

Dec. 10, 1963

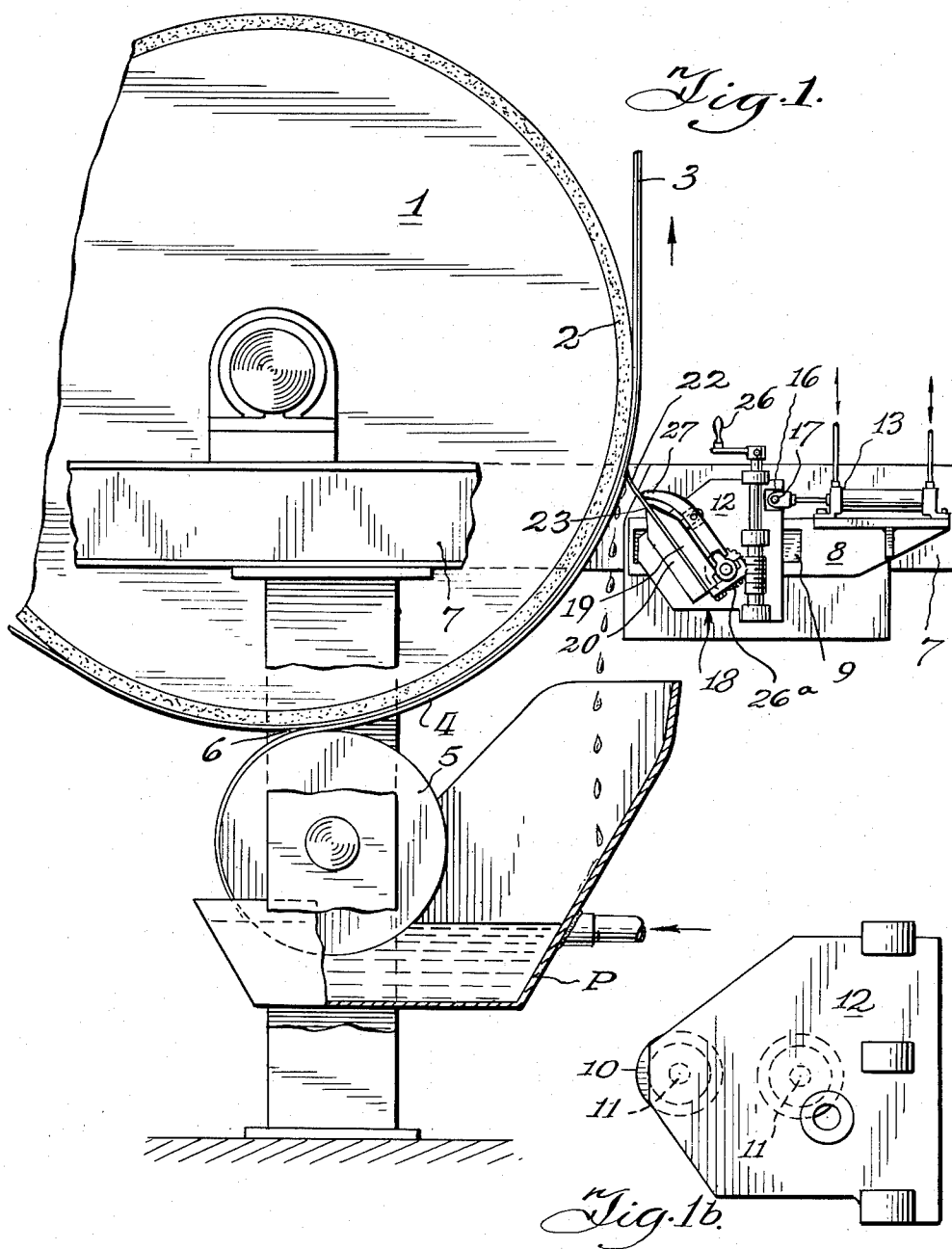
C. G. R. JOHNSON ETAL

3,113,890

APPARATUS FOR SMOOTHING COATING MATERIALS ON A PAPER WEB

Filed June 26, 1961

5 Sheets-Sheet 1



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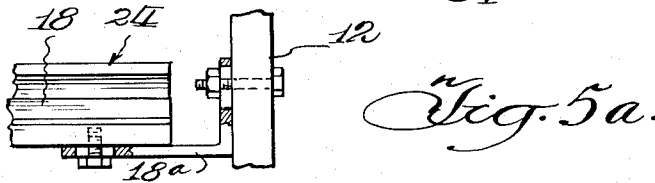
