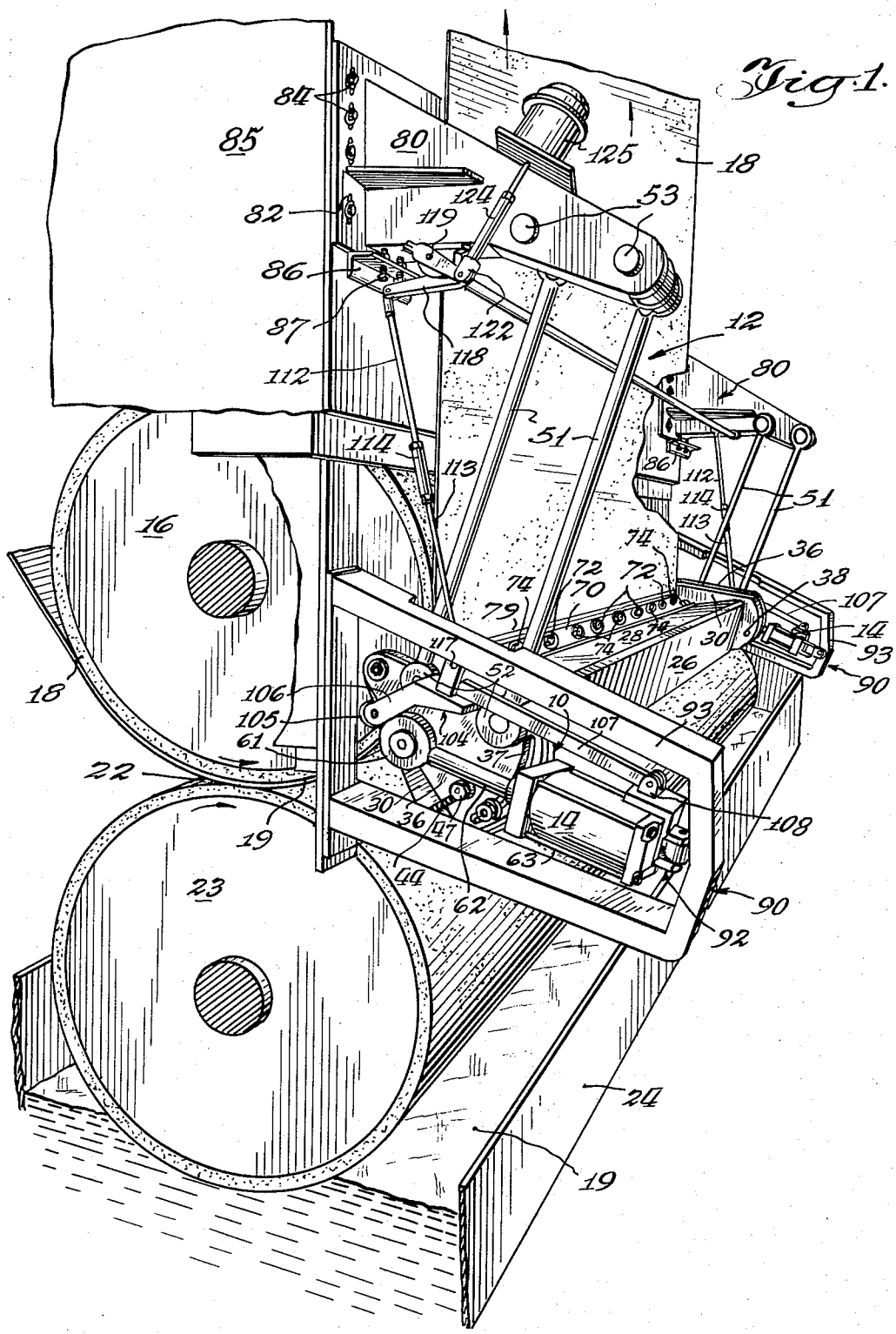
April 12, 1966 I. CAPLE ETAL 3,245,378

DOCTOR BLADE HOLDERS FOR A PAPERMAKING MACHINE

Filed May 14, 1962 6 Sheets-Sheet 1

Fig. 1.

