May 27, 1941. L. PARKINSON 2,243,604

DEVICE FOR APPLYING FILMS OF COATING MATERIAL TO PAPER WEBS

Filed May 5, 1939 4 Sheets-Sheet 1

Fig. 1.

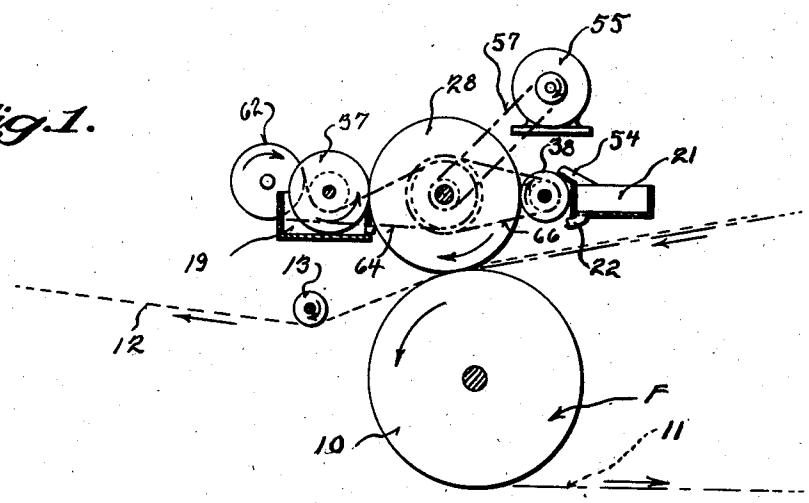
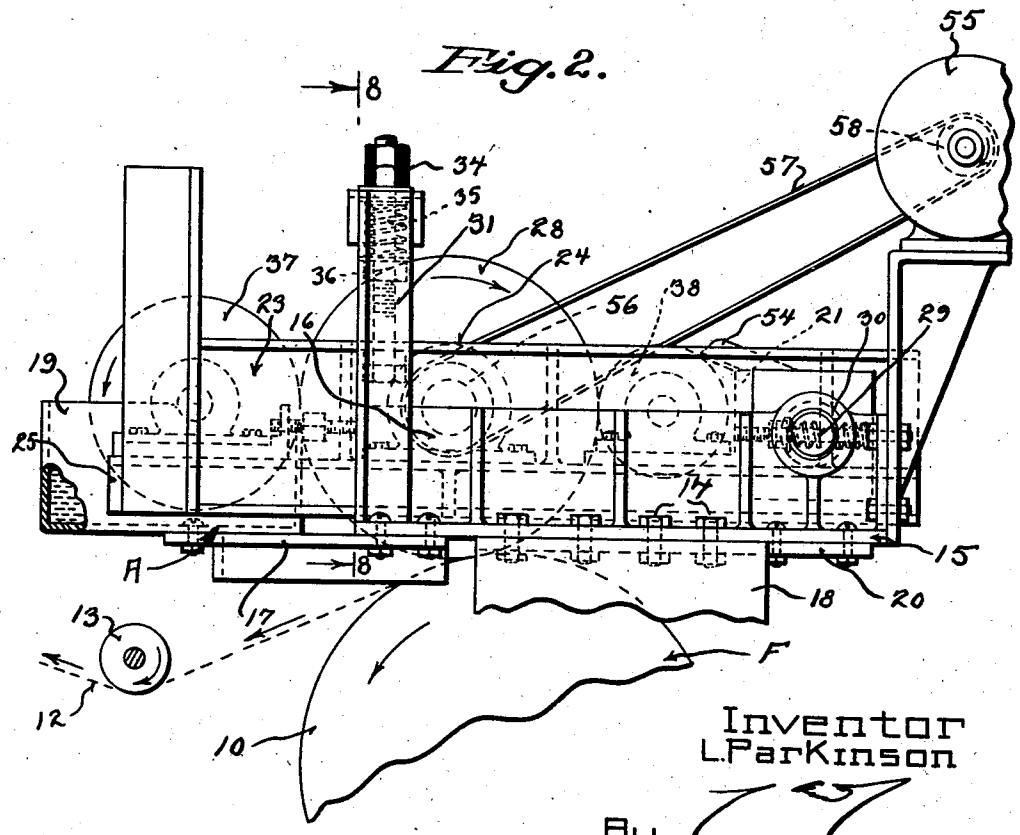


Fig. 2.



