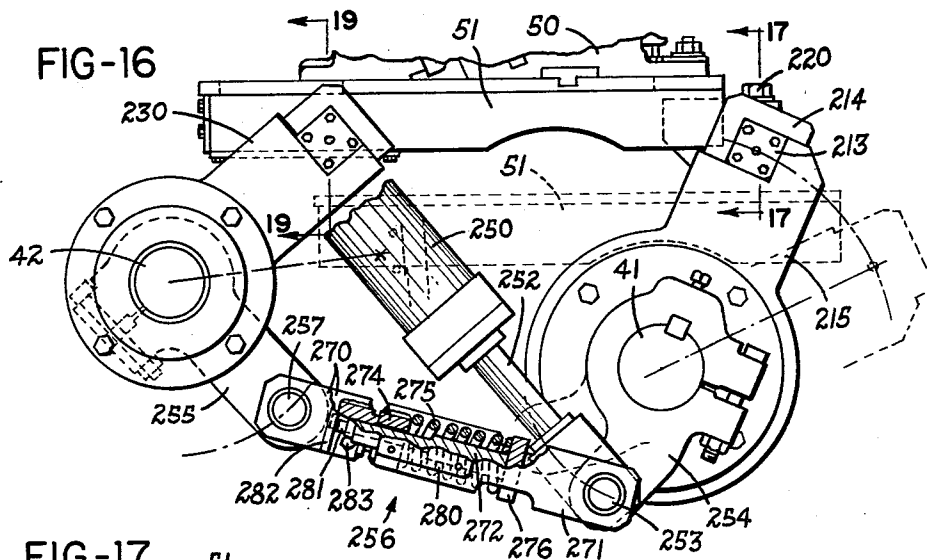


FIG-17

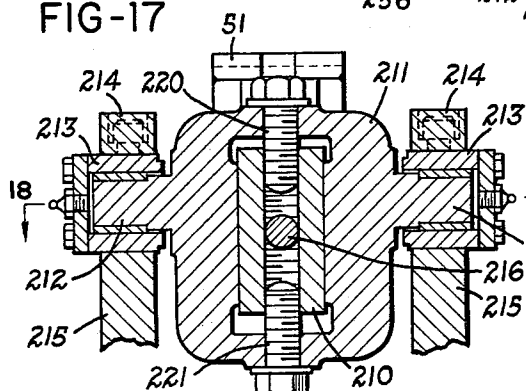


FIG-18

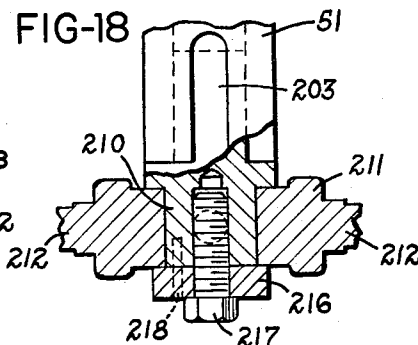


FIG-19

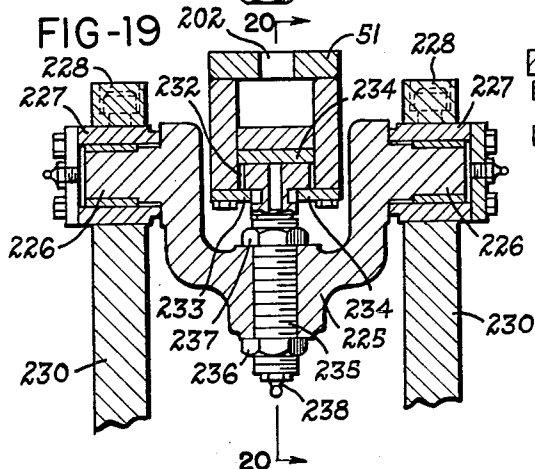
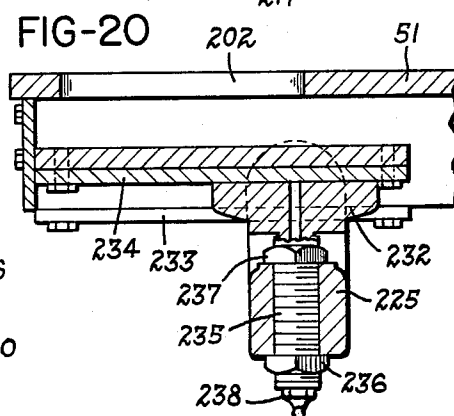


FIG-20



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FIG-21

FIG-22

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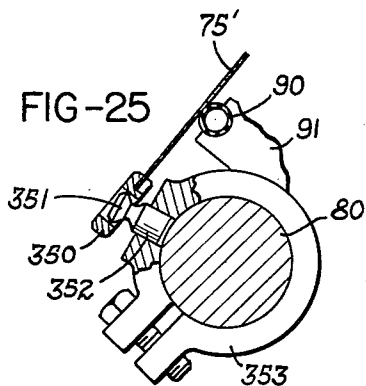
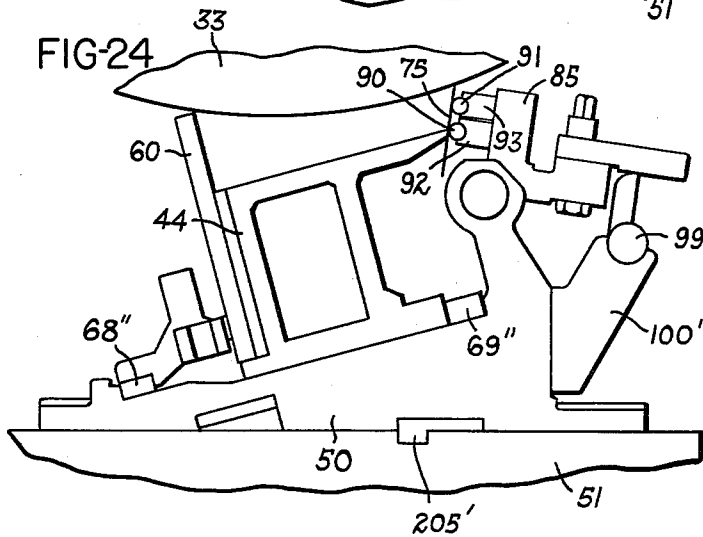
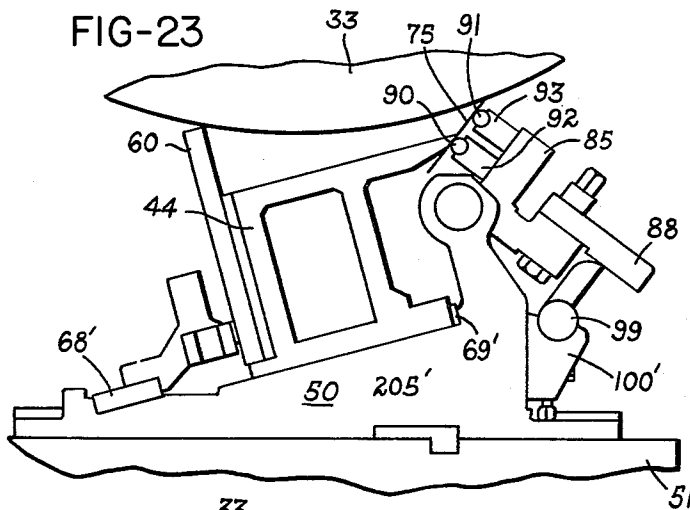
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6 Sheets-Sheet 6



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PAPER MACHINERY

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Filed June 3, 1959, Ser. No. 817,788

18 Claims. (Cl. 118—8)

This invention relates to apparatus for coating paper and other web materials.

It is a primary object of the invention to provide web coating apparatus of improved and novel construction which possesses great versatility from the standpoints, among others, of the materials to be coated, the rate and weight of the coating, the speed at which the coating can be applied, the adjustment of the area to be coated, and the ease of initial set up, adjustment for desired coating conditions, and maintenance.