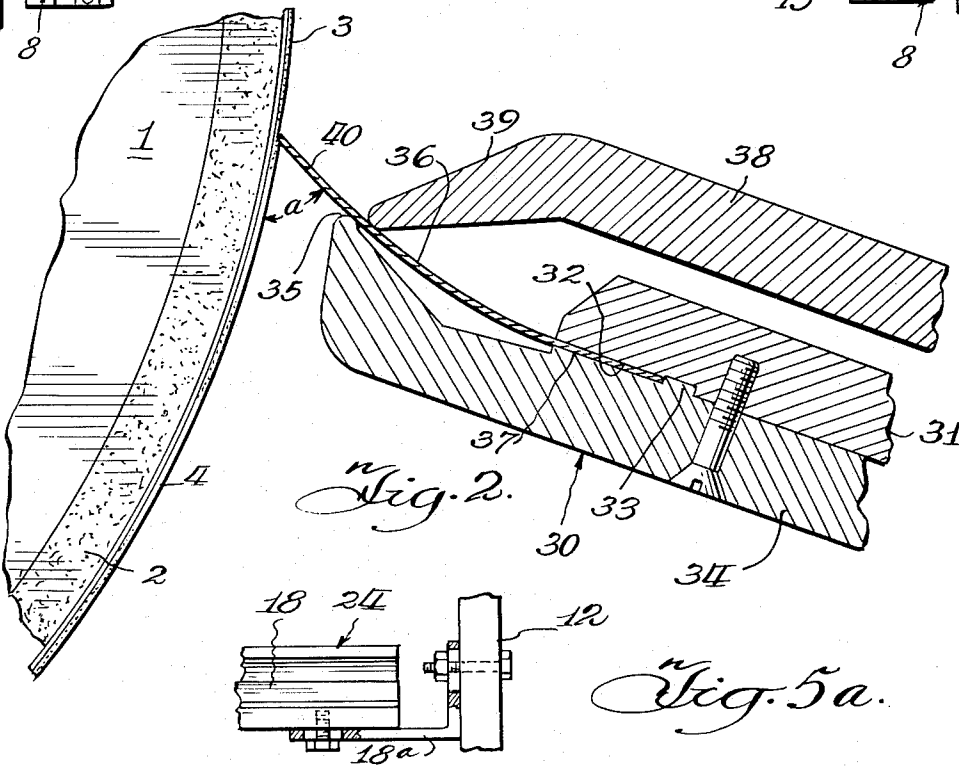
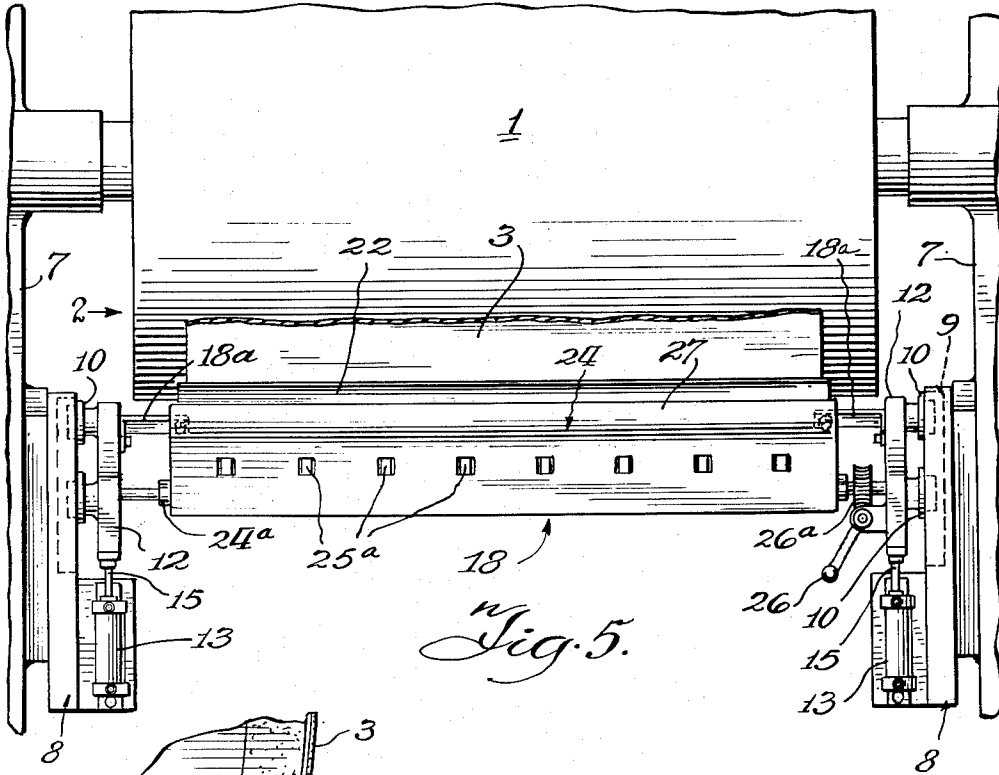
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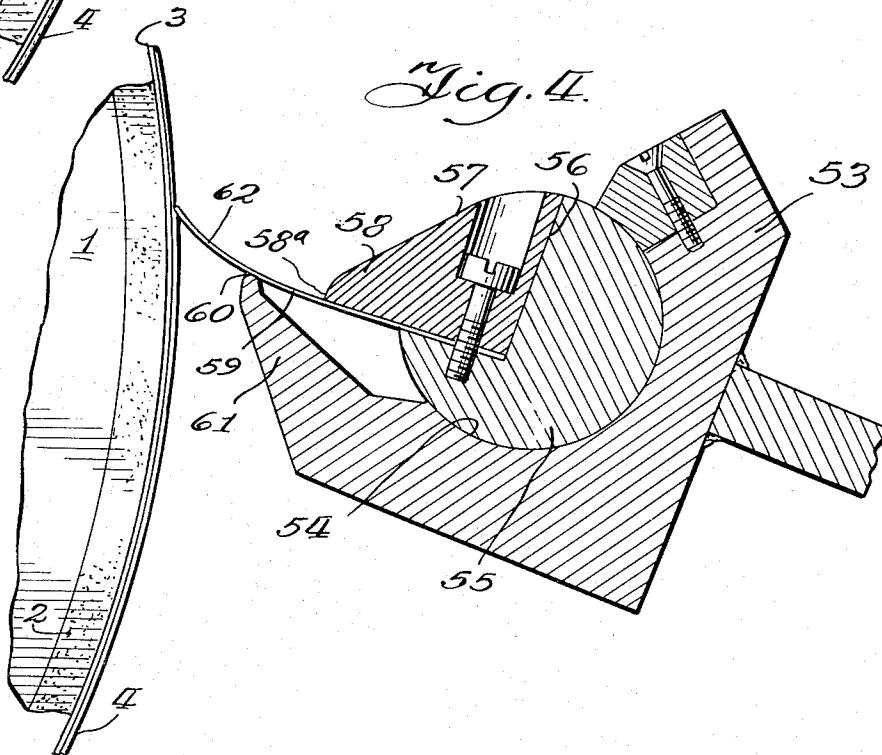
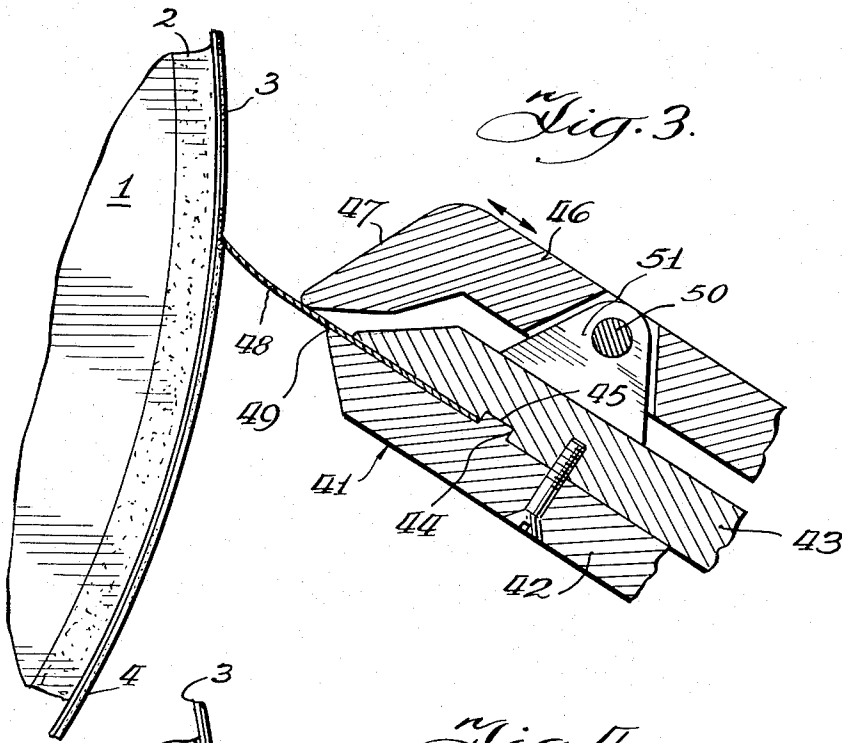
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5 Sheets-Sheet 4