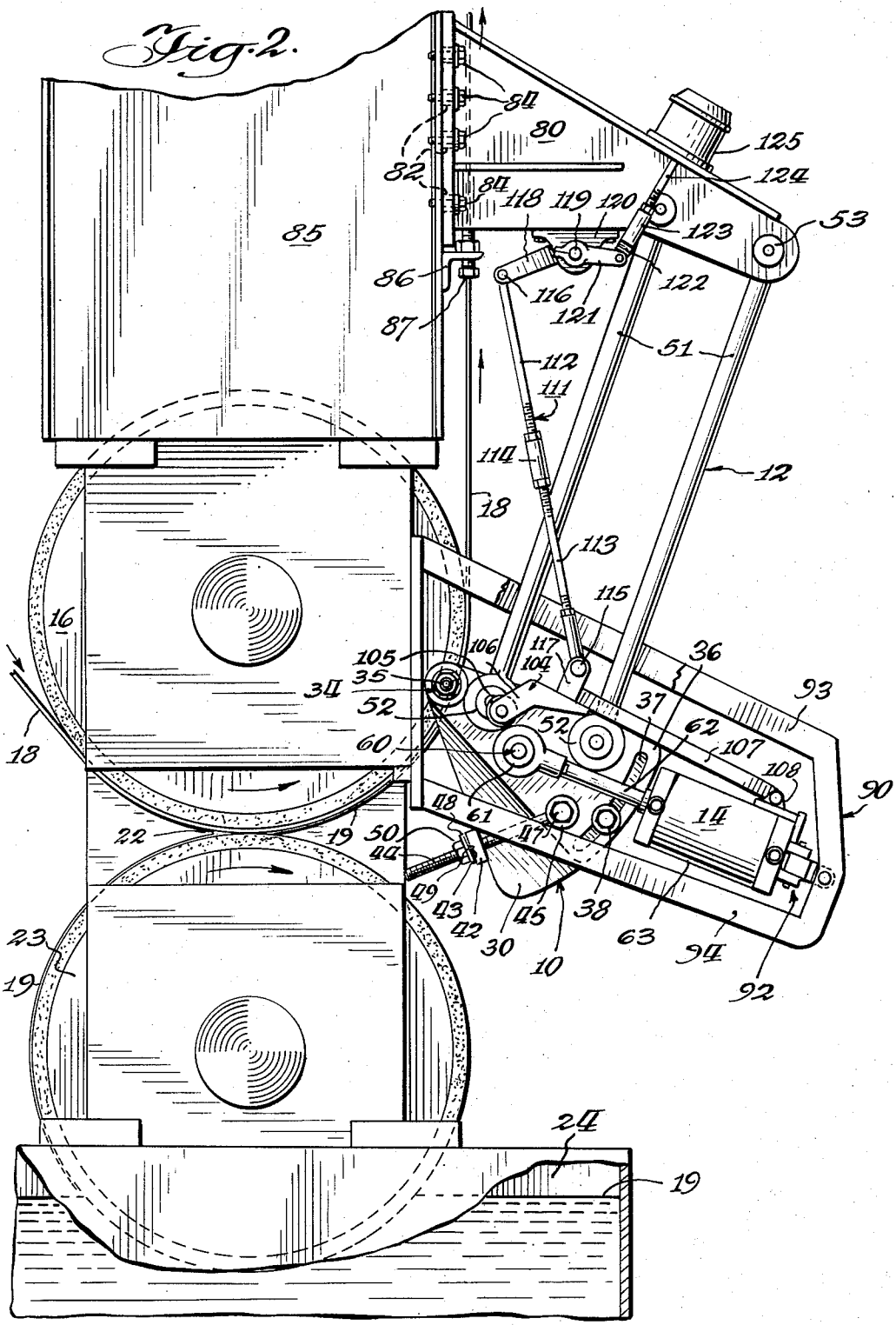


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DOCTOR BLADE HOLDERS FOR A PAPERMAKING MACHINE

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Fig. 2.



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DOCTOR BLADE HOLDERS FOR A PAPERMAKING MACHINE

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Fig. 8.

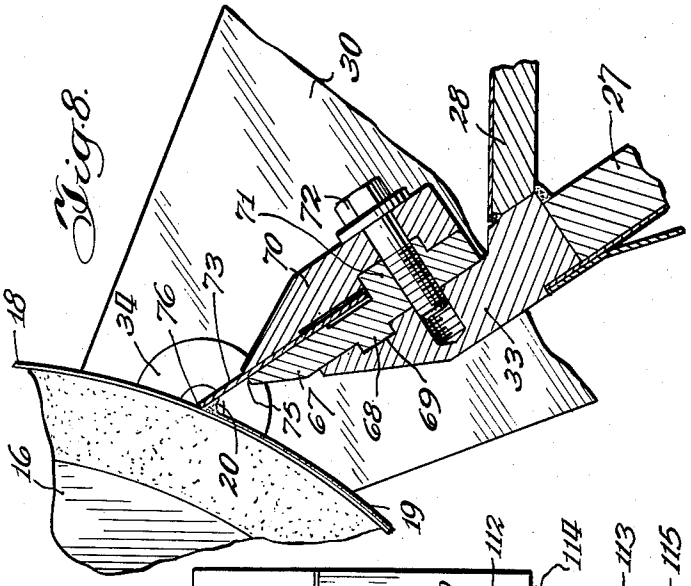
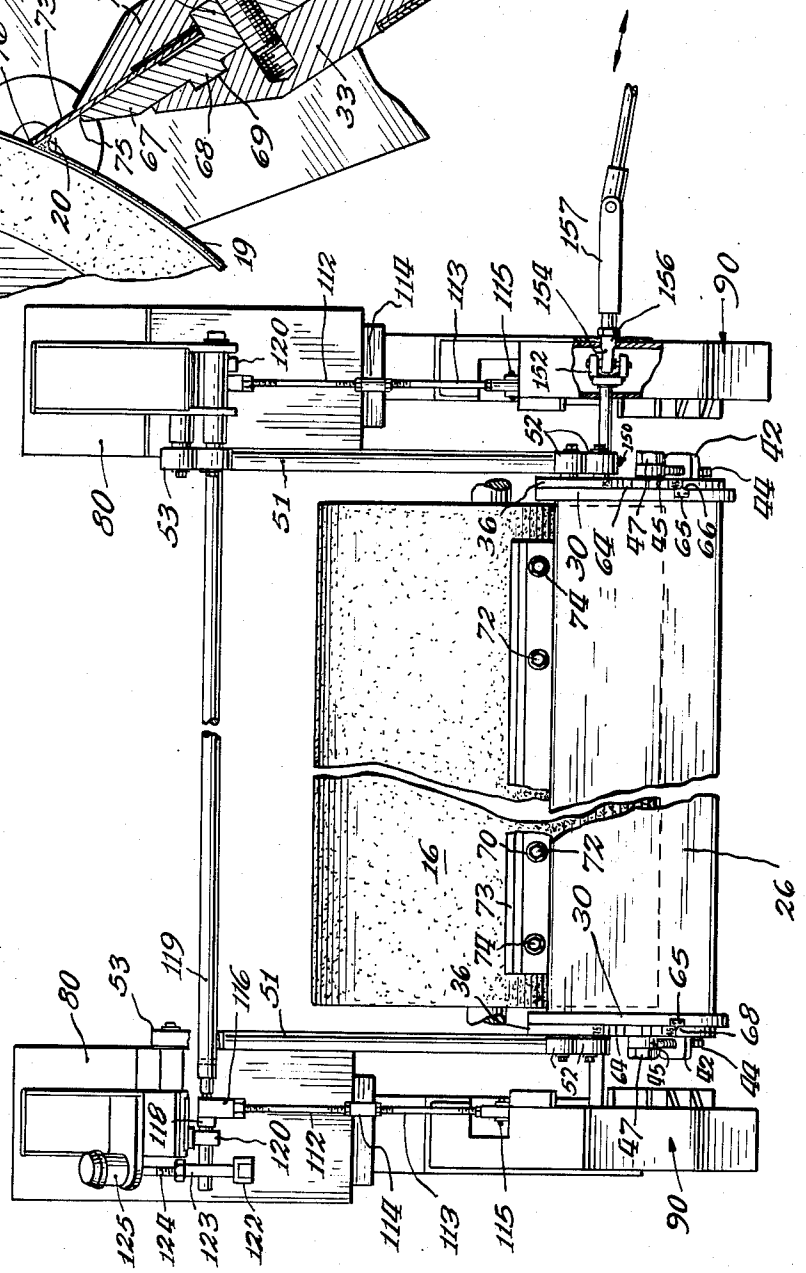


Fig. 3.