It is a particular object of the invention to provide web coating apparatus having the advantages outlined above wherein the coating composition is applied to a web through an enclosed chamber under operating conditions establishing accurate control over the rate of application of the coating composition to the web.

An additional object of the invention is to provide web coating apparatus as outlined above wherein the application of the coating composition to the web is effected and controlled with the aid of a flexible blade arranged to force the coating composition against the web under controlled conditions promoting maximum uniformity of coating.

Another object of the invention is to provide web coating apparatus of the flexible blade type which is constructed for maximum ease and accuracy of adjustment of the blade from the standpoints not only of its operating pressure against the web but also of its adjustment to compensate for wear and its replacement, and it is a particular object of the invention to provide such apparatus wherein the blade can be entirely replaced in minimum time without affecting other adjustments of the apparatus.

Another specific object of the invention is to provide web coating apparatus of the blade type wherein the working pressure of the blade against the web can be adjusted during the coating operation, and particularly wherein such adjustment may be effected uniformly across the entire width of the web or may be selective in localized areas across the web.

An additional object of the invention is to provide web coating apparatus which is constructed and arranged to make possible the rapid elimination of streaks in the coated surface without the necessity for stopping operation of the apparatus.

A further object of the invention is to provide web coating apparatus having edge dams of improved and novel structural and operational characteristics enabling rapid adjustment for desired width of the coating area, and particularly offering efficient sealing action over a wide range of coating compositions and operating pressures.

It is also an object of the invention to provide web coating apparatus having edge dams as outlined above wherein the mounting of the coating chamber is constructed and arranged for accurate adjustment in accordance with the caliper of the web to be coated while maintaining high sealing efficiency for the edge dams.

Another object of the invention is to provide web coating apparatus wherein the chamber from which the coating composition is applied to the web is supported below the backing roll with which it cooperates during coating and is carried by a mounting structure constructed and arranged to move the chamber between a raised operating

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position in accurately predetermined relation with the roll and a lowered position with minimum possibility of spilling the coating composition therefrom, and a particular additional object of the invention is to provide such a mounting structure wherein the lowered position of the coating chamber is forward of the backing roll for increased ease of access for maintenance purposes.

A still further object of the invention is to provide web coating apparatus having one or more of the advantages outlined above which incorporates a safety mechanism for sensing winding of the web on the backing roll in the event of a web break and for immediately causing the coating chamber to be moved away from the backing roll and thereby preventing possible damage to any of the parts of the apparatus by the pressures which could otherwise develop therein.

A still further object of the invention is to provide web coating apparatus capable of construction in the proportions necessary to coat webs of relatively great width wherein the mounting arrangement for the coating chamber includes a plurality of individually adjustable parts arranged to compensate for manufacturing irregularities in the assembly of the coating chamber in such manner as to establish accurate parallelism between the coating chamber and the backing roll with which it cooperates during coating.

Additional objects and advantages will be apparent from the following description, the accompanying drawings and the appended claims.

In the drawings:

FIG. 1 is a view in side elevation, partly broken away, showing web coating apparatus constructed in accordance with the invention;

FIG. 2 is a partial front elevational view looking from right to left in FIG. 1 and showing the same end of the apparatus as in FIG. 1;

FIG. 3 is an enlarged detail section on the line 3—3 of FIG. 2;

FIG. 4 is a fragmentary view similar to FIG. 2 and including the opposite end of the apparatus from that in FIG. 1;

FIG. 5 is a fragmentary view taken partially in section through the coater box as indicated by the line 5—5 of FIG. 4 but with many of the other parts in side elevation or partly broken away;

FIG. 6 is an enlarged detail section on the line 6—6 of FIG. 4;

FIG. 7 is an enlarged detail section on the line 7—7 of FIG. 4;

FIG. 8 is an enlarged detail section on the line 8—8 of FIG. 4;

FIG. 9 is a fragmentary view taken as indicated by the line 9—9 of FIG. 5;

FIG. 10 is a fragmentary elevational view looking at the inner faces of the back plate and associated gasket members of the coater box, the view being taken generally as indicated by the line 10—10 of FIG. 11;

FIG. 11 is an enlarged fragmentary section on the line 11—11 of FIG. 10;

FIG. 12 is a fragmentary side elevational view of the same end of the coater box shown in FIG. 1 and is primarily for the purpose of illustrating edge dam construction;

FIG. 13 is an enlarged fragmentary view looking from right to left in FIG. 12 with portions broken away in section on line 13—13 of FIG. 15;

FIG. 14 is a fragmentary plan view of the edge dam assembly of FIGS. 12 and 13;

FIG. 15 is a detail view of the edge dam blade in FIGS. 12—14, the view taken generally as indicated by the line 15—15 of FIG. 14;

FIG. 16 is a fragmentary view looking in the same di-

rection as FIG. 1 and illustrating primarily the mechanism for raising and lowering the coater head assembly;

FIG. 17 is an enlarged fragmentary section on the line 17—17 of FIG. 16;

FIG. 18 is a fragmentary section on the line 18—18 of FIG. 17;

FIG. 19 is an enlarged fragmentary section on the line 19—19 of FIG. 16;

FIG. 20 is a fragmentary section on the line 20—20 of FIG. 19;

FIG. 21 is a combined pneumatic and hydraulic diagram for the apparatus of FIGS. 1—20;

FIG. 22 is a fragmentary wiring diagram for the apparatus of FIGS. 1—21;

FIGS. 23 and 24 are somewhat diagrammatic fragmentary views generally similar to FIG. 5 and showing adjusted positions of the coater box for establishing different angular relationships between the coater blade and the backing roll; and

FIG. 25 is a view comparable to FIG. 6 showing a modified construction of holder for the back edge of the coating blade.

Referring to the drawings, which illustrates a preferred embodiment of the invention, the main frame of the coater includes a pair of spaced end stands 30 and 31, and the backing roll 33 over which the web W travels is supported on the end stands 30 and 31 by suitable bearings 34 and is driven to rotate in counterclockwise direction as viewed in FIG. 2 by the drive indicated diagrammatically at 35. The roll 33 is of relatively large diameter, for example a diameter of 32 inches for a roll 154 inches in length. It may if desired be provided with a resilient coating as indicated at 36 in FIG. 13, but satisfactory results have been obtained with an all metal roll, such as a chrome plated steel roll, and this offers definite advantages in use, particularly from the standpoint of ease of maintenance in continuously cleaning the roll of coating composition which is forced through a relatively porous sheet during coating. The coater head assembly is indicated generally at 40, and it is supported by means of a pair of torque tubes or beams 41 and 42 mounted below the roll 33 in the end stands 30 and 31 for rotational movement in unison to raise and lower the coater head assembly 40 with respect to the roll 33 as described in detail hereinafter.

The coater head assembly 40 is shown as a hollow box 44 of fabricated construction which extends the full length of the roll 33 and includes a top plate 45, bottom plate 46, and back and front walls 47 and 48, and the interior of this box 44 is adapted to be connected through inlets 49 to a source of steam or water of controlled temperature when the coater is to be used with the thermoplastic coating materials. The box 44 is in turn supported by a plurality of table shoes 50 each of which is secured to a table 51 of rail-like structure mounted on the beams 40 and 41, and the mounting arrangement is such that the plate 45 forms the main bottom of the chamber or pan 55 from which the coating composition is applied to the web.

The coater head assembly 40 includes a back plate 60 which forms the back wall of the chamber 55 and also cooperates with one or more gaskets 61 to form the inlet for the coating composition to the chamber 55. The plate 60 and gasket 61 are clamped against the back wall 47 of the box 44 by set screws 62 in clamps 63 which are secured to each of the table shoes 50 by hook bolts 65. Each clamp 63 also includes a nose portion 66 which engages a slot 67 in the back wall of the back plate 60 to hold the latter down against the bottom wall 46 of the coater box 44 and at the same time to clamp the rear of the coater box itself to the associated shoe 50. Similar hook bolts 65 hold down the flanged front edge of the bottom wall 46 of the box 44, and the positioning of the box 44 on each table shoe 50 is established by front and back shims 68 and 69.