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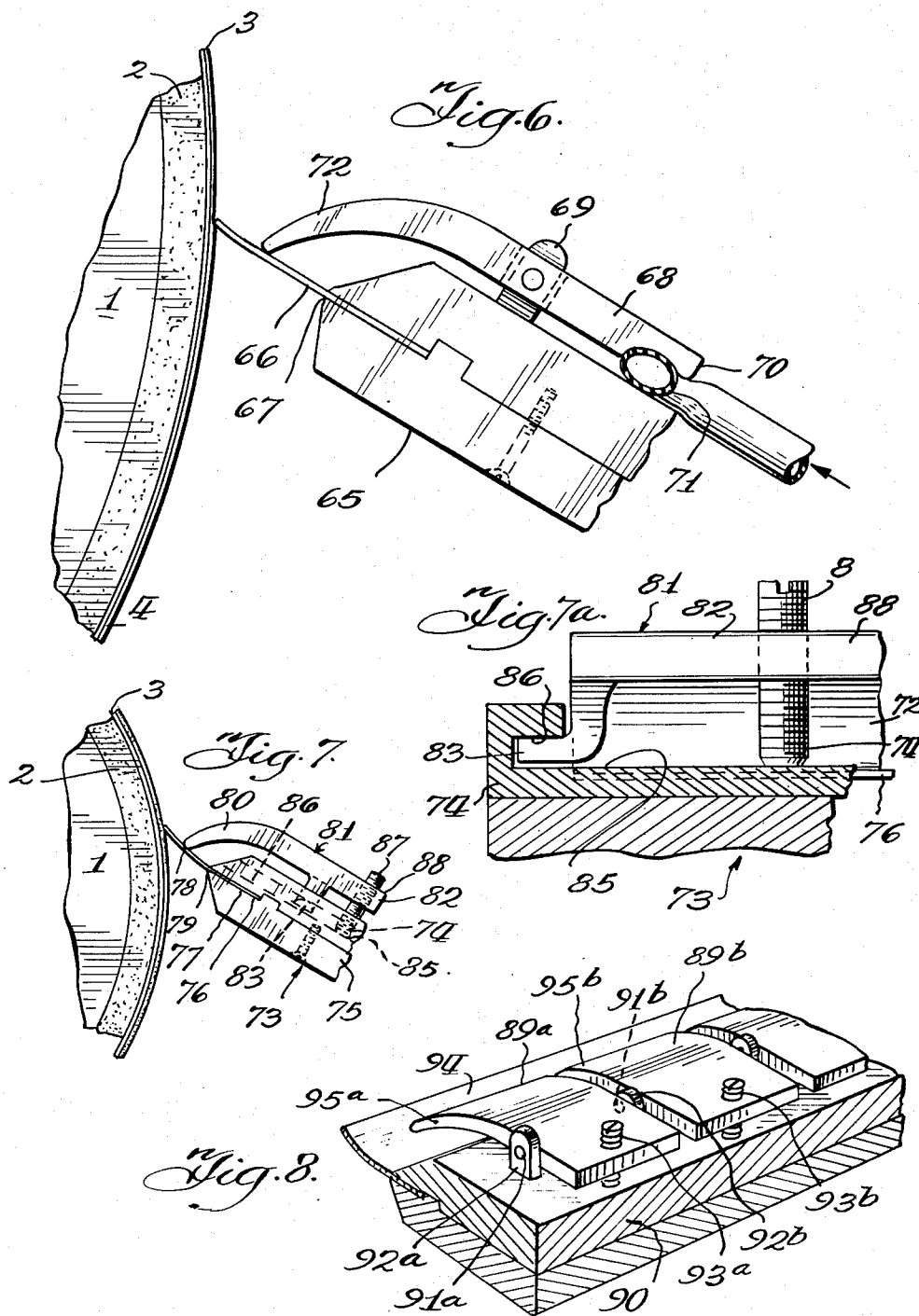
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APPARATUS FOR SMOOTHING COATING MATERIALS ON A PAPER WEB