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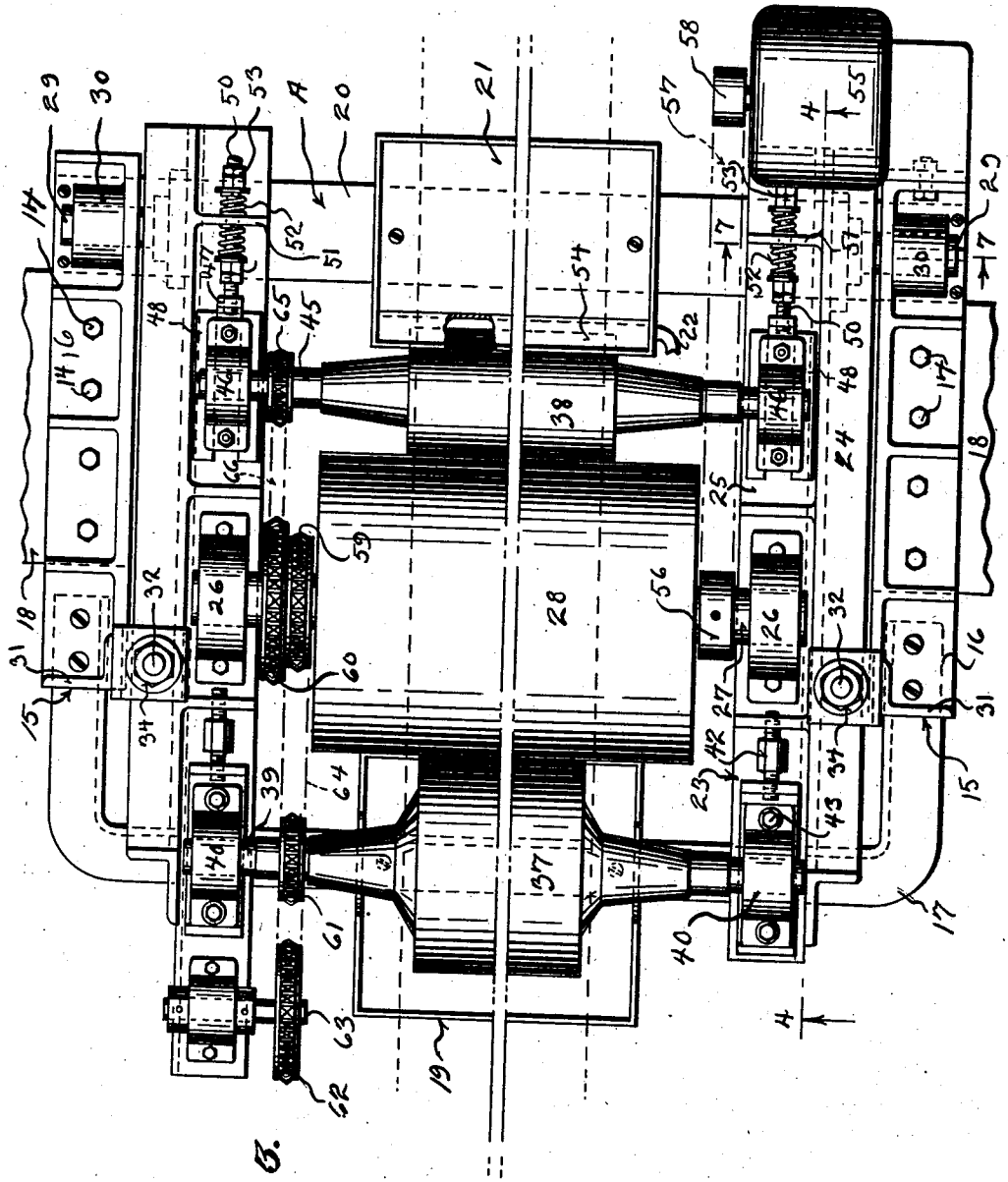

Fig. 6.

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Fig. 4.

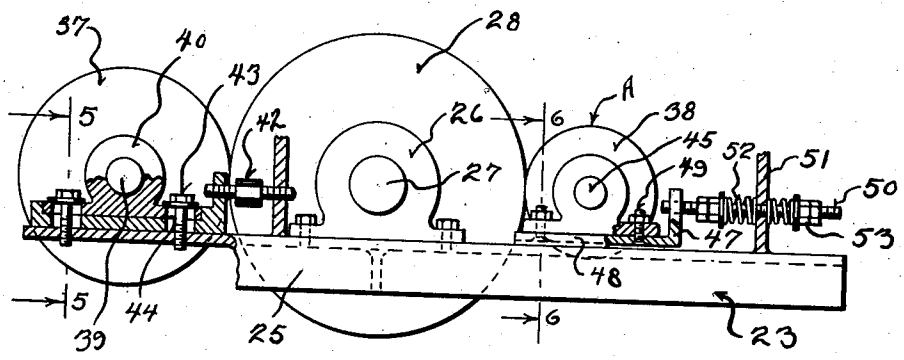


Fig. 5.

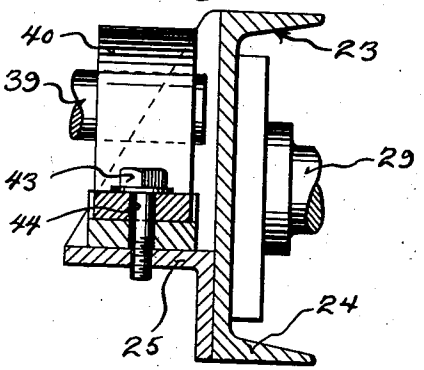


Fig. 6.

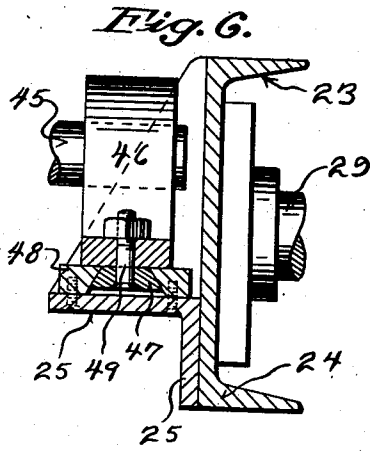
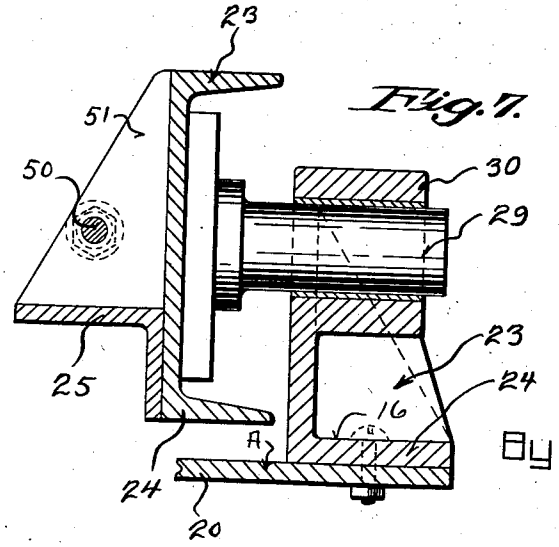


Fig. 7.



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DEVICE FOR APPLYING FILMS OF COATING MATERIAL TO PAPER WEBS

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Fig. 8.

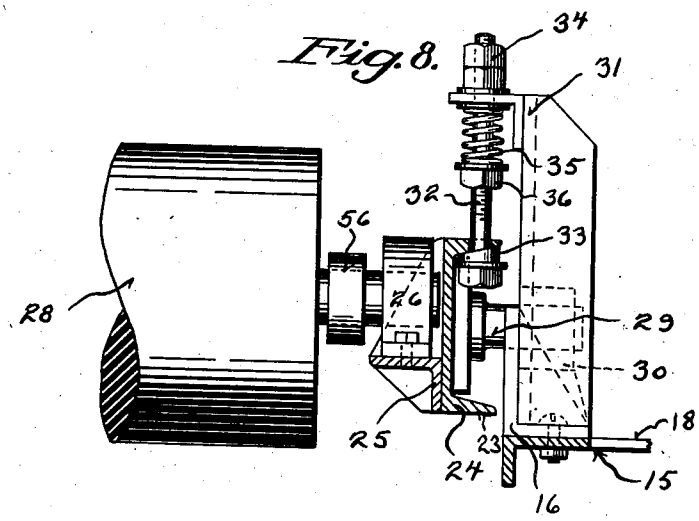
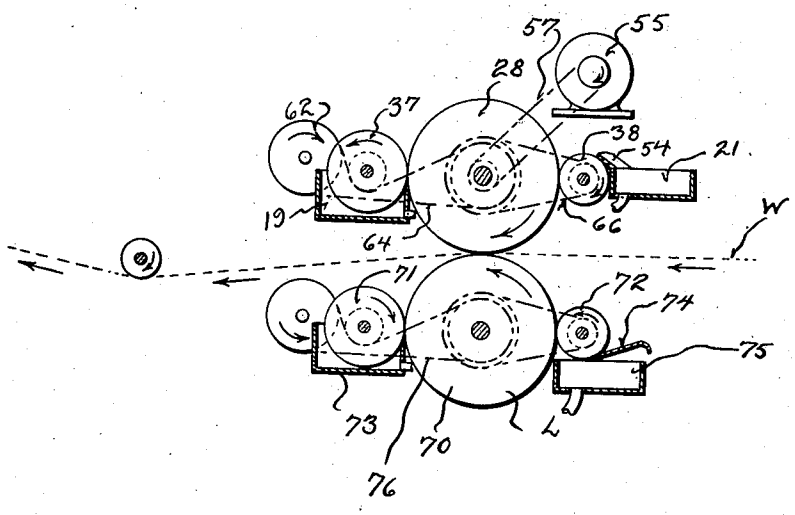


Fig. 9.



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Patented May 27, 1941 2,243,604

UNITED STATES PATENT OFFICE

2,243,604

DEVICE FOR APPLYING FILMS OF COATING MATERIAL TO PAPER WEBS

Leonard Parkinson, Park Falls, Wis.

Application May 5, 1939, Serial No. 271,976

8 Claims. (Cl. 91—50)

This invention appertains to a novel mechanism for applying a desired coating to one or both sides of a paper web as the same travels through or leaves a Fourdrinier machine or press.

One of the primary objects of the invention is to provide means for applying in a fluid condition to either side or both sides of the paper web at the couch roll or any press of the paper machine, mineral coating materials or pigments, such as clay, gypsum, talc, chalk, or titanium dioxide; adhesives or binding agents, such as starch, casein, silicates, or gums; pigment colors, or analine dyestuffs; plastics or cellulose films; waterproofing agents, such as wax; either singly or in combination as a color, slip or slurry, for the purpose of improving the surface, texture, finish, color, opacity, printing quality, or any other desirable feature that may be obtained by the addition of a coating.

Another object of my invention is the provision of novel means for insuring the applying of an even film of a coating material to the paper web, which consists in the use of a smoothing and leveling roll for engaging the riding roll, which is in constant contact with the paper sheet or web, with a pick-up roll for applying the coating to the riding roll.

Another salient object of my invention is the provision of means for removing excess coating material from the leveling and smoothing roll by the use of a scraper or doctor blade engaging said roll, means being employed for catching and returning the excess coating from the leveling and smoothing roll to the color pan or reservoir.

A further object of my invention is the provision of means for controlling the amount of the coating material applied to the paper web, which consists in the provision of means for adjusting the position or contact of the pick-up roll relative to the riding roll, and the position of the leveling and smoothing roll relative to the riding roll.

A further important object of my invention is to provide novel means for driving the rolls, whereby the same will be driven in a correct manner and at the proper speed and direction relative to one another.

A still further object of my invention is to provide novel means for adjustably mounting all of the rolls on a frame and for mounting the frame in a novel manner relative to the paper machine, so that the position of the riding roll relative to the couch roll or paper web can be readily controlled.

With these and other objects in view, the invention consists in the novel construction, arrangement, and formation of parts, as will be hereinafter more specifically described, claimed, and illustrated in the accompanying drawings, in which drawings:

Figure 1 is a diagrammatic view illustrating the arrangement of my novel coating applicator relative to the paper web and couch roll of a Fourdrinier machine.

Figure 2 is a side elevational view of my improved applicator unit, showing the same arranged above the couch roll of a Fourdrinier machine.

Figure 3 is a top plan view of my improved applicator.

Figure 4 is a longitudinal sectional view taken substantially on the line 4—4 of Figure 3, looking in the direction of the arrows, illustrating the means for adjustably positioning the pick-up roll and the leveling and smoothing roll relative to the riding roll.

Figure 5 is an enlarged, fragmentary, transverse, sectional view taken on the line 5—5 of Figure 4, looking in the direction of the arrows, illustrating the means for holding the bearing for the pick-up roll in an adjusted position.

Figure 6 is a view similar to Figure 5, but taken on the line 6—6 of Figure 4, looking in the direction of the arrows, illustrating the means for holding the bearing for the pick-up roll in an adjusted position.

Figure 7 is an enlarged, fragmentary, transverse, sectional view taken on the line 7—7 of Figure 3, looking in the direction of the arrows, illustrating the means for rockably mounting the carriage for supporting the various rolls.

Figure 8 is an enlarged, transverse, sectional view taken on the line 8—8 of Figure 2, looking in the direction of the arrows, illustrating the means for adjustably and resiliently holding the carriage in a depressed position, so that the riding roll will engage the paper web and couch roll with the desired pressure.

Figure 9 is a diagrammatic view illustrating the means for applying a coating to both sides of a paper web simultaneously.

Referring to the drawings in detail, wherein similar reference characters designate corresponding parts throughout the several views, the letter A generally indicates my novel coating applicator, and the same is adapted to be applied as a unit at the desired point on a Fourdrinier machine or any other appropriate paper machine. The unit is preferably arranged at the rear end

of a Fourdrinier machine F directly above the couch roll 10 thereof.

As illustrated, the Fourdrinier wire 11 travels over the couch roll, and the paper web 12 leaves the Fourdrinier machine at the couch roll and is guided over a paper-carrying roll 13. As the Fourdrinier machine F forms no part of the present invention, only the couch roll 10 and the Fourdrinier wire 11 have been illustrated.

Referring more particularly to my novel coating applicator A, the same embodies a rigid supporting frame 15, which can include longitudinally extending, spaced, parallel beams 16, and these beams are adapted to be bolted, as at 14, to an appropriate part 18 of a Fourdrinier or other paper machine. One end of the beams 16 has secured thereto a U-shaped supporting bar 17, and this bar carries the color pan 19. While I have referred to the pan 19 as a "color pan," it is to be understood that this pan can receive any desired type of coating material, as specifically set forth in the objects of the invention. The opposite ends of the bar 16 are connected by a cross-strap 20, and this cross-strap 20, in turn, receives and supports a pan 21 for receiving excess material, as will be later set forth.

As heretofore stated, one of the features of the invention is the provision of means for removing excess material and for returning the excess material to the pan or reservoir 19. Hence, the pan 21 is connected to the pan 19 by means of a return pipe 22.

Mounted within the supporting frame 15 is the carriage 23 for carrying the various operating parts of my novel coating applicator. The carriage 23 includes a pair of spaced, parallel, longitudinally extending channel beams 24, and the inner faces of these beams have bolted or welded thereto angle irons 25 or similar structural steel members.

Rigidly secured to the angle irons 25 intermediate their ends is a pair of transversely alined bearings 26, which rotatably receive the ends of a shaft 27 of the riding roll 28. This riding roll 28 is adapted to engage the paper web preferably directly above the couch roll 10.

In order that the riding roll 28 will engage the paper web with the desired and appropriate pressure, the channel beams 24 carry at their inner ends outwardly extending, transversely alined stub shafts 29, and these stub shafts are rockably mounted in bearings 30 mounted upon the beams 16 of the frame 15. The outer ends of the beams 16 of the frame 15 carry brackets 31, through which extend tension bolts 32. These tension bolts loosely extend through the upper flanges of the channel beams 24, and the bolts can have placed thereon wedge-shaped washers 33, which washers can be interposed between the heads of the bolts and the inner faces of the upper flanges of the channel beams 24. The tension bolts 32 extend through the brackets 31, and the bolts can be raised and lowered by means of nuts 34 threaded on the upper ends thereof. Expansion springs 35 are coiled about the bolts and engage the brackets 31 and adjusting nuts 36 on the bolts. The carriage 23, under the weight of the riding roll 28 and other operating parts of the coating applicator, tends to swing downwardly on the stub shafts 29, and the bolts 32, with the springs, form a resilient support for the carriage adjacent the outer ends thereof.

Obviously, by adjusting the nuts 34 and 36, the position of the roll 28 relative to the paper web and the pressure of the engagement of the riding roll with the paper web can be regulated.

Adjustably mounted on the carriage on opposite sides of the riding roll 28 are the pick-up roll 37 and the smoothing and leveling roll 38. As will be noted, the pick-up roll 37 rotates in the reservoir tank 19 and is of a less diameter than the riding roll 28, but of a greater diameter than the smoothing and leveling roll 38. The smoothing and leveling roll 38 is arranged between the riding roll 28 and the pan 21.

One of the important features of the device is that the centers of the three rolls are on a common horizontal axis, and their faces are in more or less intimate contact with each other through adjustable bearings, as will be later set forth. The faces of the rolls 37 and 38 may be of hard rubber or smooth polished metal, and the face of the riding roll 28 is preferably formed of medium to soft rubber.

The ends of the shaft 39 for the pick-up roll 37 are rotatably mounted in bearing blocks 40, and these blocks can be shifted back and forth on the carriage through the medium of turnbuckles 42, and these turnbuckles engage threaded bores formed in the carriers for the bearing blocks 40 and stationary webs on the angle beams 25.

Thus, by turning the members 42, the roll 37 can be shifted toward and away from the riding roll, and after the position of the pick-up roll 37 relative to the riding roll 28 has been set, the bearings can be held against movement by bolts 43, which extend through slots 44 formed in the bearing blocks 40 and their carriers and into the angle bars 25.

The ends of the shaft 45 of the leveling and smoothing roll 38 are rotatably mounted in bearing blocks 46, and these bearing blocks 46 are mounted upon slide blocks 47. The slide blocks 47 can be guided in their sliding movement by guide rails 48 securely fastened to the angle bars 25. If desired, the longitudinal edges of the slide blocks 47 can be beveled, and the mating faces of the guide rails can be similarly beveled. The bearing blocks 46 are connected with their slide blocks 47 through the medium of bolts 49. Fastened to the slide blocks 47 are adjustable tension rods 50, and these rods extend through webs 51 on the angle bars 25. Tension springs 52 are placed upon the tension rods 50 on opposite sides of the webs 51, and adjusting nuts 53 are threaded on the rods 50 engaging the opposite ends of the tension springs 52, and, obviously, by turning the nuts 53, the position of the roll 38 relative to the roll 28 can be varied.

From the description so far, it can be seen that the carriage 23 swings toward the paper web, so that the riding roll 28 will engage the paper web with the desired pressure. The pick-up roll 37 rotating in the pan 19 will carry the color or other coating material from the pan to the riding roll 28, and the roll 37 tends to place a film of the coating material over said riding roll. The roll 38 tends to smooth and level the coating liquid on the roll, so that an even film will be spread on said riding roll, and, hence, the riding roll will apply an even thin film of the coating material to the paper web.

By referring to Figures 1 and 3, it will be seen that the smoothing and leveling roll 38 rotates in the same direction as the riding roll, so that the adjacent surfaces will move in reverse directions. This gives the desired smoothing and leveling action.

The tank 21 carries a scraper or doctor blade 54, which engages the roll 38, and, hence, excess coating material is removed from the roll 38 and is delivered to the pan 21. This excess material, as stated, is returned to the color or reservoir pan 19.

While the rolls can be rotated in any appropriate manner, I prefer to drive the same in the manner illustrated in Figures 1 and 3, but it is to be understood, however, that I do not limit myself to such drive, as, obviously, the riding roll 28 can be driven from the couch roll 10 by its frictional contact therewith.

My driving means includes an electric motor 55 of the desired rating, and the riding roll 28 has keyed or otherwise secured to its shaft, a pulley 56, around which is trained a pulley belt 57. This pulley belt is, in turn, trained about a pulley wheel 58 keyed or otherwise secured to the armature shaft of the motor. The opposite end of the shaft 27 of the pick-up roll 28 from the pulley wheel 56 has keyed or otherwise secured thereto a pair of sprocket wheels 59 and 60. The sprocket wheel 59 is in alinement with a relatively small sprocket wheel 61 keyed to the shaft 39 of the pick-up roll 37, and with an idle sprocket wheel 62 carried by a stub shaft 63 mounted upon one of the angle bars 25. A sprocket chain 64 is trained about the sprocket wheel 59 and extends over the sprocket wheel 62, and one run of the chain is trained under the sprocket wheel 61 of the riding roll 37. Thus, the roll 37 also rotates in a direction opposite to the riding roll 28, and picks up the material in the pan 19 in an efficient manner and carries the same to said riding roll.

The sprocket wheel 60 is in longitudinal alinement with a relatively small sprocket wheel 65 (see Figure 3), and a sprocket chain 66 connects the sprocket wheels 60 and 65 together for driving the smoothing and leveling roll 38 in a reverse direction from the roll 28.

In Figures 1 to 8 inclusive, I have shown my novel device utilized for applying a film of the desired coating material to one side only of a paper web. In Figure 9, I have illustrated means for applying a film of a desired coating material to both sides of a paper web simultaneously. In this figure, the paper web is indicated by the reference character W, and the upper applicator is of exactly the same type as shown and described in Figures 1 to 8 inclusive. The coating applicator for the lower face of the paper web W is indicated by the letter L, and is also of exactly the same character as the applicator shown and described in Figures 1 to 8 inclusive. Hence, the lower applicator L includes a riding roll 70 for engaging the lower face of the paper web W directly below the point of engagement of the upper riding roll with the upper face of the paper web. The opposite sides of the riding roll 70 are engaged respectively by the pick-up roll 71 and the smoothing and leveling roll 72. The pick-up roll carries the coating material to the riding roll 70 from a reservoir pan 73, and excess material is taken off the smoothing and leveling roll 72 by a doctor blade 74, which is carried by a pan 75. The lower roll 70 is adapted to be driven by its frictional contact with the paper web W and the upper riding roll.

The pick-up roll 71 is driven from the riding roll 70 by the medium of a sprocket chain 76, which chain is driven by a sprocket wheel from the riding roll 70. One run of the sprocket chain 76 extends under a sprocket wheel carried by the pick-up roll 71, and this sprocket chain is trained over an idle sprocket wheel. The smoothing and leveling roll 72 is driven directly from the riding roll 70 through the medium of a sprocket chain, which is trained over a sprocket wheel carried by the roll 70 and a sprocket wheel carried by the roll 72.

From the foregoing description it can be seen that I have provided a novel and simple device for applying a film of a desired coating material to a paper web, as the same leaves the paper machine.

Changes in details may be made without departing from the spirit or the scope of my invention, but what I claim as new is:

1. In a device for applying a film of coating material to an endless paper web, comprising a riding roll for engaging the paper web, a reservoir pan for the coating material, a pick-up roll rotating in said pan and engaging one side of the riding roll, a smoothing and leveling roll engaging the opposite side of the riding roll and rotating in the same direction as said riding roll, an excess coating material-receiving pan, a doctor blade carried by the last-mentioned pan for engaging the smoothing and leveling roll for taking excess material off said smoothing and leveling roll, and conveying the same to said last-mentioned pan, and means for conducting excess material collected from said last-mentioned pan to the reservoir pan.

2. A device for applying a coating of material directly to a web of material comprising, a swinging carriage, a riding roll on said carriage movable toward and away from the web and normally engaging said web, pick-up roll on the carriage for applying coating material to the riding roll, a smoothing and leveling roll on the carriage, and means for adjusting the pick-up roll and the smoothing and leveling roll relative to the riding roll.

3. A device for applying a coating to a web of material comprising, a rigidly supported frame, a carriage rockably connected at its inner end to the supporting frame, means adjustably and resiliently supporting the outer end of the carriage from the supporting frame, a riding roll on the carriage, a pick-up roll for the coating material on the carriage engaging the riding roll, and a smoothing and leveling roll on the carriage engaging the riding roll.

4. A device for applying a coating to a web of material comprising, a rigidly supported frame, a carriage rockably connected at its inner end to the supporting frame, means adjustably and resiliently supporting the outer end of the carriage from the supporting frame, a riding roll on the carriage, a pick-up roll for the coating material on the carriage engaging the riding roll, and a smoothing and leveling roll on the carriage engaging the riding roll, the pick-up roll and the smoothing and leveling roll being adjustably mounted on the carriage for varying the positions thereof relative to the riding roll.

5. A unitary device for connection with a paper machine for applying a coating of desired material directly to the paper web of the paper machine comprising, a supporting frame adapted to be rigidly connected to the paper machine, a carriage rockably mounted on the supporting frame, means adjustably and resiliently supporting the outer end of the carriage, a coating riding roll rotatably carried by the carriage, a pick-up roll for the coating material

mounted upon the carriage and engaging one side of the applying roll, and a smoothing and leveling roll engaging the opposite side of the riding roll and mounted upon said carriage.

6. A unitary device for connection with a paper machine for applying a coating of desired material directly to the paper web of the paper machine comprising, a supporting frame adapted to be rigidly connected to the paper machine, a carriage rockably mounted on the supporting frame, means adjustably and resiliently supporting the outer end of the carriage, a coating riding roll rotatably carried by the carriage, a pick-up roll for the coating material mounted upon the carriage and engaging one side of the riding roll, and a smoothing and leveling roll engaging the opposite side of the riding roll and mounted upon said carriage, said pick-up roll and said smoothing and leveling roll being adjustable on the carriage relative to the riding roll.

7. A unitary device for connection with a paper machine for applying a coating of desired material to the paper web of the paper machine comprising, a supporting frame rigidly connected with said machine, a reservoir tank for coating material secured to the frame, an excess material-receiving pan secured to the frame, a carriage rockably mounted at its inner end on the frame, means adjustably and resiliently supporting the outer end of the carriage, a riding roll rotatably mounted on the carriage for engaging the paper web, a pick-up roll rotatably mounted on the carriage and mounted in the reservoir tank and engaging one side of the riding roll, a smoothing and leveling roll rotatably carried by the carriage and engaging the opposite side of the riding roll, a doctor blade carried by the excess material-receiving pan engaging the smoothing and leveling roll, and means for conducting material from the excess material-receiving pan to the reservoir tank.

8. A unitary device for connection with a paper machine for applying a film of coating to the paper web leaving the machine comprising, a frame rigidly connected to the machine, a carriage rockably supported at its inner end on the frame, means adjustably and resiliently supporting the outer end of the carriage, a riding roll rotatably carried by the carriage for engaging the paper web, a pick-up roll for the coating material rotatably mounted on the carriage engaging one side of the riding roll, a smoothing and leveling roll rotatably mounted on the carriage engaging the other side of the riding roll, a motor on said frame, means for driving the riding roll from the motor, and means for rotating the pick-up roll in an opposite direction from the riding roll and the smoothing and leveling roll in the same direction as the riding roll.

LEONARD PARKINSON.