As best seen in FIGS. 10 and 11, the back plate 60 is

provided with a plurality of inlet holes 70 which are spaced lengthwise of the roll 33 and are tapped to receive suitable supply pipes 71. Each of the holes 70 matches the lower end of a slot 72 in the front face of the gasket 61, with each of these slots being tapered in such manner that its side edges diverge upwardly while its back wall converges toward the box wall 46. The coating composition entering the bottom of each of these slots 72 is thus caused to spread as it flows upwardly into the chamber 55 to provide desired mixing, shearing and distribution of the coating composition throughout the entire chamber 55, and satisfactory results from this standpoint have been obtained with the upper end of each slot of approximately 10% smaller flow area than the pipes 71 to effect corresponding acceleration of the entry flow of coating composition.

The front wall of chamber 55 is formed by a flexible blade 75 which is clamped against the front edge or nose 77 of the plate 45 and urged against the surface of the roll 33 in such manner as to define therewith a coating nip, and in operation the coating composition is effectively extruded through this nip and is smoothed and forced into the outer surface of the web by the blade 75. The invention also provides advantageous means for mounting the blade 75 and for controlling its pressure engagement with the surface of the roll 33 through the web. Referring particularly to FIGS. 4—5, a shaft 80 extends substantially the full length of the roll 33 and is supported in bearing brackets 81 integral with each of the table shoes 50. A plurality of split collars 82 are clamped on the shaft 80 in relatively closely spaced relation, for example on 11-inch centers, and each of these collars 82 includes a slot 83 which forms the support for the back edge of the blade 75.

Clamp means are mounted on the shaft 80 for swinging movement between an operating position clamping the blade 75 against the nose 77 and a retracted position leaving the blade 75 free for removal and replacement. Referring particularly to FIGS. 5 and 7, the clamp means include a plurality of hinges 85 mounted for swinging movement on the shaft 80 in substantially the same spaced relation as collars 82 and all connected by a bar 88 to which each of the hinges 85 is secured by a bolt 86 and key 87. The hinges 85 support a pair of expansible tubes 90 and 91 in individual holder bars 92 and 93 respectively which extend the full length of the roll 33 and are secured to each hinge 85 by a screw 95 and washer 96. As best seen in FIGS. 4 and 7, each hinge 85 is forked to provide a slot 97 in which these screws 95 are slidable vertically for corresponding relative adjustment of the holder bars 92 and 93.

The hinges 85 and holder bars 92 and 93 are arranged in such spaced relation that in the operating position of the clamp assembly, the tube 90 engages the back surface of the blade 75 in a position opposite the nose 77 to clamp the blade in position, and the tube 91 similarly engages the back surface of the blade in a position intermediate the plate 45 and the surface of the roll 33. In order to swing the hinges 85 in unison with the bar 88 between their operating and release positions, a rock shaft 99 is supported below the bar 88 by a plurality of bearing brackets 100 each bolted at 101 on the front of one of the table shoes 50. The rock shaft 99 includes a handle 102 located approximately centrally thereof and a plurality of cam lugs 103 spaced axially thereon for engagement with the underside of the bar 88 so that when the handle 102 is raised to the position shown in full lines in FIG. 5, the cam lugs 103 act through the bar 88 to swing the clamp assembly to its operating position, and when the handle 102 is moved to its dotted line position in FIG. 5, the clamp assembly can drop back to its release position for blade 75.

Accurate vertical positioning and alignment of the shaft 99 are established by slotted holes 105 in each bracket 100 for its mounting bolts 101 in combination

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with a pair of adjusting set screws 106 threaded in the under side of each bracket 100 with their heads engaging the associated table shoes 50 as best seen in FIG. 5. In addition, the bar 88 carries a pivoted latch hook 107 which cooperates with a slotted guide plate 108 on the bar 88 to hold the handle 102 in its raised position.

Means are provided for holding the shaft 80 in fixed relation with the clamp assembly in the operating position of the clamp assembly to establish the working position of the blade 75 with respect to the roll 33, and these means are adjustable to provide for advancing the blade 75 with respect to the roll to compensate for wear. Referring particularly to FIG. 8, a link 110 includes a split portion 111 which is clamped on the shaft 80 by a plurality of bolts 112. An adjusting screw 113 is threaded through the bar 88 and engages a flat 114 in the side of a pin 115 journaled in the forked outer end of the link 110. Rotation of the screw 113 will accordingly cause the shaft 80 to rotate in clockwise direction with respect to the bar 88 and thereby to raise the holder collars 82 for the blade 75 to advance the blade with respect to the roll 33.

It will accordingly now be apparent that in the operating position of the clamp assembly as described, the tube 90 will clamp an intermediate portion of the blade 75 firmly against the plate nose 77, while the tube 91 will exert pressure against the back surface of the blade between the plate 45 and the roll 33 to establish the desired pressure engagement between the front edge of the blade and the roll. This engagement may be controlled as desired by supplying pressure air to the tubes 90 and 91 through separate control valves as described hereinafter in connection with FIG. 22. Means are also provided for effecting adjustment at positions spaced along the lengths of both of the tubes 90 and 91 to compensate for warping or any possible irregularities in the surface of the roll, by raising or lowering the flexible holder bar 93 on each hinge 85 by vertical adjustment of the screws 95 in the slots 97.

Special provision is made in accordance with the invention for establishing the ends of the area in which the coating composition is applied to the web W. Referring particularly to FIGS. 12-15, the end of the chamber 55 adjacent the end stand 30 is established by an edge dam holder 130 and associated edge dam blade 131, clamp 132, and socket head cap screws 133. Since the structure at the opposite end of the apparatus is essentially the same except for the reversal of parts, only the edge dam assembly adjacent the stand 30 will be described, and the corresponding parts at the other end which appear in the drawing are identified by similar reference characters.

The edge dam holder 130 is secured to one end of a holder bar 135 by screws 136 in dovetailed slots 137. The holder bar 135 is of dovetailed section and is in turn adjustably supported by a head 140 and cooperating clamp 141 bolted on the side of the head 140. Thus when the lock screws 142 for the clamp 141 are released, the holder bar 135 can be adjusted axially of the roll 33 to position the edge dam blade 131 in the desired location to act as a seal defining the side limits of the web area to be coated. The invention also makes special provision for maintaining appropriate sealing engagement in all adjusted positions of the holder bar 135 between the blade 131 and the roll 33 and also between the holder 130 and the box 45 and back plate 60.

Referring particularly to FIGS. 12 and 13, the head 140 includes a cylindrical bore 144 which fits over an upstanding cylindrical boss 145 on the supporting bracket 146 which is bolted at 147 to the underside of the coater box 44 and projects outwardly therefrom. The boss 145 includes a flat 150 in the outer side thereof, and the upper and lower sides 151 and 152 of this flat are beveled at angles shown as 30° to the horizontal. The head 140 is provided with four relatively large cap screws in its

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outer side which cooperate with the flat 150 and its sides, a pair of these cap screws 155 being arranged for direct engagement with the flat 150 while the other two cap screws 156 and 157 engage the upper and lower sides 151 and 152 respectively of the flat 150 and have their inner ends preferably beveled as shown to match the bevel of the sides 151 and 152.

The head 140 has sufficient clearance, for example .005 inch, on the boss 145 for free sliding movement and some slight axial misalignment thereon. In the initial adjustment of the apparatus, the head 140 is secured to the holder bar 135 by tightening the lock screws 142 for the clamp 141, and the screws 155 are worked against each other until the back edge of the holder 130 is pressed firmly against the back plate 60. The screws 156 and 157 are then similarly worked against each other until the bottom of the holder 130 is urged into the desired pressure engagement with the top of the box 45. These adjustments compensate for manufacturing tolerances and deflections, and they establish a close fit between the holder 30 and the back plate 60 and boss 45 which assures that whenever the edge dam assembly is removed for cleaning or other maintenance purposes, it will always go back to the same position and cannot loosen and slip forward sufficiently to jam between the backing roll and the top of the boss 45.