Filed June 26, 1961

5 Sheets-Sheet 5



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3,113,890

APPARATUS FOR SMOOTHING COATING MATERIALS ON A PAPER WEB

Charles G. Russell Johnson, Neenah, and Karl E. Sager, Appleton, Wis., assignors to Kimberly-Clark Corporation, Neenah, Wis., a corporation of Delaware
Filed June 26, 1961, Ser. No. 119,377
5 Claims. (Cl. 118—126)

This invention relates to knife blade mountings and is particularly concerned with such mountings as they are incorporated with backing rolls of paper coating machines.

In an exemplary knife blade coating operation a web of paper to be coated is passed over a roller and a sharp flexible blade is pressed into engagement with the paper and a coating carried thereon. The coating material is smoothed, leveled, troweled, or the like by the knife blade action.

The angular relationship of the blade extremity and a tangent to the roll at the line of blade contact is an important factor affecting the coating process; similarly, the pressure under which the knife blade holder and the blade are urged to the paper are important considerations in the coating operation and in quality control of the applied coating.

With present mounting arrangements, changes in pressure due to blade wear or other causes vary the blade angle since the degree of flexure of the blade changes with pressure. For example, in order to apply relatively heavy coating weights of a mineral coating to paper, relatively light pressures may be exerted on the blade holder and knife blade. With these light pressures, the angle between the blade extremity and the tangent to the roll at the line of blade contact is greater than with higher pressures. This results with present devices in less bearing surface of the knife blade contacting the paper at the blade tip, and therefore pressure per unit area of the blade on the sheet increases and, at least in part, offsets the decrease in lineal pressure or force exerted by the blade. Therefore, with the usual arrangements control is difficult.

Also, the blade angle and pressure have important effects on the flow of the coating in contact with the blade, the weight of coating applied, and the passage of particles which might be scratch producing. Thus, more specifically, the coating on the finished sheet is improved by blade angle-pressure control. Reference to blade angle will be understood to relate to the angle formed by the blade tip and a tangent to the backing roll at the blade tip. Radial pressure, as used herein, is, in effect, the force between the blade tip and the paper and backing roll in the direction of the radial line at the point of blade contact. Radial pressure is usually expressed in pounds per lineal inch of blade length.

It is a primary object of this invention to provide knife blade holder mountings in which the blade angle with respect to the paper web may be changed substantially independently of the radial pressure exerted on the blade. Conversely, the pressure exerted on the blade holder and the blade may be changed by the mechanism of the invention while retaining the blade angle substantially constant.

It is a further object of this invention to provide a novel process by which blade radial pressure may be changed substantially independently of blade angle and vice versa.

It is yet another object of this invention to provide a novel knife blade holder mounting which is adjustable in the course of a coating operation to so compensate for knife blade wear that a constant knife blade angle with respect to the paper being coated may be maintained.

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The foregoing and other allied objects of the invention are achieved by providing a yieldably mounted blade holder and incorporating with it a pressure bar fixed to the holder and movable with the holder but having a component part positionable relative to the holder to engage and pressure a blade extending from the holder. The blade, by this procedure, is bent relative to a forward edge of the holder which edge serves as a fulcrum. The blade tip is inhibited from movement by its contact with the backing roll or the roll supported paper web, and, accordingly, the yieldably or movably mounted blade holder adjusts its position to maintain substantially the same total pressure.

In the event that it is desired to change pressure while maintaining blade angle, the procedure described above may be reversed; that is, the pressure desired is applied and the blade flexure is adjusted through the medium of the pressure bar to restore the desired blade angle.

The invention will be more fully understood by reference to the following detailed description and accompanying drawings wherein:

FIG. 1 is a view in side elevation with parts broken away of one embodiment of knife blade mounting in accordance with the invention;

FIG. 1a is an enlarged view of a portion of the structure of FIG. 1;

FIG. 1b is a detail view of a portion of the structure of FIG. 1;

FIG. 2 is a fragmentary view in side elevation illustrating a further embodiment of a blade-holder in accordance with the invention;

FIG. 3 is a fragmentary view in side elevation of yet another embodiment of a blade-holder in accordance with the invention;

FIG. 4 is a view similar to those of FIGS. 1 to 3, but illustrating an embodiment in which the pressure bar is formed integral with a clamping element of the blade holder;

FIGS. 5 and 5a are respectively plan and fragmentary views of the structure of FIG. 1;

FIG. 6 is a fragmentary view illustrating an alternative mode of biasing a pressure bar;

FIGS. 7 and 7a are views illustrating a further embodiment of a blade mounting wherein the pressure bar is slideable;

FIG. 8 is a fragmentary view in perspective of a structure similar to that illustrated in FIG. 5 but wherein the pressure bar is segmented; and

FIGS. 9 and 9a are respectively side elevation and fragmentary views of a further modification of a mounting in accordance with the invention.