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DOCTOR BLADE HOLDERS FOR A PAPERMAKING MACHINE

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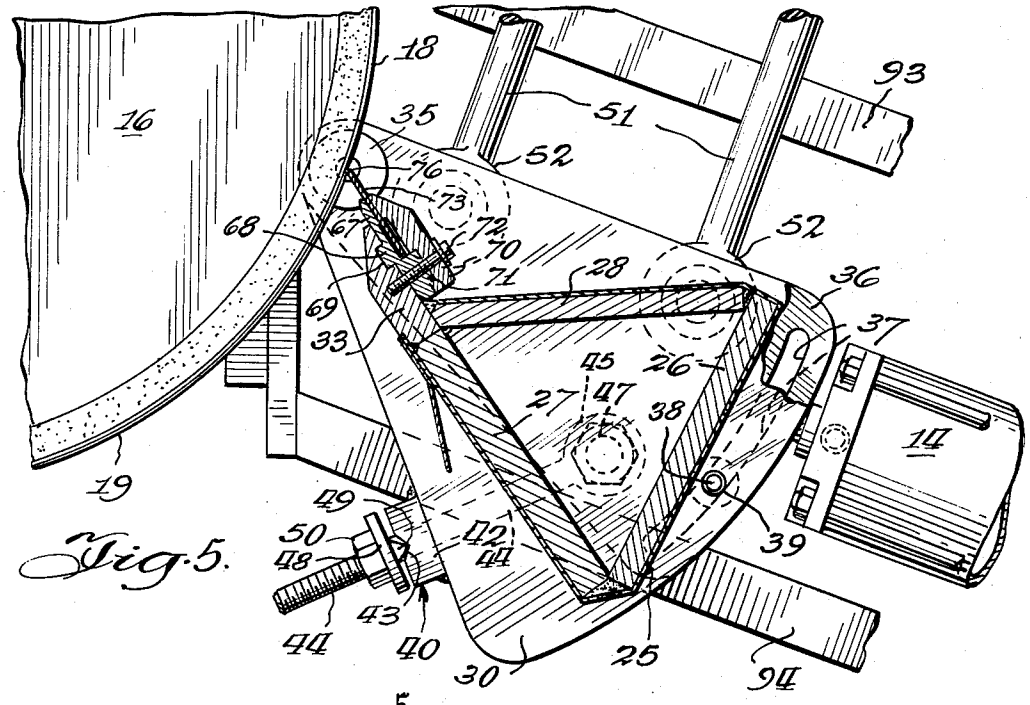


Fig. 5.

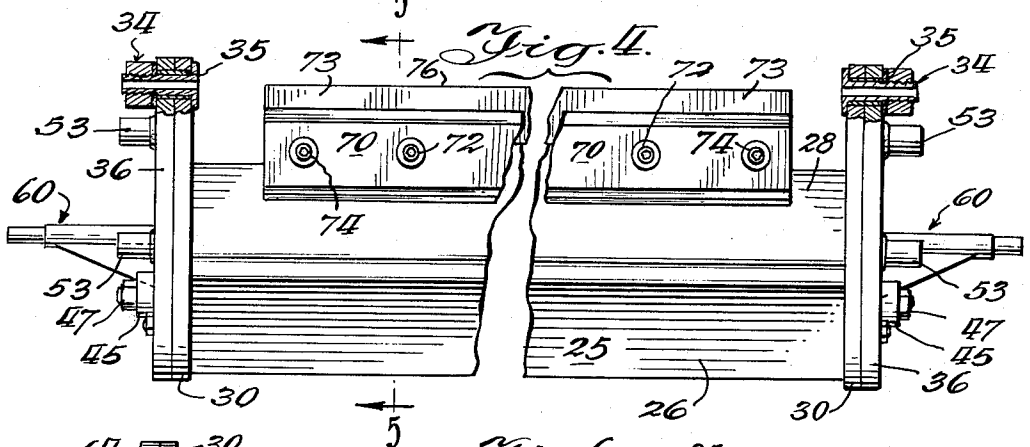


Fig. 4.

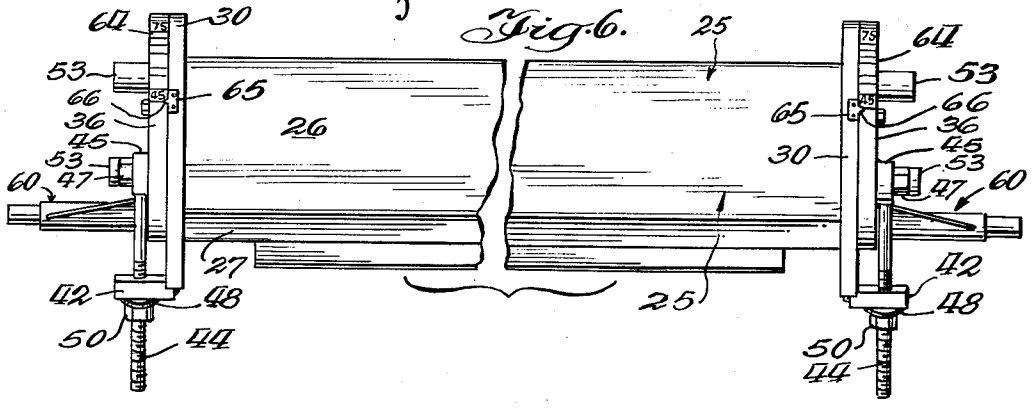


Fig. 6.

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DOCTOR BLADE HOLDERS FOR A PAPERMAKING MACHINE

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Fig. 7.

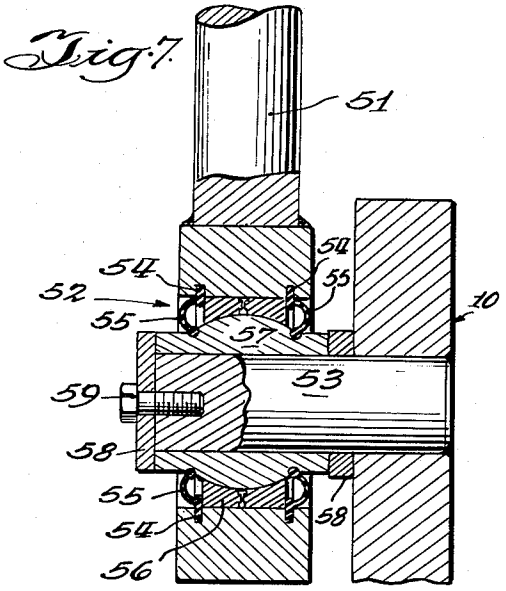


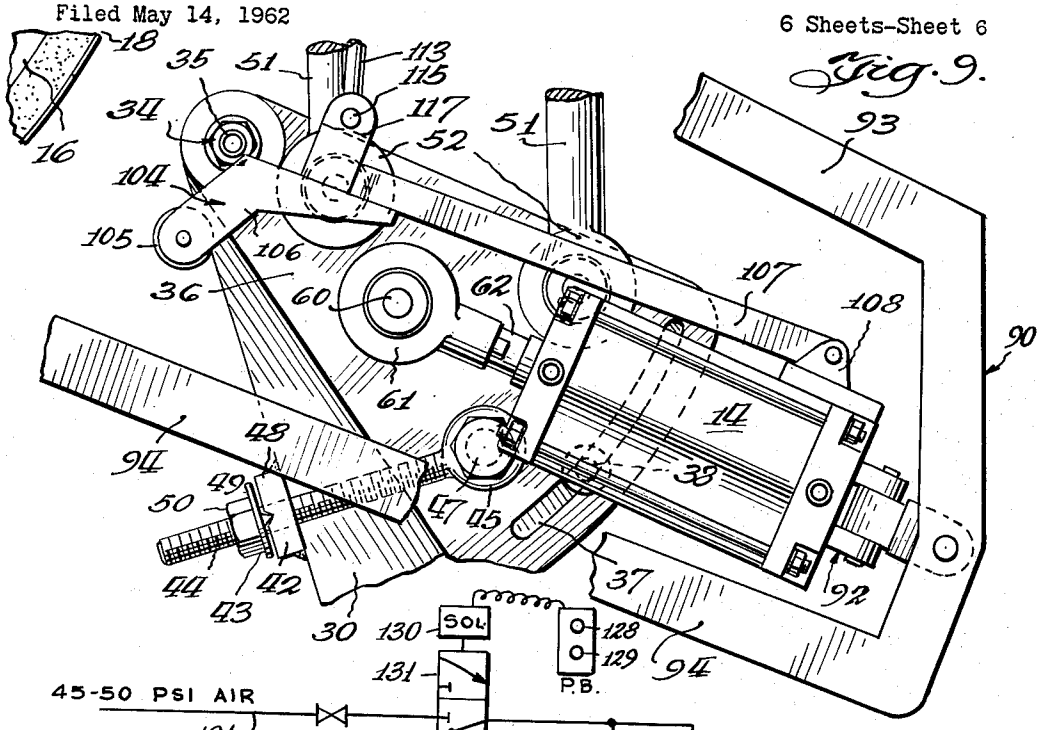
Fig. 11.