For optimum results in sealing against escape of coating composition at the sides of the fountain chamber in operation, the structure of the individual edge dam blades and the manner of their attachment to the edge dam holders are of substantial importance. In the first place, it will be noted in FIG. 14 that the end of the holder bar 135 to which the holder 130 is attached is not square with the length of the bar but is beveled at a definite angle, shown as in the range of 3 to 5° although satisfactory results have been obtained with this angle as small as 1°. The holder at the opposite end of the apparatus is similarly inclined with respect to its holder bar 135 so that the two edge dam blades diverge in the direction of movement of the web on the roll 33. With this arrangement, the web has an inward component of movement with respect to each edge dam blade tending to draw the coating composition inwardly therefrom and correspondingly to minimize the tendency of the coating composition to extrude between the surface of the web and the edge dam blade.

A specific construction of edge dam blade 131 which has been found satisfactory from the standpoint of minimum leakage under test is illustrated in detail in FIGS. 14-15. Its main part is a brass plate 131 of substantial thickness, for example 1/2 inch, and having its upper edge surface 160 curved for sealing engagement with the surface of the roll 33. Sealing engagement between the front end of the blade 131 and the blade 75 is effected by an elastic bit 161 constructed to fit within a retaining slot 162 in the front edge of the blade 131 as best seen in FIG. 15, and the bit 161 is held in this slot by a retaining clip 163. The bit 161 also seals along its upper edge 165 against the surface of the roll 33.

Special provision is made for mounting the composite blade 131 in optimum sealing engagement with the roll 33. As shown in FIGS. 14-15, the clamp screws 133 pass through enlarged slots 170 and 171 in the lower edge of the blade 131 providing for both vertical and longitudinal movement of the blade with respect to these screws before they are tightened. In addition, the blade 131 is provided with drilled bores 172 in its lower edge which receive coil springs 175 arranged as shown in FIG. 16 to engage the upper surface of the box 45 and thereby to bias the blade 131 upwardly toward the roll 33.

Adjustment of each edge dam blade is carried out before the coating operation begins, with the parts all in generally proper position but with the clamp screws 133 loose. Two sheets of paper of the same thickness as the web to be coated are laid over each blade 131, and the

coater head assembly 40 is then raised to proper operating position. The springs 175 will bias each blade 131 upwardly, and each blade will therefore be forced down against these springs by engagement with the roll 33 through the inserted sheets of paper. With the blade in this position, the operator reaches in with a screwdriver or other implement and raps against the back of the slot 162 in the blade to drive the blade firmly against the back plate 60, and the screws 133 are then tightened. The bits 161 are then mounted in position by means of the clips 163.

The coater head assembly as a whole, including the edge dams, is mounted in the frame below the roll 33 for movement into and out of its operative relation with the roll with minimum possibility of spilling any of the coating composition therein during such movement as well as minimum possibility of interference with the working parts as the result of possible spilling of the coating in operation. At the same time, the mounting arrangement for the coater head assembly is such that the assembly is moved forward and out from directly under the roll 33 so that in its lowered position it is more easily reached for cleaning, blade changing and other maintenance purposes. Special provision is also made for assuring accurate relative alignment of the entire coater head assembly with the roll 33, and particularly for compensating for such irregularities as could otherwise develop from sources such as machining variations, thermal expansion and deflection, irrespective of the width of the machine.

In addition to the features just noted, the mounting arrangement of the invention is of such structure and mode of operation as to facilitate accurate adjustment in accordance with the caliper of the web being coated, and particularly for assuring adjustment in such manner that the edge dams move precisely the same distances at both ends with respect to the roll 33 in order to minimize the possibility of leakage with webs of different caliper. A further characteristic of the supporting means for the coater head assembly, which is of great importance in use, is that the heavy strains on the back plate 60 which could result from wrapping of the web on the roll 33 in the event of a web break are automatically relieved without the possibility of damage to any of the mechanism.

Referring particularly to FIGS. 16-20, the number of table shoes 50 depends upon the width of the machine as a whole, satisfactory results having been obtained with these shoes spaced on 33-inch centers for a roll 33 which is 154 inches long, and each of the table shoes 50 is secured in accurately aligned relation to its associated table rail 51 by means of bolts 200 and 201 in slots 202 and 203 at the opposite ends of the table rail 51. A key 205 assures proper location and alignment of each table shoe and associated rail in combination with the slots for the bolts 200 and 201. The several table rails 51 are in turn mounted on the beams 41 and 42 in accurately aligned relation for movement with respect to the roll 33 as these beams are rotated in unison, and the mounting of each rail 51 includes provision for individual adjustment compensating for deflection or manufacturing inaccuracies of the coater box 44 in such manner that the coater box can be accurately aligned with the backing roll 33.

At the front end of the apparatus, each table rail 51 includes a rectangular boss portion 210 which is slidably received within a yoke 211 including journals 212 supported in bearings 213 which are in turn secured by clamps 214 to the ends of a cooperating pair of arms 215 projecting radially from the beam 41. The bearings 213 are adjustable axially of the journals 212 on the arms 215, and preferably both of these bearings for each of the yokes 211, except at the rails 51 at the center of the machine, are adjusted to provide sliding clearance for the associated yoke journals 212 and thereby to serve as

expansion joints compensating for thermal expansion of the coater box assembly in use.

As noted, each boss 210 is slidable within the associated yoke 211 and is held in the yoke by a similarly slidable plate 216 and clamp bolt 217 cooperating with one or more dowel pins 218, as shown in FIG. 18. Vertical adjustment of the boss 210 in the yoke 211 is effected by means of a pair of adjusting bolts 220 and 221 as shown in FIG. 17. When the machine is initially set up, each boss 210 is individually adjusted in this manner to establish the same predetermined vertical spacing between the axis of the journals 212 and the reference plane of the upper surface of the associated rail 51, and it will be seen that these adjustments cooperate to compensate for whatever deflection and manufacturing tolerances might otherwise cause the coater box 44 to deviate from the desired accurate parallel alignment with the roll 33.

The mounting for the rearward end of each table rail 51 on the beam 42 is illustrated in FIGS. 19-20, and it includes a yoke 225 having journals 226 in bearings 227 mounted by clamps 228 on a pair of radially projecting arms 230 on the beam 42. The connection between the table rail 51 and the yoke 225 includes a slide 232 which is mounted for sliding movement within the hollow table rail 56 between gibs 233 and 234, and the slide 232 has sufficient lateral clearance in the gibs 233 and 234 for such lateral movement as may be required by thermal expansion of the coater box assembly. The slide 232 includes a depending bolt 235 which extends through the yoke 225 and is secured in properly adjusted relation thereto by means of lock nuts 236 and 237, and the bolt 235 is shown as hollow for delivery of lubricant by way of the nipple 238 to the cooperating surfaces of the slide 232 and table rail 51. The bolt 235 provides for initial adjustment of the associated yoke 225 to the proper predetermined vertical spacing between the axes of the journals 226 and the reference plane of the upper surface of the associated rail 51 in the same manner as described for the front end of each rail 51.

With this mounting as described, it will be seen that when the beams 41 and 42 are caused to rotate in unison, the table rails 51 and the entire coater head assembly 40 carried thereby will move downwardly and to the right as viewed in FIG. 16. The rotary movement of the beams 41-42 is effected by a pair of hydraulic cylinders mounted at opposite ends of the apparatus in the lower portions of the end stands 30 and 31. One of these cylinders 250 is shown in FIGS. 1 and 16 as pivoted at 251 to the end stand 30, and its piston rod 252 is connected at 253 with a lever 254 clamped on the journal portion of the beam 41. The beams 41 and 42 are in turn interconnected by a linkage comprising a lever 255 clamped on the journal portion of the beam 42 and a composite link 256 pivoted to the lever 255 at 257 and also to the lever 254 at 253.

It is of definite importance for optimum efficiency that it be possible to adjust the coater box assembly with respect to the roll 33 in such manner that each point on the edge dams moves precisely the same distance radially with respect to the roll 33 within the range of adjustments required for sheets of different caliper, having in mind that such adjustments may be as fine as .001 inch or as coarse as .040 inch or more. The mounting arrangement of the invention accomplishes this result by reason of the interrelationships of the several components thereof as now described.