Referring to the drawings, the numeral 1 (FIGS. 1 and 5) designates a backing roll of considerable width commonly associated with coating apparatus in the application of mineral coatings to paper webs. Roll 1 has a rubber covering 2 on which the traveling paper web 3 is supported. Roll 1 is driven in rotation by suitable means (not shown) carrying the traveling paper web 3 with it in the direction indicated by the arrow. Web 3 receives an excess of mineral coating indicated at 4 from applicator roll 5; roll 5 forms an applicator nip with the backing roll 1 at 6 (FIG. 1).

The blade holder is supported on each side of the machine as shown in FIG. 5; for the sake of convenience, since the oppositely positioned support arrangements are similar, reference is made in the immediately following description to one machine side only, that shown at the right in FIG. 5.

Fixedly secured to any convenient foundation or machine support 7 is a frame 8 having a longitudinally extending slot 9. Slot 9 receives rollers 10 which are secured rotatably on fixed shafts 11, the shafts being fixedly

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retained by carrier 12. Carrier 12 (FIG. 1b) is therefore movable relative to the frame 8 on the rollers.

To urge the carrier 12 to position, double acting hydraulic cylinder 13 is supported from the frame 3 and has associated with it piston 14 and piston rod 15 (FIG. 1a). Piston rod 15 is pivotally supported in a recess 16 on pin 17 of carrier 12. Thus unbalanced pressure on the rightward face of piston 14 urges the piston 14 and carrier 12 leftwardly (FIGS. 1 and 1a).

A blade holder generally designated at 18 is adjustably supported in position by angle irons 18a (FIG. 5a) extending from the holder to carrier 12. Holder 18 (FIGS. 1 and 1a) comprises opposed clamping elements 19 and 20 between which the knife blade 21 is retained. As illustrated in FIG. 1, the blade 21 has an extending portion or extremity 22 which projects well beyond the forward edge 23 of the blade holder. The blade (FIG. 1) extends in the direction of paper web travel and is engaged with the paper web on the backing roll to smooth coating composition 4 on the web.

Secured on the upper surface of the clamping element 19 for pivotal movement relative to the blade holder is a pressure bar 24 pivoted at 25 on ears 25a for movement relative to the forward edge of the holder. A lever handle 26 is connected through worm gearing at 26a (FIG. 5) to a cam bar 24a housed at 18' (FIG. 1a) on the rearward portion of the blade holder; this cam bar extends the full width of the blade holder and is limitedly rotatable to control the position of the pressure bar 24 on its pivot 25. The cam bar also has its extremities journaled in carriers 12 (FIG. 5) providing support for the blade holder from the carrier. Accordingly, the cam bar is rectilinearly movable with the carrier as are the blade holder and pressure bar. Forwardly, pressure bar 24 is preferably shaped as illustrated in FIG. 1 as a depending extremity 27; this depending extremity (FIG. 5) extends substantially the width of the blade holder. The pressure bar 24 has its extremity 27 in contact with the extended portion of the blade 22 and accordingly, the pressure bar biases the blade into contact with the paper 3, exerting a counter-pressure, the forward edge 23 serving for this purpose as a fulcrum.

It will be noted from the foregoing that when it is desired to increase the angular relationship, that is, the angle "a" between the tangent and the blade at the blade tip (FIG. 1a), it is effected manually by turning the handle to cause finger 27 to bias downwardly, thus urging blade extremity 22 downwardly. This action, in effect a warping of the blade, is offset by the movement of the carrier 12 rightwardly (FIG. 1) against the pressure of the hydraulic cylinder which adjusts itself to maintain the same total pressure on the device.

Thus, for any given apparatus arrangement, the structure of the invention permits facile blade angle manipulation independently of blade pressure and also provides for compensation of operating variables which may occur in the course of a run; for example, blade wear, coating characteristics, and the like.

In the structure illustrated in FIG. 2, the blade holder is carrier retained as in FIG. 1. Blade holder 30 is comprised of an upper clamping element 31 having a lower face 32 in secure contact with which there extends protuberant portion 33 of a lower opposing clamping element 34. Forwardly, element 34 has an edge 35 in the form of a protruding lip which extends upwardly from the blade holder body and serves as a fulcrum for blade 36. Blade 36 has its rearward portion compressed between the opposing clamp elements 31 and 34 and is located against the protuberant portion 33 at the blade rearward extremity 37 to inhibit blade movement in the holder. The blade is pressed in this instance inwardly of the lip 35 between lip and the main body of the holder by the pressure bar 38 with its depending extremity 39; the stressing of the blade is such that by an increase of pressure the blade extremity 40 bends upwardly. Thus, in

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this instance, increased pressure by the pressure bar decreases the angle between the tangent to the backing roll and the blade at the blade tip.

The structure of FIG. 3 includes a blade holder 41 having a lower clamping element 42 and an upper clamping element 43, alignment of the elements being achieved by the cooperating protuberant portion 44 and recess 45 of the elements. Clamping element 42, as clearly shown in FIG. 3, extends well forwardly of the clamping element 43. Pressure bar 46 with its forward depending extremity 47 engages the blade extremity 48 forwardly of the protruding edge 49 of the clamping element 42. Thus, forward edge 49 serves as a fulcrum for the blade under the action of the pressure bar. In this instance, the pressure bar itself is pivoted substantially in the same manner as illustrated in FIG. 1, pivot pin 50 being received by the upstanding ears 51 which are themselves secured to the upper clamping element.