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DOCTOR BLADE HOLDERS FOR A PAPERMAKING MACHINE

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Fig. 9.



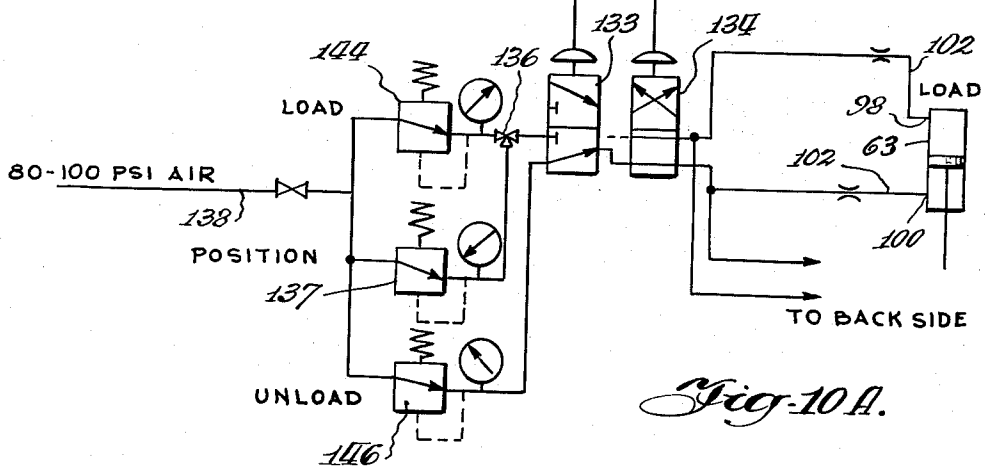


Fig. 10A.

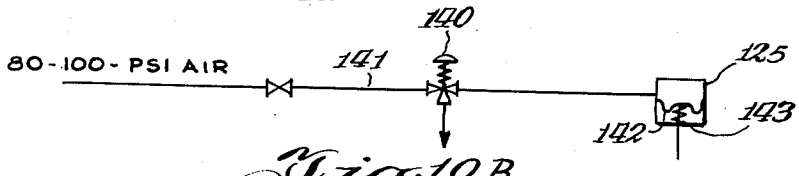


Fig. 10B.

United States Patent Office 3,245,378 Patented Apr. 12, 1966

3,245,378

DOCTOR BLADE HOLDERS FOR A PAPERMAKING MACHINE

Ira Caple and Kai Paul Schubart, Neenah, Wis., assignors to Kimberly-Clark Corporation, Neenah, Wis., a corporation of Delaware

Filed May 14, 1962, Ser. No. 194,415
10 Claims. (Cl. 118—126)

This invention relates to coating devices for applying coating compositions and is particularly directed to mechanisms for the coating of paper webs.

It is customary in the paper manufacturing and allied fields to apply an excess of coating composition to a web and to then blade the coating with a flexible doctor blade. In the blading operation the excess of the coating composition is removed from the web while the remainder of the coating material is troweled or smoothed onto the web surface. For such purpose the traveling web, during the blading procedure, is usually supported as on a rotating resilient backing roll. The flexible doctor blade may be simply a thin metal blade suitably provided with a ground longitudinally extending blading edge or it may be a small diameter flexible rod supported on an edge of a flexible plate element. Such doctor blade is presented to the web traveling on the backing roll to form an acute angle with a tangent to the backing roll at the line of blade contact.

Blades, blade holders, and the assemblies or mountings for such devices are subject to a number of deficiencies, including difficulty of accurate alignment; retention of alignment under applied pressures; change of line of contact of the blade edge with the backing roll with change of blade holder angle; and change of angle with pressure, blade wear and change of blade holder position. Such variable factors, some of which may occur during the coating operation, lead to quality variations in the coated product.

A primary object of the present invention is to provide a novel self-aligning suspension arrangement of a doctor blade holder assembly in which the doctor blade holder angle is substantially independent of blade wear, pressure applied to the assembly, and change of position of the doctor blade holder relative to a backing roll.

An important object of the present invention is the provision of a novel combination of suspension arrangement and doctor blade holder assembly in which the combination is composed of relatively simple, readily assembled parts so constructed and arranged as to preclude misalignment or derangement of the same.

A particular object of the present invention is to provide apparatus for the retention of a doctor blade in which blade pressure may be held substantially constant in a simple and effective manner independently of blade angle or blade wear.

Yet another object of the invention is the provision of a doctor blade holder assembly for the coating of paper webs, and which arrangement has a high degree of sensitivity.

In a preferred embodiment of the invention a doctor blade holder assembly is itself carried between parallel, depending swinging supports which are articulated to ends of the assembly and which form a type of parallelogram suspension. Such supports are at least four in number, at least two being disposed on each opposed end of the assembly and so carried on universal joints that the doctor blade holder assembly is self-aligning under applied pressure.

Pressure is itself preferably applied substantially radially of the backing roll by fluid pressure cylinders acting on the assembly to move the blade directly into the backing roll or directly away from the backing roll when unloading the blade. By this arrangement, blade pressure against the backing roll is maintained constant regardless of blade wear.

The blade holder and its mounting are desirably pivoted for movement relative to the depending supporting arms. The holder is arranged to pivot about the line of contact of the blade with the backing roll; thus the line of doctor blade contact with the roll may be maintained even though blade angle and blade holder angle are changed.

The overhead suspension arrangement of the blade holder assembly facilitates the mechanical arrangement of the equipment. Thus, to effect a backing roll change, it is merely necessary to swing the assembly out of the way, rearwardly away from the roll. In most arrangements, in accordance with the invention, this does not require detachment of the assembly to any degree; thus, no time is lost in realigning or adjusting equipment components. Additionally, ball and socket suspension provides for simplified blade holder reciprocation while maintaining pressure application in a constant direction relative to the backing roll.

In the preferred embodiment of the invention the excess of coating is applied at a first applicator nip, and the web with the excess thereon is carried on the backing roll to a nip formed by the blade and roll; the dwell time between the nip is readily controlled in the procedure of the invention.

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

FIG. 1 is a fragmentary perspective view illustrating a preferred embodiment of the invention;

FIG. 2 is a left hand end view of the embodiment of FIG. 1, particularly illustrating the cooperative relationship of the suspension system, the assembly, and the fluid pressure means;

FIG. 3 is a front view on a reduced scale of the embodiment of FIGS. 1 and 2, with the coating supply removed, taken from the operator's side of the mechanism;

FIG. 4 is a plan view partially in section of the doctor blade holder assembly;

FIG. 5 is a considerably enlarged view and taken on line 5—5 of FIG. 4;

FIG. 6 is an elevational view of the structure of FIG 4;

FIG. 7 is a detail view illustrating the ball and socket suspension arrangement:

FIG. 8 is an enlarged and fragmentary view of the coating device, partially in section, and particularly illustrating the blade holder and blade;

FIG. 9 is a fragmentary view illustrating the assembly in retracted position relative to the backing roll of the embodiment illustrated in the preceding figures;

FIGS. 10A and 10B are schematic views of control equipment useful in the described preferred embodiment; and

FIG. 11 is a schematic elevational view of a further embodiment of the invention.

In the detailed description which follows, corresponding parts, where convenient, are designated with similar numerals. Also, since opposite ends of the assembly are similar, in general reference is made to the structural arrangement of one end.

In broad aspect the arrangement of invention includes:

(a) the blade holder assembly designated generally at **10**;
(b) the suspension system designated generally at **12**; and
(c) the pressure control system designated generally at **14**.

In essence, the blade holder assembly is cradled by

the suspension system for movement toward and away from a backing roll **16**. Fluid pressure means of the control system position the blade holder assembly in one of four positions:

(1) fully retracted from the backing roll;

(2) advanced to a stop position adjacent but not in contact with the backing roll;

(3) in kiss-contact with the backing roll; or

(4) under pressure against the backing roll.

In the full pressure operating position (FIG. 2) a web of paper **18** carrying an excess of coating composition **19** is passed to the nip **20** formed between the flexible blade illustrated at **73** in FIG. 8 and the resilient rubber-covered backing roll **16**; the excess of coating in the embodiment illustrated is applied to the web at nip **22** formed between the backing roll and applicator roll **23**. The applicator roll rotates in pan **24** in the direction indicated by the arrow and carries the coating composition **19** to the nip **22**, where the coating is applied to the web traveling on backing roll **16**. The excess of coating which is bladed off at nip **20** is returned to the system (FIG. 2).

The blade holder assembly

The assembly **10** includes a longitudinally extending carrier **25** (FIGS. 4 and 5) which is generally triangular in cross-sectional shape, hollow, and formed of relatively wide, longitudinally extending plates **26**, **27**, and **28** suitably welded together. Carrier **25** has end plates or panels **30** at its opposed ends, closing the structure and forming with the longitudinally extending plates a mount for the blade holder; the end plates **30** are of generally triangular shape but have rounded surfaces (FIG. 5) and project forwardly from the carrier (FIG. 2) toward the backing roll **16**. The carrier and panels are of greater length than the backing roll, and the panels extend beyond the backing roll ends an equal distance on each end of the roll. Forwardly also, welded to the junctures of plates **27**, **28** and extending longitudinally over an intermediate portion of the carrier length, is a holder tray **33** for the blade holder structure.

The end panels **30** each project well forwardly of the tray **33** (FIGS. 4 and 5) and terminate in an apex which is apertured to receive a bushing **35**. In the embodiment shown, each bushing **35** also receives a companion securing member or plate **36**. Each plate **36** in the described embodiment is also of generally triangular shape (FIG. 2) and each plate **36** overlies an end panel **30**. A nut and bolt assembly **34** retain the panel and plate. A pin in slot arrangement opposite the bushing **35** provides for relative pivotal movement between a companion securing plate **36** and end panel **30**; the slot **37** is formed arcuately through the plate **36**, and threaded pin **38** in the slot is engaged threadedly with a panel aperture **39** (FIG. 5) to retain the panel (and the blade holder assembly **10**) in adjusted angular position when the threaded pin is urged into engagement with the securing plate at the slot.

For relative movement of each plate and panel angularly, a manually operable adjustment designated at **40** is provided (FIGS. 2, 5 and 6). This adjustment includes a projecting lug **42** carried fixedly on panel **30** and having a V slot **43**. The lug **42** receives freely therethrough a threaded eyebolt **44**, the eye **45** of which is journaled on and retained by a shouldered and headed stud **47** carried by and threaded into a cooperating securing plate **36**. The eyebolt **44** projects forwardly (FIG. 2) toward the backing roll and receives a washer **48** having a V projection **49** which engages in the V slot **43** of a lug **42**; a nut **50**, threaded on the journaled eyebolt, when rotated causes travel of the panel **30**, lug, and eyebolt (in rotation) and, accordingly, relative angular movement of the panel and securing plate, while the washer remains engaged with the lug and provides for smooth rotation of the nut.

Each securing plate **36** is itself retained fixed against angular movement relative to the end panels; the parallel depending swinging support arms **51** of the suspension system inhibit such movement while otherwise providing for free movement of the assembly. As shown, two arms **51** having such suspension terminal eyes **52** are journaled on studs **53** and are suitably retained by conventional retaining rings **54**, **55** (FIG. 7). The bearing shoe **56** is free to move on the fixed universal or ball type bearing surface **57** which is itself retained positioned between side members **38** and cooperating bolt **59**.

Additionally, a fixed shouldered shaft projction **60** of a securing plate **36** receives a terminal eye **61** of a piston **62** of an air cylinder **63**. The terminal eye is similarly retained on projection **60** by conventional retaining rings.

A portion of the peripheral surface of each securing plate **36** is graduated in angular degrees (FIG. 6) to provide an angle scale **64**. An angle indicator **65** (FIG. 3) includes a pointer **66** and is fixedly retained by a panel **30** in cooperable relation with scale **64**. Thus, the carrier and end panels of the blade holder assembly which form the blade holder mounting may be adjusted in fixed known angular relationship with the securing plates of the assembly and, accordingly, also with the backing roll. The angle scale indicates the acute angle formed between a tangent to the backing roll and the blade holder.

In this preferred embodiment the blade holder is itself separate from the carrier. The holder includes a lower clamp element **67** (FIG. 8) formed with a depending key **68** which snugly engages in a longitudinally extending slot **69** of the tray **33**; an upper clamp element **70** is recessed to receive upstanding key **71** of the lower clamp element. Such clamp elements extend longitudinally with the tray **33** and are retained thereon by a plurality of threaded bolts **72** spaced longitudinally of the carrier; the blade **73** is held between the clamp elements **67**, **70** by suitable bolts **74** spaced longitudinally of the holder itself and suitably alternately with bolts **72** (FIG. 3). Thus, the blade and holder are readily pre-assembly for mounting on the tray. Blade **73** in the holder is positioned in abutment rearwardly with a machined, smoothed forward face of key **71**. The projection of the blade beyond the forward lip **75** of the holder is customarily about ¾ inch. When positioned, the blade forward edge **76** is in longitudinal alignment with the centers of the two bushings **35** of the blade holder assembly.

The suspension system

The suspension arms **51** are provided on each longitudinal end (FIGS. 1 and 2) of the blade holder assembly. As noted, terminal eyes **52** are articulated to studs on the securing plates. The suspension arms of each end preferably lie in parallel planes which extend perpendicularly to the backing roll face. Upwardly the arms or ties rods **51** are journaled on suitable bearings. The structural arrangment of the arm connections is shown most clearly in FIG. 7.

Referring again to FIG. 3, a hanger **80** of bifurcated structure extends downwardly, rearwardly and fixedly receives the fixed shafts **53** which extend through the bifurcated structure and support the suspension arms. The hanger projects laterally on each side of the bifurcation and is provided with vertically extending slots **82** through which bolts **84** are passed to secure the hanger **80** to the machine frame **85** in adjusted position. An angle iron **86** carried fixedly by frame **85** receives bolts **87** which are utilized in adjusting the vertical height of the hanger **80**.

As noted, the hanger **80** projects downwardly rearwardly; one bearing is horizontally spaced from and vertically below the other and thus a line passed through the centers of the bearings is at an angle with the horizontal. This angle is preferably equal to the angle formed by the radius R of the backing roll with the horizontal; this radius R is the radius which extends to the line of contact of the blade with the backing roll. The arms **51** are all of equal length and, accordingly, the rear-

ward arms on each side are articulated to the blade holder assembly in lower vertical positions than the forward arms. Such arrangement provides not only for free movement of the blade holder assembly but serves to urge the leading edge of the assembly upwardly in its travel to the backing roll and to provide for mechanical balance of the assembly itself.

The control system

Power is supplied to the arrangement through fluid pressure means; in the specific embodiment described air cylinders are utilized.

As shown in FIGS. 1–3 inclusive, brackets **90** project downwardly rearwardly from a lower portion of frame **85** on either end of the assembly and below the hangers **80**. Supported in the bracket (FIG. 2) is the air cylinder **63**, the support being such that the cylinder is free to move in any direction. Thus, rearwardly (FIG. 2) a universal joint **92** retains the cylinder supported in floating condition between the bracket top **93** and bottom **94**; forwardly (FIG. 2) the cylinder piston rod **62** terminates in the eye **61** which is received on the bearing of fixed shaft **60** (FIG. 5) projecting from a securing plate **36** (FIG. 4). To provide protection for the piston rod from corrosion due to coating spray or the like, each piston rod is preferably provided in operation with a suitable covering bellows (not shown). Since the bearing (FIG. 7) permits free movement of the piston rod at one end and the universal **92** permits free movement of the cylinder, the cylinder pressure may be exerted essentially radially of the backing roll. Thus, in the embodiment described, the pressure on the blade holder assembly may be essentially radially of the backing roll and the pressure exerted by a blade on a web passing on the backing roll is then in substantially direct relation to applied air pressure. Air cylinder inlet and outlet ports **98**, **100** are connected by flexible lines **102** to the source of air supply designated at **101** in FIG. 10A to provide for free cylinder pivotal movement horizontally and vertically.

The application of air pressure is controlled to prevent a misalignment in the advance of the assembly; to provide for a "kiss-contact" loading of the assembly initially and prior to full loading of the blade; and to provide a controlled preset load pressure.

Since the assembly is self-aligning, it is desirable to provide stops to insure of end to end alignment of the assembly while the blade is yet spaced from the roll. In the described embodiment pivoted stops designated generally at **104** (FIG. 2) are employed. The stop member **105** (FIG. 9) in the form of a roller is carried on a depending end portion **106** of a latch **107** which is pivoted on ears **108** carried fixedly by the casing of the air cylinder **63**. The latch extends transversely of the assembly length; intermediate the latch length and adjacent the stop member each latch is pivoted to a lever system.

The lever system includes for each end of the assembly a latch rod **111** having upper and lower rod portions **112**, **113** respectively, joined by a turnbuckle **114**; the latch rod **111** terminates at each end in an eye as at **115**, **116**, the eye including a suitable bearing. The cylinder brackets **90** are cut out to provide for passage of the latch rods. The terminal eye **115** of the latch rod (FIG. 9) is journaled on ears **117** of the latch **107** while the upper eye **116** is journaled on a latch arm **118**. Latch arm **118** is itself supported for rotational movement with a cross-shaft **119** on pillow blocks **120**; such blocks (FIG. 2) depend from hanger **80**.

As thus described, the lever system is similar at each end of the blade holder assembly. However, at the left hand end (FIG. 2) the shaft **119** has fixed thereto a leverage arm **121** which itself at one extremity is carried by yoke **122**; yoke **122** is carried by an extension **123** of a depending rod **124** of a spring return air operated diaphragm (FIG. 3). Actuation of the air valve **125** thus controls rotation of shaft **119** and the vertical position of latch rods **111** and stop members **105**.

In the embodiment described, spring pressure on the spring return air operated diaphragm **125** (FIG. 10B) retains the latch in locked position; upon application of air pressure, effected with a manually controlled pushbutton, the system is biased to locking position, as is described hereinafter.

FIGS. 10A and 10B schematically illustrate one arrangement of power supply and control mechanism useful in the operation of the device. The numeral **128** designates a load pushbutton and the numeral **129** a pushbutton for unloading the device. Operation of pushbutton **128** energizes solenoid **130** which permits supply air to pass two-way valve **131** and supply air to the diaphragm valves **133**, **134**. Air pressure on the latter valves repositions the valves from the "unload" position shown in the drawing (see FIG. 9 also) to place the air cylinders **63** in communication with the manually operable three-way valve **136**. This valve **136** is at this time in a condition suitably termed "Position," and so designated in the drawing, to permit air of relatively low pressure to pass the three-way valve from the pressure regulator **137** to which regulator the air is supplied from the main line **138**. Thus, air enters the air cylinders **63** at the upper end (FIG. 10A) and urges the piston forwardly to the stop members **105** previously described.

Spring pressure retains the stop members positioned downwardly (FIG. 9) until the plunger **140** is manually depressed. Then air is supplied through line **141** to the cylinder **125** to raise the stop members **105** to unlocking position. Plunger valve **140** normally opens to the atmosphere, removing air pressure from the spring biased diaphragm **142** and permitting the spring **143** to effect lowering of the stops. Accordingly, release of the manually operated plunger restores spring pressure, and the rollers lie on the housing of the bearing.