The raised operating position of the coater box assembly is established with the aid of an adjusting mechanism shown particularly in FIGS. 2 and 3 and including a split collar 260-261 clamped on each of the journal portions of the beam 41 with the aid of a key 262. The collar portion 260 includes a projecting arm 263 carrying a wear pin 264 adapted for engagement with an adjustable stop screw 265 threaded through the split clamp portion of a stub shaft 266 secured in projecting relation

with the base of each end stand. The stop screw 265 is provided with a micrometer type indicator 267, and after these screws 265 at the two ends of the beam 41 have been adjusted to the proper positions to align both ends of the beam accurately with each other and to establish the limit position of upward travel of the arms 215, the screws 265 are clamped in these adjusted positions by the clamp bolts 268. For increased convenience, the indicators 267 are readily calibrated to show the precise amount of adjustment of the edge dam seals with respect to the roll 33, which is the significant adjustment from the standpoint of the caliper of the web.

FIG. 16 shows that when the coater box assembly is in its uppermost position, the arms 230 extend at a lesser angle to the horizontal than the arms 215, but the lever 255 for the beam 42 is considerably more nearly in line with the link 256 than the lever 254 for the front beam 41. Therefore, during initial rotation of the beams 41 and 42 in clockwise direction as the piston rod 252 moves inwardly of the cylinder 250, the rear beam 42 will rotate faster than the front beam 41 and thereby cause the back ends of the edge dam blades 131 to move at a greater rate than the front ends thereof. This movement, however, includes both radial and tangential components with respect to the roll 33, and the parts are readily proportioned in accordance with the vectors of these motions to cause identical radial components of motion for both ends of the edge dam seals, at least within a range of, for example, .100 inch which would be substantially greater than any necessary adjustment for caliper of web.

If the movement continued as described, the assembly would tilt undesirably, but the effective radius arm of the lever 255 will increase relatively rapidly while there is an accompanying only minor decrease in the effective radius arm of lever 254, so that beam 41 will accelerate with respect to beam 42 until when the coater assembly reaches its lowermost position, it is again substantially level. These relative movements are indicated by the dotted arcs in FIG. 16 illustrating the paths of travel for the yoke journals 212 and 226, and the difference between these paths with respect to the table rails 51 is compensated for by movement of the slides 232 therein.

In the initial setting up of the apparatus, the adjusting screws 265 are employed to locate the front beam 41 in its maximum position of rotation in counterclockwise direction as viewed in FIG. 16 such that the arms 215 extend at a predetermined angle to the vertical, shown as 25°. The other adjustments described for each of the table rails 51 are carried out with the front beams in this position, and thereafter the clamp portion of the lever 255 is secured on the journal portion of beam 42 with the center table rail 51 in accurately level position to establish the desired operating relation of the several levers. Then the assembly is moved to a raised position with spacers of predetermined dimensions between the back plate 60 and the roll 33 and also between the bottom plate 45 and the roll 33, with a set of these spacers being aligned with each table rail 51, and each rail 51 is adjusted individually by means of its adjusting screws 220-221 and 235 until the coater box assembly is correspondingly uniformly spaced from the roll 33 over its entire length. Such adjustments as may subsequently be required in accordance with the caliper of web to be coated is effected by means of the screws 265 without changing these conditions.

The optimum operating position for the coater head assembly 40 determined as described will establish a definite clearance between the upper edge of the plate 60 and the surface of the web on the roll 33, for example .001-.035 inch. A seal in this location has been found unnecessary since the continued entry of the web through the resulting slot tends to draw the coating composition away therefrom and thus to prevent leakage, although if the coating within the chamber 55 is to be maintained under pressure, a running seal between the plate 60 and

the roll 33 may be necessary. In any event, if the web breaks and wraps around the roll 33, it can quickly build up to a thickness sufficient to cause damage by wedging between the roll and the plate 60. Provision is therefore made for detecting such build-up of the web on the roll and for causing rapid downward movement of the coater assembly before damage can occur.

Referring particularly to FIG. 16, the composite link 256 comprises a clevis 270 pivoted to the lever 255, a second clevis 271 pivoted to the lever 254, and a rod 272 having a threaded connection with the clevis 270. The other end of the rod 272 extends slidably through a collar portion 274 of the clevis 271 and carries a heavy compression spring 275 which is mounted between the collar 274 and a head 276 on the rod 272. A limit switch 280 is mounted on the clevis 271 with its operating button 281 projecting toward bracket 282 adjustably mounted on the clevis 270 by the screws 283, and the adjustment is shown as such that the switch 280 is normally held closed by the bracket 282.

With this construction of the link 256, in normal operation when the cylinder 250 is operated, the movement of the lever 254 will be transmitted through the spring 275 to the rod 272 and thereby to the lever 255 for conjoint rotation of the beams 41 and 42. If the web should build up on the roll 33 while the coater head assembly is in raised operating position and thereby tend to wedge between the surface of the roll and the plate 60, this will cause a downward force along the back of the coater head which will be transmitted into an attempt of the arms 230 to rock the beam 42 in clockwise direction. When this force is sufficient to move the rod 272 against the spring 275, the resulting movement of the bracket 282 will cause the limit switch 280 to open, and this in turn will cause downward movement of the coater head assembly, in the manner now described in connection with the electric and pneumatic diagrams.

Referring to FIG. 21, the hydraulic cylinders 250 are shown as double acting and operated in the direction to raise the coater head assembly by means of an air booster cylinder 300 through a closed hydraulic circuit including lines 301 and 302 and the pressure chamber 303 in which the piston rod of the cylinder 300 reciprocates. The operation of the air cylinder 300 is in turn controlled by a solenoid valve 305 which is connected with the main air supply line 306 through an adjustable reducing valve 307 having a visual gauge 308, and the connection between the valve 305 and the cylinder 300 includes a flow control valve 309.

The return side of the cylinders 250 is connected with the lower end of a pressure reservoir tank 310 having a visual gauge 311, and the upper end of this tank is directly connected with the air supply line 306 between the reducing valve 307 and the solenoid valve 305 to maintain the reduced line pressure in the tank 310 at all times. The line 301 is also connected with the bottom of the tank 310 through a check valve 312 and manual shutoff valve 313, and this connection is open at the valve 313 only to replace the loss of hydraulic fluid in the operating system for the cylinders 250. As shown in FIG. 21, therefore, the valve 305 is normally spring biased to an open position in which there is no pressure in the cylinder 300, and this condition establishes the down position for the coater head assembly, since the pressure in the reservoir tank 310 will be supplied to the return side of the cylinders 250. When the valve 305 is energized, it supplies operating air pressure through the cylinder 300, and since the cylinder 300 is of substantially greater area than the tank 310, the hydraulic pressure will be supplied to the cylinders 250 in the direction to raise the coater head assembly.

A fragmentary electrical control system for the apparatus is shown in FIG. 22 with the several switches and relays in the positions normally occupied at the start of operations with the coater head assembly in its down

position. To raise the coater head assembly, it is necessary first to operate the switches 315 and 316 momentarily in order to energize relays CR and 2CR, which lock themselves in an energized state and deenergize solenoid valve 305 to connect the lower end of the cylinder 300 to the air supply line. The resulting supply of pressure to the cylinder 300 will result in operation of the cylinders 250 to raise the coater head assembly to its operating position.

The relay M in FIG. 22 represents the operating relay for the motor and pump (not shown) which supply the coating composition to the fountain chamber 55. The relay M is closed to start the motor by operation of push button switch 317, and the relay M locks itself in through its own front contacts and the associated front contacts of relay 2CR. The motor and pump can be stopped by operation of push button switch 318, as will normally be done when the coating operation is to be terminated. Then operation of switch 319 will deenergize relay 1CR, thereby deenergizing solenoid valve 305 to connect the bottom end of the cylinder 300 to atmosphere, and the coater head assembly will move down as the pressure from tank 310 is effective thereon.