In the structure of FIG. 4 the body 53 of the knife holder device is recessed at 54 to rotatably receive a shaft 55. Shaft 55 may be rotated within limits in any convenient manner, for example, as cam bar 24a is rotated in FIGS. 1 and 5; that is, gearing, friction, or other lock devices may rotate and retain the shaft fixed in adjusted position. Shaft 55 is cut out or segmented at 56 over its length and receives segment 57 having a projecting portion 58 terminating in extremity 58a. Portion 58 and extremity 58a serve as the pressure bar. The blade 59 is received between the shaft 55 and the segment 57, and is clamped therebetween in any convenient manner. The blade 59 bears against the forward protuberant edge 60 which extends upwardly on an arm 61 of the body 53, and thus the protruding edge serves as a fulcrum. In this instance, the forward portion 62 of the blade is biased to position by engagement of the portion 58 and extremity 58a with the blade rearwardly over a relatively wide area between the edge 60 and the main body of the holder 53.

In FIG. 6 an alternative method for actuation of the pressure bar is illustrated. Thus, in FIG. 6 the blade holder is designated at 65 and the blade projection 66 is arranged to be contacted outwardly of the edge 67 by the pressure bar 68 pivoted at 69. Fixedly positioned beneath the rearward extremity 70 of the pressure bar is a tube 71 such as an air hose. This tube 71 may be inflatable by air in any suitable manner to cause the pressure bar 68 to pivot toward the blade extremity 66, to thereby bring the extremity 72 into contact with the knife blade. The tube 71 in such instance, of course, would preferably extend completely across the blade holder beneath the pressure bar and affords to the operator a quick and convenient means of effecting a desired pressure-angle relationship.

FIG. 7 illustrates an embodiment in which the pressure bar is engageable with the knife blade in a sliding motion in contrast to the pivotal movement described hereinbefore. The holder is indicated generally by the numeral 73 and is comprised of upper and lower clamping elements 74, 75 respectively. The rearward portion 76 of the blade 77 is retained by the clamp elements while the forward extremity of the blade 78 projects beyond the forward edge 79 of the blade holder and is engaged by the depending extremity 80 of the pressure bar 81.

The pressure bar 81 is itself supported for forward and rearward sliding movement relative to the forward edge of the holder to permit adjustment of the position of extremity 80 along the blade length. To provide for this sliding movement, the upper clamp element 74 is recessed over its width to slidably receive and confine laterally the integral crossbar 82. This slide-crossbar cooperation may obviously take a plurality of mechanical forms, one of which is indicated in the section shown in FIG. 7a.

In the fragmentary view in FIG. 7a, the crossbar 82

is shown to be provided with a leftwardly projecting integral boss 83, which is received and confined between the inwardly extending lip 86 and the bottom 85 of the recess of the clamp element 74. A similar configuration that is essentially a tongue and groove arrangement is, of course, provided at the rightward side of the blade holder and at any necessary locations (not shown) across the width of the machine; and the crossbar is accordingly retained against substantial lateral movement while being freely slideable forwardly and rearwardly (FIG. 7).

The pressure bar 82, when once positioned, is retained fixedly relative to the blade holder 73 by any suitable means such as a plurality of set screws extending across the holder width; one such set screw is shown in FIG. 7 at 87 and, as will be noted from the drawing, the screw extends through the rearward end 88 of the pressure bar, into contact with the bottom 85 of the recess rearwardly of the crossbar 81.

The knife blade 77 is, of course, in operation, biased into contact with the backing roll 1 due to the pressure exerted on the holder as already described in connection with FIG. 1. Accordingly, the blade extremity 78 assumes a slight curvature as indicated in FIG. 7; the pressure bar movable on a lineal slide as indicated above will bias the blade differentially over its extremity 78 depending upon the location of the pressure bar extremity 80 relative to the forward edge of the holder. As shown in FIG. 7, the bottom 85 of the recess which forms the slide extends in a plane which is parallel with the general plane of the knife blade when there is no pressure on the blade extremity. More specifically, as illustrated in FIG. 7, the angular relationship between the general zero pressure plane of the blade and the plane of the slide is 180° (parallel); however, should it be desired to emphasize pressure by the pressure bar extremity 80 on the blade extremity 78 in a particular manner in a specific apparatus arrangement, the plane of the slide may be inclined; that is, at an angle other than 180° with the general plane of the unstressed knife blade.

As illustrated in FIG. 8, the blade holder and pressure bar need not be provided in one continuous width. If sectioned, however, the sections of the blade holder and the pressure bar should be so positioned in adjacent relationship that pressure on the blade may be substantially continuous over the blade width. The pressure bar sections 89a, 89b of FIG. 8 are illustrated as being individually supported by a suitable holder 90; each bar section is separately pivotally mounted on a laterally extending pivot rod 91a, 91b supported by pairs of ears 92a, 92b. Each pressure bar section has a screw 93a, 93b carried thereon rearwardly and which is adapted to engage the upper surface of the holder 90 when individually adjusted. Thus, the pressure exerted on knife blade 94 (FIG. 8) by the depending extremity 95a may be slightly different than that exerted by the extremity 95b, a feature which permits of precise adjustment and the overcoming, for example, of the effects of slight discontinuities such as may occasionally occur in the blade itself. It is to be noted, however, that the adjacent sections suitably widen forwardly and are in very close side-by-side contact on the blade; accordingly, the pressure application across the blade width is, in effect, continuous.