Freeing of the assembly from the stops by air application to cylinder **125** permits the assembly to advance until the blade is in "kiss-contact" with the roll.

With the blade so positioned, three-way valve **136** is shifted to load position and full pressure is applied through regulator **144** to the blade and to the backing roll **16** by the blade.

As the air pressure is applied to the upper end (FIG. 10A) of cylinder **63**, air is exhausted to the atmosphere through line **102**.

When it is desired to unload, it is simply necessary to press the "unload" pushbutton. This returns valve **131** to the position of the drawing, thereby returning valves **133** and **134** to the drawing (FIG. 10A) position also; air pressure is then applied to the bottom end (FIG. 10A) of the air cylinders **63** through regulator **146**, evacuating air from the upper end of the these cylinders and withdrawing the blade in a positive motion from the backing roll.

Spring pressure is returned to the stop member mechanism when plunger **140** is released; thus the stop members normally lie on the housing and the mechanism simply moves downwardly under spring pressure when the piston retracts, permitting the rollers to drop into place to lock the stop members.

The oscillating mechanism

Customarily, the paper web being coated is of slightly lesser width than the backing roll. Accordingly, wear of the smoothing device may cause a ridge to occur in the smoothing device at each paper edge if the device is continuously presented in one position to the web. To prevent such ridge formation, it is desirable to oscillate the smoothing device. The suspension system of the assembly and the air cylinder mountings provided for such oscillation of the assembly. Thus, the air cylinders, since they are free to move horizontally, apply the air pressure directionally, that is, generally radially, if desired, re-

gardless of the longitudinal position of the assembly; the pivotal connections of the suspension arms with the assembly permit free longitudinal movement slightly out of a true vertical plane while yet maintaining substantial planar perpendicularity to the longitudinal axis and face of the backing roll.

For the purpose of oscillating the assembly (FIG. 3) a shaft **150** is welded to the rightward securing member **36** or to the carrier itself; the outer extremity of this shaft carries a first universal joint having a yoke **152**, and a pin **154** which projects through the yoke arms. Journaled on the pin is a shaft **156** which itself has a second universal joint **157**, which shaft is driven in reciprocation as indicated by the arrow by any suitable eccentric. An assembly movement longitudinally of the backing roll (**144**") of about 1" is provided by the arrangement and is suitable for the purpose.

In the preferred mode of operation of the device thus described, the hanger **80** is adjusted in vertical position to so align the blade with the backing roll that the line of contact will be about 20° below the horizontal (FIG. 2). The adjustment is made by loosening bolts **84** and moving the hanger relative to the bolts in slots **82**. Such movement is effected while the hanger rests on the angle iron **86**, the adjustment being made by means of bolts **87**. With the hanger bolts locked in position, the arms depend almost vertically.

In the blade holder angle, which is the angle between a tangent to the backing roll and the blade holder, the line of contact is initially adjusted by means of the pin in slot arrangement designated at **37**, **38**, the carrier being tilted relative to the suspension arms by means of nut **50**.

Adjustment is made both for the hanger and for the blade holder carrier at each end of the device. The angle at which the blade will contact the tangent to the roll is indicated by the scale **64**. Suitably, this angle may be in usual operation about 55°.

The coating supply in pan **24** is an aqueous mineral coating composition having the following formulation:

	Parts by weight
Clay	70
Sodium hexametaphosphate	0.2
Calcium carbonate	30
Caustic	0.2
Starch	17
Calcium stearate	0.5

Water sufficient to make 58% solids.

The viscosity of such composition is approximately 40 poises, or about 40° Brookfield at 50° C. with a No. 6 spindle at 100 r.p.m. By way of specific example, the paper web **18** applied to the inlet side of nip **22** has a basis weight uncoated of about 55 pounds basis weight, being predicated upon 500 sheets 25" x 38". The web is fed to the backing roll at substantially backing roll rotational speed, that is, about 900 f.p.m., the backing roll itself having a diameter of approximately 30 inches. The applicator roll rotates at a less rotational speed than the backing roll and may similarly have a diameter of about 30 inches or may be as small as ⅓ the backing roll diameter. In practice, a suitable applicator roll speed is 300 surface f.p.m. when the backing roll speed is 900 f.p.m.

The blade (FIG. 1) is pressured to the backing roll at a pressure of about 3 pounds per lineal inch, although this way may vary between about 1½ pounds to 9 pounds per lineal inch.

Under the foregoing conditions, the total coat weight applied to the web may be about 12 pounds per side, it being understood that such webs are normally passed through a second and similar coater. Before passing to the second coater, the web is dried in conventional manner.

In a further embodiment of the device of invention (FIG. 11), the securing plates of the previous embodiment may be eliminated and the angle change mechanism may be effected from overhead. Thus, referring specifically to FIG. 11, the suspension arms **160** depend from a toothed segment **162** which meshes with a gear **164** and is itself pivoted at **166** to a machine frame portion **168**. The backing roll **170** is pressured by the blade **172** which is carried in the holder **174**. The holder **174** is itself mounted at **176** on a longitudinally extending (not shown) carrier similar to the apparatus described in connection with the previous embodiment. A fixed support **178** pivotally retains at **180** an air cylinder **182**. The piston **184** is radially aligned with the radius R of the backing roll. The mount **176** is supported as described in the previous arrangement on universal joints **186**, similar joints being provided also on sector **162**. In FIG. 11 only one side of the device is illustrated but it will be understood that the opposite sides of the mount **176** would be similarly supported for movement. In FIG. 11 force is applied directly radially.

Advantages of the described arrangements include the occupation of a minimum of space which is always a premium factor in the arrangement of paper machinery equipment. Additionally, the universal joints and suspension arms freely supporting the blade holder assembly permit self-adjustment of the assembly and accurate alignment with the backing roll even though the assembly weight may itself be not quite uniform over the assembly length.

The provision of the line of contact parallel with (FIG. 11) or coincident with the pivot axis of the blade holder provides for angle adjustment of the blade relative to the roll tangent while maintaining the line of contact fixed; such provides that the dwell time or peripheral length of the backing roll between the applicator nip and blade nip may be constant regardless of blade angle.

The device of FIG. 11 is advantageous with respect to angular adjustment since the blade angle may be changed while the apparatus is in operation; such may be desirable if the blade wears, for example. The overhead arrangement and the position of the pivot axis parallel with the line of blade contact and longitudinal axis of the backing roll and in a vertical plane, which includes the line of blade contact, facilitate this angular adjustment without machine stoppage.

Also, the apparatus of FIG. 11 provides for direct radial loading; the apparatus of FIGS. 1 to 3 provides loading which may be very nearly radial; such loading provides that the blade pressure may be very nearly constant despite normal blade wear and small blade angle change.

It is to be noted that the hollow nut and bolt assemblies **34** (FIG. 4) at each end of the device is adapted to receive a small diameter flexible rod which, as already noted hereinbefore, is carried on an edge of a flexible plate element in known manner and may serve as the flexible doctor blade in place of the blade specifically described hereinbefore.

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. In combination, in a coating device for paper webs and the like, a backing roll mounted to rotate on its longitudinal axis; a longitudinally extending doctor blade holder assembly extending lengthwise with and fronting on the backing roll; and means mounting the blade holder assembly for movement toward and away from the backing roll in a direction transversely to the said longitudinal axis, said means comprising parallel depending swinging support arms, two adjacent each longitudinal end of the assembly, the arms of each end being journaled to the

said end and supporting the assembly for swinging movement in said transverse direction.

2. In combination, in a coating device for paper webs and the like, a backing roll mounted to rotate on its longitudinal axis; a longitudinally extending doctor blade holder assembly extending lengthwise with and fronting on the backing roll periphery; means mounting the blade holder assembly for movement toward and away from the backing roll in a direction transverse to the said longitudinal axis, said means comprising parallel depending swinging support arms, two adjacent each longitudinal end of the assembly, the arms of each end being journaled to the said end and supporting the assembly for free swinging movement in said transverse direction; and pivot means defining a pivot axis for the blade holder assembly, said pivot axis extending parallel with said longitudinal axis and lying in a vertical plane which intercepts the backing roll periphery and the blade holder assembly in the forward position of the said assembly in a common line.

3. In combination, in a coating device for paper webs and the like, a backing roll mounted to rotate on its longitudinal axis; a longitudinally extending doctor blade holder assembly extending lengthwise with and fronting on the backing roll and including a blade holder and a flexible blade; means mounting the blade holder assembly for movement toward and away from the backing roll in a direction transversely to the said longitudinal axis, said means comprising parallel, depending swinging support arms freely journaled on each longitudinal end of the assembly, said blade and backing roll in the advanced position of the assembly defining a line of blade contact with the backing roll; and pivot means defining a pivot axis for the said assembly, said pivot axis being parallel with said line of blade contact and with the said longitudinal backing roll axis, said pivot axis and line of blade contact lying in a common vertical plane.

4. The combination, as claimed in claim 3, and in which the said pivot axis and the said line of blade contact are coincident.

5. In combination, in a coating device for paper webs and the like, a backing roll mounted to rotate on its longitudinal axis; a longitudinally extending doctor blade holder assembly having fixed end panels, said assembly extending lengthwise with and fronting on the backing roll and including a blade holder; means mounting the blade holder pivotally and for movement toward and away from the backing roll in a direction transversely to the said longitudinal axis, said means comprising securing members of the assembly carried by and arranged to overlie the said end panels and also extending longitudinally beyond the backing roll extremities, pivot means retaining the panel and securing member of each end together in cooperable relation, said pivot means also lying beyond the back roll extremities at each assembly end and being disposed toward the backing roll axis, a pin in slot arrangement for pivotal movement of each cooperable panel and securing member relative to each other, said pin in slot arrangement lying opposite said pivot means, means associated with each cooperable securing member and end panel for rotating said assembly to different angular positions and means for locking each cooperable panel and securing plate in adjusted angular position; and parallel, depending, swinging support arms journaled on each securing member being articulated to the securing member retaining said assembly suspended and also restraining a securing member against rotation.

6. In combination, in a coating device for paper webs and the like, a backing roll mounted to rotate on its own longitudinal axis; support means above the backing roll; a longitudinally extending doctor blade holder assembly extending lengthwise with and fronting on the backing roll and suspended for movement toward and away from the backing roll in a direction transversely to the longitudinal axis of the backing roll; parallel, swinging support arms depending from said support means, two on each longitudinal end of the said assembly articulated to the assembly supporting the assembly in suspended position; and means for urging said suspended assembly in the direction of the backing roll to maintain the assembly in engagement with the backing roll under transverse stress, said latter means comprising fluid pressure means journaled to said assembly for free movement longitudinally and transversely of said backing roll.

7. In combination, in a coating device for paper webs and the like, a backing roll mounted to rotate on its own longitudinal axis; support means above the backing roll; a longitudinally extending doctor blade holder assembly extending lengthwise with and fronting on the backing roll and suspended for movement toward and away from the backing roll in a direction transversely to the longitudinal axis of the backing roll; parallel, swinging support arms depending from said support means, two on each longitudinal end of the said assembly articulated to the assembly supporting the assembly in suspended position; and means for urging said suspended assembly in the direction of the backing roll to maintain the assembly in engagement with the backing roll under transverse stress, said latter means comprising a pair of pivots lying in an extension of the radius of the backing roll on each end of the assembly, and a fluid pressure piston-cylinder combination journaled between each pair of said pivots, the pivot of each end which is remote from the backing roll restraining the said piston-cylinder combination from movement as a unit.

8. In combination, in a coating device for paper webs and the like, a backing roll mounted to rotate on its own longitudinal axis; support means above the back roll; a longitudinally extending doctor blade holder assembly extending lengthwise with and fronting on said backing roll suspended for movement toward and away from the said backing roll in a direction transverse to the longitudinal axis of the backing roll; parallel, swinging support arms depending from said support means, two on each longitudinal end of the said assembly articulated to the assembly supporting the assembly in suspended condition; means on each end of the assembly for urging the suspended assembly in the direction of the backing roll to maintain the assembly in engagement with the backing roll under transverse stress, said means comprising fluid pressure cylinders having their pistons journaled on said assembly, and a shiftable, positionable stop member, one in alignment with each piston, lineally aligned abutments of said assembly in the form of a bearing housing for each piston adapted to coact with each piston to assure stopping of said assembly at a predetermined setting in the advance of the assembly to the said backing roll; and means for freeing said stop members simultaneously from said abutments whereby the freed assembly is aligned end to end for movement to the backing roll.

9. A combination as claimed in claim 8 and in which the means for freeing the stop members include a rocker lever pivoted on the frame of the device adjacent each end of the assembly, a support link pivoted on each rocker lever, a swing link pivoted to the other extremity of each support link, a cross-rod carrying the swing links, and means for rotating said cross-rod.

10. Apparatus for coating paper in web form comprising a rotatable roll on which a said web carrying an excess of coating composition travels, a flexible doctor for removing said excess of coating composition from said web, said doctor engaging said web on said backing roll along a line of contact, angle adjustment mechanism including a blade holder for varying the angle at which said flexible doctor contacts said web on said backing roll,

vertically extending suspension means supporting said blade holder for movement toward and away from the said backing roll, segment gear means formed as part of and supporting the suspension means, means including gearing meshed with said segment gear means to move said suspension means to a selected angular position, pivot means supporting said segment gear means and defining a pivot axis about which said segment gear means pivots, said pivot axis extending parallel with and lying in the same vertical plane as said line of contact, a pair of pivots in alignment with an extension of the radius of the backing roll through said line of contact, one pair on each end of said blade holder, and a fluid pressure cylinder-piston means supported by each pair of said pivots for urging the blade holder and suspension means toward and away from the circumferential surface of said backing roll.

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