Whenever it is desired to drop the coater head promptly, for example in case of an emergency such as a break in the web, this is accomplished by operation of the push button switch 320, which is opened to drop out relay 2CR and thereby to deenergize solenoid valve 305 for immediate movement of the coater head assembly away from the roll 33. At the same time, deenergizing of relay 2CR while relay 1CR remains energized will break the self-locking circuit for the relay M and thereby stop the supply of coating composition to the fountain. Subsequent reestablishment of normal operating conditions will require reenergizing of relay 2CR by operation of the reset switch 316.

The limit switch 280 is shown in FIG. 22 as connected to operate in the same manner as the emergency switch 320. In other words, whenever a build up of web material on the roll 33 causes sufficient downward movement of the plate 60 to effect operation of limit switch 280 as described, the relay 2CR will be deenergized in the same manner as by operation of the emergency switch 320, thereby causing immediate downward movement of the coater head assembly.

It will be apparent that rapid downward movement of the coater head assembly as described may result in spilling of some of the coating composition therefrom, and it is desirable to provide means for minimizing the possibility of such spilling. One simple arrangement for this purpose is to provide a reversing switch for the pump motor which will be actuated in response to operation of either the emergency switch 320 or the limit switch 280. Another simple but effective such safety means is shown in FIG. 21 as a single acting air cylinder 323 connected with the air supply line 306 by a solenoid valve 325 and having its piston rod operating in a suction chamber 326 connected by line 327 with one of the supply pipes 71 to the fountain 55.

In normal operation, the valve 325 is deenergized, and cylinder 323 remains in its up position. Whenever the relay 2CR is deenergized by either of switches 280 or 320, however, the relay S will be energized through the back contacts of relay 2CR, and the valve 325 will then be operated by the closed front contacts of relay S. Thus simultaneously with the downward movement of the coater head assembly, the cylinder 323 will cause the suction chamber 326 to be filled with coating composition from the fountain, thereby reducing the quantity of coating composition in the fountain and correspondingly minimizing the possibilities of its spilling.

FIG. 21 also shows the air supply and control system for the expansible tubes 90 and 91. These tubes are provided with separate controls in order to make it possible to adjust the locking or loading effects thereof as desired.

Thus the connection between the tube 90 and the supply line 306 includes a manually operated three-way valve 330, an adjustable reducing valve 331 having an associated visual gauge 332, and a line 333. The tube 91 is similarly provided with a manual control valve 335, an adjustable reducing valve 336 having an associated gauge 337, and a connecting line 338. The dotted outline 340 in FIG. 21 represents the grouping of these controls on a common panel on the end stand 30 as shown in FIG. 1, and the dotted outline 341 in FIG. 1 represents a suitable arrangement of electric control panel.

The arrangement of individually adjustable controls for the two tubes 90 and 91 is especially advantageous in operation if a solid lump or particle should become lodged between the blade 75 and the web and thereby cause streaking in the coating. Such a condition may be corrected very rapidly by momentary operation of the control valve 335 for the loading tube 91, and when this is done, the momentary relief of the loading pressure will make it possible for the coating composition to sweep the lodge lump or particle past the blade 75, after which reapplication of pressure through the valve 335 will restore normal coating conditions.

FIGS. 23 and 24 illustrate moved positions of the coater box 44 on the table shoes 50 for the purpose of establishing different angular relationships between the blade 75 and the surface of the roll 33. Thus while FIG. 5 shows the blade 75 at an angle of 45° to a tangent to the surface of the roll at its point of engagement with the roll, FIG. 23 shows a mounting arrangement of the coater box wherein this angle is 30°. In order to accomplish this change of angle, a very small exchange of parts is required. Specifically, a key 205' of generally L-shape in section is substituted for each T-shaped key 205, and a different set of shims 68' and 69' is substituted for each set of shims 68 and 69 shown in FIG. 5.

The net result of these changes illustrated in FIG. 23 is to shift the coater box 44 rearwardly with respect to the axis of the roll 33 as compared with the setting shown in FIG. 5, and also to position the nose 77 of the bottom plate 45 somewhat closer to the surface of the roll. The operating position of the clamp hinges 85 is therefore somewhat lower than in FIG. 5, and this condition is established by substituting bearing brackets 100' of shorter vertical extent in place of the bearing brackets 100 as shown in FIG. 5. It is also desirable either to machine the nose 77 of plate 45 to the appropriate different angle, or to form this nose initially of rounded contour adapting it to different angular positions of the blade 75. Otherwise, the construction and operation of the apparatus in this adjusted position is the same as already described.

FIG. 24 shows an adjusted position of the coater box 44 establishing a 60° angle between the blade 75 and a tangent to the surface of the roll 33. This condition is set up first by reversing the shims 205' to locate the table shoes 50 further forward on the table rails 51, and a still further set of shims 68'' and 69'' is also used. Also, since the net result as shown is to require angular movement of the clamp hinges 85 beyond their operating position of FIG. 5, a further set of bearing brackets 100'' is used to locate the rock shaft 99 in a correspondingly higher position with respect to the table shoes 50. These are the only changes required except as already noted for the nose 77, and otherwise the operation of the apparatus in this adjusted position is the same as already described.

FIG. 25 shows an alternative construction for use in place of the holder collars 82 to support the back edge of the coating blade. In FIG. 25, the blade 75 corresponds to the blade 75 but differs therefrom in that it is provided along its back edge with a plurality of annular grommets 350. Each of these grommets is received over the rounded head portion 351 of a stud 352 mounted in

a collar 353 adjustably clamped on the shaft 80. With this arrangement, rotational adjustment of the shaft 80 in either direction will produce corresponding adjustment of the blade 75', and also the studs 352 will positively hold the blade 75' against the pulling force of the web, which could be substantial when the blade is in a position such as at the 30° angle shown in FIG. 23.

While the forms of apparatus herein described constitute preferred embodiments of the invention, it is to be understood that this invention is not limited to these precise forms of apparatus and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. Apparatus for coating one surface of a moving web, comprising a backing roll for supporting the opposite surface of the web, a frame including means for supporting said roll, a coating chamber including a bottom plate extending lengthwise of said roll and a back plate projecting substantially above the level of said bottom plate and forming the back wall of said chamber, a flexible blade extending lengthwise of said roll and said bottom plate, means clamping said blade to said plate with the front edge portion of said blade extending freely beyond said plate for flexible engagement with said roll, means forming side edge walls on said chamber including seals for engaging the surface of said roll, means mounting said chamber on said frame below said roll for raising and lowering movement with respect to said roll, means establishing a raised operating position of said chamber wherein said seals and said blade engage the surface of said roll through the web to be coated, means for rotating said roll in such direction that the surface thereof moves from said back plate towards said blade, means for supplying coating composition to the interior of said chamber for discharge between said roll and said blade, and means controlling the operation of said mounting means during lowering movement of said chamber to cause substantially uniform radial movement of said edge walls with respect to said roll throughout a range of such movement at least equal to the thickest web to be coated.

2. Apparatus for coating one surface of a moving web, comprising a backing roll for supporting the opposite surface of the web, a frame including means for supporting said roll, a coating chamber including a bottom plate extending lengthwise of said roll and a back plate projecting substantially above the level of said bottom plate and forming the back wall of said chamber, a flexible blade extending lengthwise of said roll and cooperating with said bottom plate to form the front wall of said chamber, means forming end walls on said chamber including seals for engaging the surface of said roll, a pair of front and back means extending lengthwise of said frame below said roll, arms projecting radially from said beams for mounting said chamber thereon, means pivoting said chamber on said arms, means for rocking said beams to raise and lower said chamber with respect to said roll, means establishing a raised operating position of said chamber wherein said seals and said blade engage the surface of said roll through the web to be coated, means for rotating said roll in such direction that the surface thereof moves from said back plate towards said blade, and means for supplying coating composition to the interior of said chamber for discharge between said roll and said blade.

3. Apparatus for coating one surface of a moving web, comprising a backing roll for supporting the opposite surface of the web, a frame including means for supporting said roll, a coating chamber including a bottom plate extending lengthwise of said roll and a back plate projecting substantially above the level of said bottom plate and forming the back wall of said chamber, a flexible blade extending lengthwise of said roll and said bottom plate, means clamping said blade to said plate with the front

edge portion of said blade extending freely beyond said plate for flexible engagement with said roll, means forming end walls on said chamber including seals for engaging the surface of said roll, a pair of front and back beams extending lengthwise of said frame below said roll, arms projecting radially from said beams for mounting said chamber thereon, means pivoting said chamber on said arms, drive means for rocking one of said beams, linkage means connecting said beams to cause the other of said beams to rock with said one beam to shift said chamber between a raised position substantially directly below and in working relation with the surface of said roll and a lowered position spaced forwardly of said roll, means for adjusting said linkage means to establish varying rotational rates for said beams causing substantially equal radial movement of both ends of said seals with respect to said roll throughout a portion of the shifting movement of said chamber at least equal in extent to the thickest web to be coated, and means forming a slidable connection between said chamber and said arms on one of said beams to compensate for said varying rotational rates.

4. Apparatus for coating one surface of a moving web, comprising a smooth backing roll for supporting the opposite surface of the web, a frame including means for supporting said roll in fixed axial position, a coater box extending substantially the full length of said roll, two supporting beams for said box mounted in said frame below and in parallel relation with said roll, a plurality of mounting assemblies mounting said box on said beams at positions spaced axially thereof, and each said assembly including means for effecting adjusting movement of said box with respect to said beams within a range sufficient to establish substantially uniform spacing between said box and said roll.

5. Apparatus for coating one surface of a moving web, comprising a backing roll for supporting the opposite surface of the web, a frame including means for supporting said roll in fixed axial position, a coater box extending substantially the full length of said roll, two supporting beams for said box mounted for rotational movement in said frame below and in parallel relation with said roll, a plurality of mounting assemblies mounting said box on said beams at positions spaced axially thereof, each said assembly including means pivoting said assembly to each of said beams on an axis eccentric with respect to the rotational axis of said beam to provide for raising and lowering movement of said box with respect to said roll in response to said rotational movement of said beams, drive means for rotating one of said beams, linkage means connecting said beams to cause the other of said beams to rotate with said one beam, means for adjusting said linkage means to establish varying rotational rates for said beams in accordance with a predetermined path of movement of said box with respect to said roll, and each said assembly including means for effecting adjusting movement in said box with respect to said pivot axes within a range sufficient to establish substantially uniform spacing between said box and said roll without affecting said predetermined path.

6. Apparatus for coating one surface of a moving web, comprising a backing roll for supporting the opposite surface of the web, a frame including means for supporting said roll in fixed axial position, a coater box extending substantially the full length of said roll, two supporting beams for said box mounted in said frame below and in parallel relation with said roll, a plurality of parallel arms projecting radially from each of said beams in axially spaced relation, a plurality of mounting assemblies mounting said box on said arms, each said assembly including two journals forming pivotal connections between said assembly and one of said arms on each of said beams respectively, each said assembly including means adjacent each said journal for effecting

adjusting movement of said box with respect to said adjacent journal within a range sufficient to establish substantially uniform spacing between said box and said roll, and means for causing controlled rotational movement of said beams to raise and lower said box with respect to said roll.

7. Apparatus for coating one surface of a moving web, comprising a backing roll for supporting the opposite surface of the web, a frame including means for supporting said roll in fixed axial position, a coater box extending substantially the full length of said roll, two supporting beams for said box mounted in said frame below and in parallel relation with said roll, a plurality of parallel arms projecting radially from each of said beams in axially spaced relation, a plurality of mounting assemblies mounting said box on said arms, each said assembly including two journals forming pivotal connections between said assembly and one of said arms on each of said beams respectively, each said assembly including means adjacent each said journal for effecting adjusting movement of said box with respect to said adjacent journal within a range sufficient to establish substantially uniform spacing between said box and said roll, means for causing controlled rotational movement of said beams to raise and lower said box with respect to said roll, and each of said assemblies including parts secured against axial movement with respect to said box and each of said beams respectively and connected together for relative movement axially of said box in response to differential thermal expansion of said box and said beams.

8. Apparatus for coating one surface of a moving web, comprising a backing roll for supporting the opposite surface of the web, a frame including means for supporting said roll, a coating chamber including a bottom plate extending lengthwise of said roll and a back plate projecting substantially above the level of said bottom plate and forming the back wall of said chamber, a flexible blade extending lengthwise of said roll and cooperating with said bottom plate to form the front wall of said chamber, means forming side edge walls on said chamber including seals for engaging the surface of said roll, means mounting said chamber on said frame below said roll for raising and lowering movement with respect to said roll, means establishing a raised operating position of said chamber wherein said seals and said blade engage the surface of said roll through the web to be coated, means for rotating said roll in such direction that the surface thereof moves from said back plate toward said blade, means for supplying coating composition to the interior of said chamber for discharge between said roll and said blade, means for sensing build-up of the web on said roll tending to wedge said back plate away from said roll, and means actuated by said sensing means for effecting lowering movement of said chamber.

9. Apparatus for coating one surface of a moving web, comprising a backing roll for supporting the opposite surface of the web, a frame including means for supporting said roll, a coating chamber including a bottom plate extending lengthwise of said roll, a flexible blade extending lengthwise of said roll and cooperating with said bottom plate to form the front wall of said chamber, means forming end walls on said chamber including seals for engaging the surface of said roll, means mounting said chamber on said frame below said roll for raising and lowering movement with respect to said roll, means establishing a raised operating position of said chamber wherein said seals and said blade engage the surface of said roll through the web to be coated, means for supplying coating composition to the interior of said chamber for discharge between said roll and said blade, means for moving said chamber from said raised position to a lower retracted position spaced from said roll, control means for initiating said lowering movement of said

chamber, and means responsive to actuation of said control means for effecting withdrawal of at least a portion of the coating composition from said chamber to minimize spilling thereof.

10. Apparatus for coating one surface of a moving web, comprising a backing roll for supporting the opposite surface of the web, a frame including means for supporting said roll, a coating chamber including a bottom plate extending lengthwise of said roll and a back plate projecting above the level of said bottom plate and forming the back wall of said chamber, a flexible blade extending lengthwise of said roll and cooperating with said bottom plate to form the front wall of said chamber, edge dams forming end walls on said chamber and including seals for engaging the surface of said roll, an elongated bar for supporting each said edge dam, means securing each said edge dam to the end of the associated said bar, means at the ends of said chamber forming an adjustable mounting for each of said bars providing for adjusting movement of said bars lengthwise of said roll to locate the associated said edge dam in the desired spaced relation with the adjacent end of said roll, and means in each said mounting for effecting tilting of the associated said bar in the directions of said bottom plate and said back plate to locate the associated said edge dam seal in sealing relation with said plates.

11. Apparatus for coating one surface of a moving web, comprising a backing roll for supporting the opposite surface of the web, a frame including means for supporting said roll, a coating chamber including a bottom plate extending lengthwise of said roll and a back plate projecting above the level of said bottom plate and forming the back wall of said chamber, a flexible blade extending lengthwise of said roll and cooperating with said bottom plate to form the front wall of said chamber, edge dams forming end walls on said chamber and including seals for engaging the surface of said roll, an elongated bar for supporting each said edge dam, means securing each said edge dam to the end of the associated said bar, a head for supporting each said bar, a bracket at each end of said chamber for supporting the adjacent said head, each said bracket including an upstanding boss receiving the adjacent said head slidably thereon, means on each said head forming an adjustable mounting for the associated said bar providing for adjusting movement of said bars lengthwise of said roll to locate the associated said end dam in the desired spaced relation with the adjacent end of said roll, cooperating means on each said head and boss for effecting tilting and rotational movements of said head on said boss in the directions to urge the associated said end dam seal into firm engagement with said plates, and means for securing each said head in the resulting adjusted relation with the associated said boss.

12. Apparatus for coating one surface of a moving web, comprising a backing roll for supporting the opposite surface of the web, a frame including means for supporting said roll, a coating chamber including a bottom plate extending lengthwise of said roll and a back plate projecting substantially above the level of said bottom plate and forming the back wall of said chamber, a flexible blade extending lengthwise of said roll and cooperating with said bottom plate to form the front wall of said chamber, means forming side edge walls on said chamber including edge seals for engaging the surface of said roll, means mounting said chamber on said frame below said roll for raising and lowering movement with respect to said roll, means establishing a raised operating position of said chamber wherein said edge seals and said blade engage the surface of said roll through the web to be coated, means for rotating said roll in such direction that the surface thereof moves from said back plate toward said blade, means for supplying coating composition to the interior of said chamber for discharge between said roll and said blade, and means maintaining

said edge seals in diverging relation in the direction of movement of the web therepast causing the web to tend to draw the coating composition inwardly of said chamber from the junctions between the surface of the web and said edge seals.

13. Apparatus for coating one surface of a moving web, comprising a backing roll for supporting the opposite surface of the web, a blade of flexible material extending lengthwise of said roll, a supporting member of substantially the same length as said blade extending along the inner surface thereof, means for clamping an intermediate portion of said blade against said supporting member with the front edge portion of said blade projecting freely beyond said supporting member toward said roll to define therewith and with said supporting member a coating nip for receiving coating composition for flow between the front edge of said blade and said roll, an expansible tube extending substantially the full length of said blade in engagement with the opposite surface thereof from said supporting member at a position spaced beyond the position of engagement of said blade with said supporting member, support means for said tube positioned in spaced relation with said clamping means, means for supplying controlled pressure fluid to said tube to flex said blade about the edge of said supporting member and thereby to establish corresponding pressure engagement between the front edge of said blade and the surface of said roll, and individually operable means located at spaced positions lengthwise of said tube for effecting localized adjustment of said support means with respect to said clamping means to cause corresponding localized variation of the pressure engagement between the front edge of said blade and said roll.

14. Apparatus for coating one surface of a moving web, comprising a backing roll for supporting the opposite surface of the web, coating chamber means including a plate extending lengthwise of said roll in fixed spaced relation therewith, a blade of flexible material extending lengthwise along one edge of said plate, releasable means for clamping an intermediate portion of said blade against said plate with the front edge portion of said blade projecting freely beyond said plate toward the surface of said roll, means for supplying coating composition to the space between said plate and said roll for flow between the front edge of said blade and said roll, pressure means fixed with relation to said chamber means and extending along the outer surface of said blade at a position spaced between said clamping means and the front edge of said blade for flexing said blade about said edge of said plate to urge said blade against said roll under controlled pressure establishing corresponding pressure engagement between the front edge of said blade and said roll, and selectively operable means for effecting localized adjustment of said pressure means.

15. Apparatus for coating one surface of a moving web, comprising a backing roll for supporting the opposite surface of the web, coating chamber means including a plate adapted to extend lengthwise of said roll in fixed spaced relation therewith, a blade of flexible material extending lengthwise along one edge of said plate, clamp means for said blade mounted on an axis fixed with relation to said chamber means for swinging movement between an operating position adjacent said plate and a retracted position, means carried by said clamp means for urging an intermediate portion of said blade into clamping engagement with said plate in said operating position of said clamp means with the front edge of said blade projecting freely beyond said plate toward the surface of said roll to define therewith and with said plate a coating nip for receiving coating composition for flow between the front edge of said blade and said roll, pressure means also carried by said clamp means for engaging the outer surface of said blade between the front edge thereof and said urging means in said operating position of said clamp means to flex said blade about said edge of said plate and

thereby to establish pressure engagement between the front edge of said blade and the surface of said roll, and means for adjusting said pressure means.

16. Apparatus for coating one surface of a moving web, comprising a backing roll for supporting the opposite surface of the web, coating chamber means including a plate extending lengthwise of said roll in fixed spaced relation therewith, a blade of flexible material extending lengthwise along one edge of said plate, clamp means for said blade mounted on an axis fixed with relation to said chamber means for swinging movement between an operating position adjacent said plate and a retracted position, means carried by said clamp means for urging an intermediate portion of said blade into clamping engagement with said plate in said operating position of said clamp means with the front edge of said blade projecting freely beyond said plate toward the surface of said roll to define therewith and with said plate a coating nip for receiving coating composition for flow between the front edge of said blade and said roll, an expansible tube also carried by said clamp means for engaging the outer surface of said blade between the front edge thereof and said urging means in said operating position of said clamp means, and means for supplying controlled pressure fluid to said tube to flex said blade about said edge of said plate and thereby to establish corresponding pressure engagement between the front edge of said blade and the surface of said roll.

17. Apparatus for coating one surface of a moving web, a backing roll for supporting the opposite surface of the web, coating chamber means including a plate extending lengthwise of said roll in fixed spaced relation therewith, a blade of flexible material extending lengthwise along one edge of said plate, clamp means for said blade mounted on an axis fixed with relation to said chamber means for swinging movement between an operating position adjacent said plate and a retracted position, an expansible tube carried by said clamp means for engaging an intermediate portion of said blade opposite said plate in said operating position of said clamp means to hold said intermediate blade portion against said plate with the front edge portion of said blade extending freely beyond said plate toward the surface of said roll and forming a flexible wall portion of said chamber, a second expansible tube carried by said clamp means for engaging the outer surface of said blade between the front edge thereof and said plate in said operating position of said clamp means, means for supplying controlled pressure fluid to said tubes to clamp said blade against said plate edge and to flex said blade about said one edge of said plate and thereby to establish pressure engagement between the front edge of said blade and the surface of said roll, and individually operable means located at spaced positions lengthwise of said tubes for effecting localized adjustment of said second tube with respect to said first tube and said roll to cause corresponding localized variation of the pressure engagement between the front edge of said blade and said roll.

18. Apparatus for coating one surface of a moving web, comprising a backing roll for supporting the opposite surface of the web, a frame including means for supporting said roll, coating chamber means including a plate extending lengthwise of said roll and forming a wall of said chamber, means for mounting said chamber means on said frame below said roll, means for moving said mounting means to shift said chamber means between a raised position substantially directly below and in working relation with the surface of said roll and a lowered position spaced forwardly of said roll, a blade of flexible material extending lengthwise along the forward edge of said plate, clamp means for said blade mounted on said chamber means for movement between an operating position adjacent said plate and a retracted position for

removal of said blade, pressure means carried by said clamp means and effective in said operating position of said clamp means to urge an intermediate portion of said blade into clamping engagement with said plate with the front edge portion of said blade projecting freely beyond said plate toward the surface of said roll and forming a flexible wall portion of said chamber, and additional pressure means carried by said clamp means for engaging the outer surface of said blade between the front edge thereof and said plate in said operating position of said clamp means to flex said blade about said edge of said plate and thereby to establish pressure engagement between the front edge of said blade and the surface of said roll in said raised position of said chamber means.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent 3,079,889

March 5, 1963

Robert J. Jacobs et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 1, line 34, for "adjustament" read -- adjustment --; column 2, line 11, for "onthe" read -- on the --; column 4, lines 57 and 58, for "intermmmediate" read -- intermediate --; column 5, line 12, for "compensat" read -- compensate --; line 34, strike out "also"; column 6, line 72, for "beings" read -- begins --; column 11, line 4, for "an denenergizes" read -- and energizes --; column 12, line 21, for "lodge" read -- lodged --; column 13, line 53, for "means" read -- beams --; column 17, line 65, and column 18, line 13, for "uring" read -- urging --; column 20, line 8, under the heading "UNITED STATES PATENTS", for "June 2, 1940" read -- January 2, 1940 --.

Signed and sealed this 26th day of November 1963.

SEAL)

Attest:

RNEST W. SWIDER

Attesting Officer

EDWIN L. REYNOLDS

Acting Commissioner of Patents