The structure illustrated in FIGS. 9 and 9a is similar to that of FIGS. 1 and 1a but in addition, specifically provides for rotational movement of the blade holder to fixed adjusted position relative to carrier 12 prior to effecting a blading operation.

To achieve this variation, a worm 97 (and its associated handle) is secured to and supported by the blade holder 98. Worm gear 99 is keyed to cam shaft or cam bar 100 which, similarly to cam bar 24a, has its extremities (not shown) journaled in the carrier 12 for rearward support of the holder. The pressure bar extremity 101 is pivoted into contact with blade 102 by manual rotation of

the worm and its cooperating gear, and this function may be performed at any time that it is desirable to change the blade angle-radial blade pressure relationship.

Initial angular adjustment of the blade holder and pressure bar extremity 101 as a unit is effected by rotating the blade holder 98 relative to the carrier with the extremities of the cam shaft serving as a pivot. For this purpose a stud 103 threaded at 106 (FIG. 9a) extends on each of the blade holders 98 to the adjacent carrier and through an arcuate slot 104 of the carrier. A cooperating nut 105 threaded on the extremity 106 serves to lock the blade holder and carrier in adjusted pivoted position. Thus, the holder and pressure bar adjustment mechanism are locked together for rotation as a unit but are independently rotatable relatively to provide pressure on a blade.

The mode of operation of the device of the invention may be illustrated suitably by reference to FIGS. 1 and 5. As already noted, the material to be coated—specifically, the web of paper 3—receives the excess 4 of coating at the applicator nip 6 and the paper supported by the backing roll passes to the blade 21 and the blade extremity 22. This coating material is fluid and the coating compositions employed are of the type commonly utilized in the paper coating field. While other coatings may be employed in the practice of the invention, the description which follows specifically contemplates mineral coatings such as the usual clay-adhesive-water base coating compositions; and other pigments such as calcium carbonate may also be employed and adhesives of various natures such as starch, casein, glue and the like may be utilized. It is to be understood that the specific nature of the composition is not critical. However, it is to be noted that such compositions usually have a solids content of between about 50 and 70% by weight and a viscosity of between about 45 and 100 poises.

The blade is effective to trowel such coating composition, removing excess which falls along the underside of the blade, to a receiving pan P for recirculation. One such aqueous composition suitable for the practice of the invention is set forth herein for completeness:

Premium domestic clay	-----	60 parts by weight.
Calcium carbonate	-----	40 parts by weight.
Ethylated starch (ethylene oxide derivative of starch)	----	20 parts by weight.
Sodium hexametaphosphate	-----	0.3 part by weight.
Calcium stearate	-----	1 part by weight.
		76 parts by weight.
H ₂ O Caustic (or ammonia)	-----	To adjust to pH of 9.0 approximately.
		62% by weight
Coating solids	-----	approximately.

Further, the paper web 3 may, for example, have an uncoated basis weight of 30 pounds per 3300 square feet and be comprised of about 40% by weight of sulphite pulp and 60% by weight of groundwood pulp. It is emphasized that these are exemplary only and useful in the method of invention.

The blade in the course of operation tends to be worn by the coating composition and web movement beneath the blade and occasionally particles are entrained in the coating composition and passed to the blade which may result in some scratches being produced on the paper coating itself. The structure of invention facilitates control of these factors by providing for angular adjustment of the blade at constant pressure or at desired pressure even while the web is moving on the backing roll 1. As clearly indicated from the foregoing and from the figures themselves, it is merely necessary to adjust the position of the lever handle 26 (FIGS. 1 and 5) in the desired direction, thereby exerting control over the blade position relative to the web. Thus, a constant radial load may be imposed at the blade tip for a variety of operating conditions.

The paper web with the coating leveled thereon commonly passes from the blade to driers as is well known in the art. Further, while the description has been limited

to the coating of the first side of the sheet, it is obvious that similar mechanisms may be used for coating the second side of the sheet or for applying a second layer of coating material to a previously coated sheet. Also, the device may be utilized in on-the-machine operations where the paper web is formed and coated in a continuous manner or it may be employed in an off-the-machine operation if desired.

To complete the specific example to which reference has been made, a 30-pound uncoated base sheet may have applied thereto on one side a coating of about 6½ pounds when dry and if, as is the usual case, the sheet is coated on both sides, a total coating weight pickup of 13 pounds is readily achieved. The device of invention permits closer control of the coating weight pickup over the length of the web.

Reference has been made hereinbefore to the knife blade as being a flexible element. Such blades are common in the art and, as an example of the construction of such blade, it may simply be made of spring steel and having a thickness of about 0.012". Usually, the thickness is below 0.024". Such blades, when urged at constant pressure into contact with the web being coated, may have a projection beyond the holder extremity of ¾" more or less; such projection, however, is typical. Blade wear may change the blade angle by as much as 10 to 30 degrees in the course of operation. The structure of this invention facilitates both maintenance of the proper angle and improves blade life since the blade may also be presented to the web at an appropriate determined angle.

While a blade in contact with a web in a coating operation will at its tip wear and assume very quickly an edge having the general contour of the roll and web thereon, it is conventional practice to assist the contour formation by grinding the blade initially. It is therefore to be understood that the blade may be initially sharpened.

It will be understood that this invention is susceptible to modification in order to adapt to different usages and conditions, and accordingly, it is desired to comprehend such modifications within the invention as may fall within the scope of the appended claims.

What is claimed is:

1. Apparatus for coating webs of paper and the like comprising a backing roll mounted for rotation in a given direction, means to pass a web of paper around the said roll in the said given direction, a flexible knife blade extending in the direction of roll rotation angularly to the axis of said backing roll into contact with the web on the backing roll to level a coating on the side of the web which is away from the said backing roll, holder means mounted for movement in a rectilinear path, which path extends toward said backing roll, said holder means supporting said flexible knife blade, self-adjusting fluid pressure means pressing said holder means toward and said flexible blade in contact with said web, and other pressure means carried by said holder means free to move independently of said holder means and lockable with said holder means for movement in the rectilinear path with the holder means and positioned to engage said blade transversely on the side of the flexible knife blade remote from the said roll to change the angular relationship of said blade and backing roll.

2. In apparatus for smoothing a coating composition on a paper web, in combination:

- (a) a rotating backing roll wrapped by a traveling paper web carrying coating composition thereon;
- (b) a flexible blade extending in the direction of paper web travel and engaged with the paper web on the backing roll to smooth the coating composition on said web;
- (c) a blade holder retaining the flexible blade and having a lower forward edge serving as a fulcrum for said flexible blade and over which said flexible blade projects outwardly and forwardly of said blade holder to the said web on the said backing roll;

(d) a pressure bar carried on an upper side of the blade holder engaging said flexible blade biasing the flexible blade across the said lower forward edge of the blade holder;

(e) support means extending rectilinearly toward and away from the backing roll;

(f) means movable with the blade holder mounting the blade holder on the said support means for movement of the blade holder relative to the support means toward and away from the said backing roll; and

(g) self-adjusting pressure means urging said flexible blade, said blade holder and said pressure bar as a unit on the said support means rectilinearly forwardly toward said backing roll and web.

3. In apparatus for smoothing a coating composition on a paper web, in combination:

(a) a rotating backing roll wrapped by a traveling paper web carrying coating composition thereon;

(b) a flexible blade extending in the direction of paper web travel and engaged with the paper web on the backing roll to smooth the coating composition on said web;

(c) a blade holder retaining the flexible blade and having a lower forwardly projecting edge serving as a fulcrum for said flexible blade and over which said flexible blade projects outwardly and forwardly of said blade holder to the said web on the said backing roll;

(d) a pressure bar carried on an upper side of the blade holder engaging said flexible blade outwardly of the blade holder and forwardly of said lower forward edge between the blade holder and backing roll biasing the flexible blade across the said lower forwardly projecting edge of the blade holder;

(e) support means extending rectilinearly forwardly toward and rearwardly away from the backing roll;

(f) means movable with the blade holder mounting the blade holder on the said support means for movement of the blade holder relative to the support means toward and away from the said backing roll; and

(g) self-adjusting fluid pressure means urging said flexible blade, said blade holder and said pressure bar as a unit on the said support means rectilinearly forwardly toward said backing roll and web.

4. In apparatus for smoothing a coating composition on a paper web, in combination:

(a) a rotating backing roll wrapped by a traveling paper web carrying coating composition thereon;

(b) a flexible blade extending in the direction of paper web travel and engaged with the paper web on the backing roll to smooth the coating composition on said web;

(c) a blade holder retaining the flexible blade and having a lower forwardly projecting edge serving as a fulcrum for said flexible blade and over which said flexible blade projects outwardly and forwardly of said blade holder to the said web on the said backing roll;

(d) a pressure bar carried on an upper side of the blade holder engaging said flexible blade rearwardly of said forwardly projecting edge biasing the flexible blade across the said lower forwardly projecting edge of the blade holder;

(e) support means extending rectilinearly forwardly toward and rearwardly away from the backing roll;

(f) means movable with the blade holder mounting the blade holder on said support means for movement of the blade relative to the support means toward and away from the said backing roll; and

(g) self-adjusting fluid pressure means urging said flexible blade, said blade holder and said pressure bar as a unit on the said support means rectilinearly forwardly toward said backing roll and web.

5. In apparatus for smoothing a coating composition on a paper web, in combination:

- (a) a rotatable backing roll for carrying a paper web on which web coating composition is to be smoothed;
- (b) a flexible blade extending in the direction of roll rotation for engagement with a paper web carried on the backing roll to smooth coating composition on the web;
- (c) a blade holder retaining the flexible blade and having a lower forward edge over which said flexible blade projects outwardly and forwardly of said blade holder toward the said backing roll;
- (d) a pressure bar carried on a top surface of the blade holder and disposed to engage said flexible blade to bias the blade to the said lower forward edge of the said blade holder;
- (e) a support frame disposed adjacent each longitudinal extremity of the blade holder and extending rectilinearly toward the backing roll;
- (f) a carrier secured to each longitudinal extremity

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of the blade holder and having rollers which are supported by an adjacent frame to provide for movement of the blade holder and carrier rectilinearly toward and away from the backing roll; and
 (g) fluid pressure means comprising a double acting hydraulic pressure cylinder and a piston within the cylinder secured to each carrier for urging said carriers, blade holder, pressure bar, and blade as a unit on said frames rectilinearly toward the backing roll.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,113,890

December 10, 1963

Charles G. Russell Johnson 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 3, line 17, for "he" read -- the --; line 72, after "between" insert -- the --; column 6, lines 40 to 50, the tabulation should appear as shown below instead of as in the patent:

Premium domestic clay-----	60 parts by weight.
Calcium carbonate-----	40 parts by weight.
Ethylated Starch (ethylene oxide derivative of starch)-----	20 parts by weight.
Sodium hexametaphosphate-----	0.3 part by weight.
Calcium stearate-----	1 part by weight.
H ₂ O-----	76 parts by weight.
Caustic (or ammonia)-----	To adjust to pH of 9.0 approximately.
Coating solids-----	62% by weight approximately.

Signed and sealed this 9th day of June 1964.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents