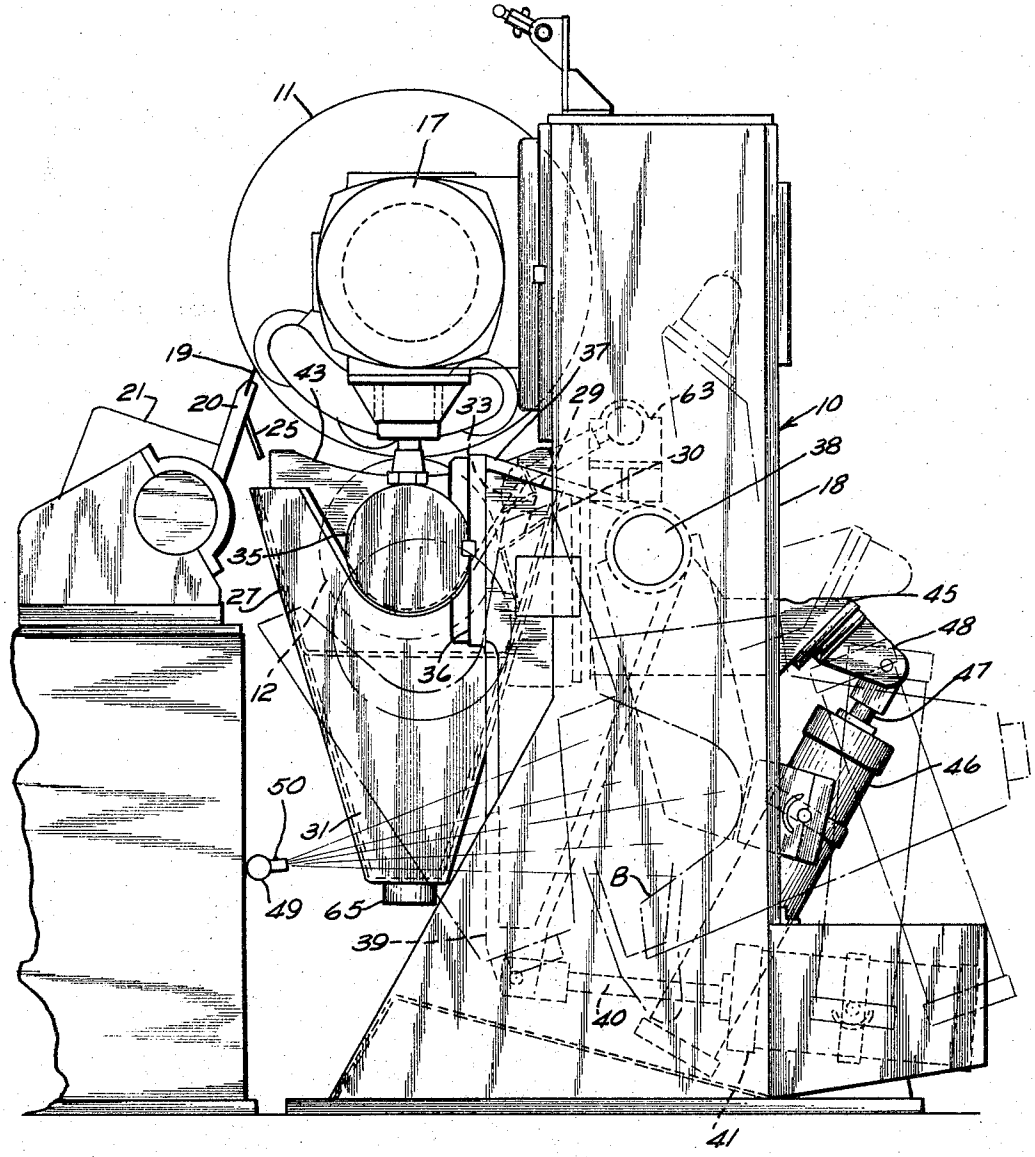
Nov. 21, 1967 R. K. BLACKBURN ET AL 3,353,516

FLOODED NIP COATER PAN

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FIG. 1



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FIG. 2

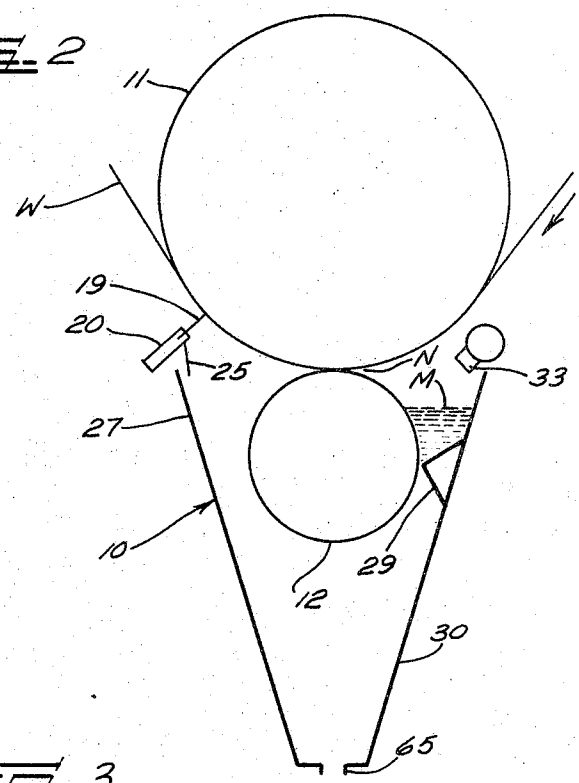
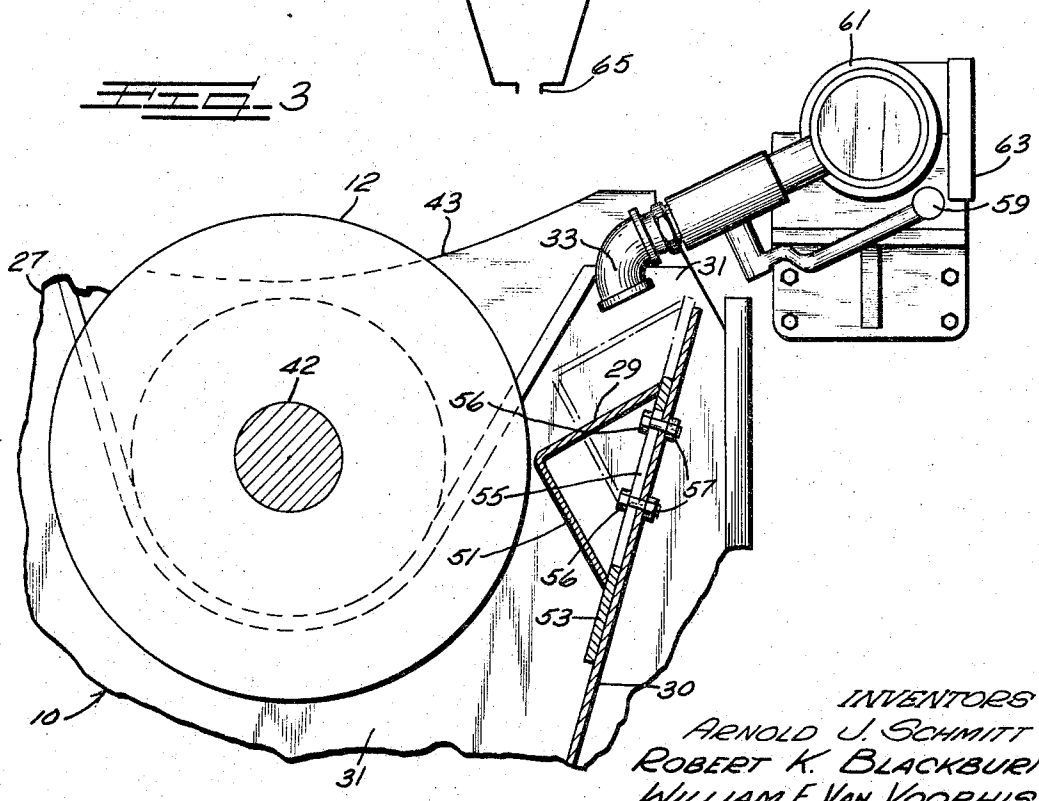


FIG. 3



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FLOODED NIP COATER PAN

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8 Claims. (Cl. 118—249)

This invention relates to improvements in devices for coating travelling webs of paper and more particularly relates to an improved form of coater of the flooded nip-type.

The present invention has as its principal objects to provide a novel and improved form of flooded nip coater arranged with a view toward maintaining a minimum volume of coating material in the system.

Another object of the invention is to provide an improved coating device for coating travelling webs of paper by the use of an applicator roll, coating the paper as it travels along a backing roll, so arranged as to reduce the volume of coating material in the system and thereby avoid coating waste during a break in the web or down time of the coater.

Still another object of the invention is to provide a novel coating device for coating travelling webs of paper and the like, operating on the flooded nip coating principle in coating a paper web as it travels in the nip between an applicator roll and backing roll, utilizing a weir to form a puddle of coating material on the applicator roll and thereby reducing the volume of coating material in the system required to coat the web and also reducing the area of coating material exposed to air with the resultant reduction in drying of the coating material in the puddle and attainment of a better quality of coating.

Another object of the invention is to improve upon the puddle coaters heretofore in use for coating a travelling web of paper in which a weir extending across the coating pan is provided to form a puddle of coating material on the incoming side of the applicator roll, making it unnecessary to provide end seals on the applicator rolls heretofore required and adjustable with respect to the applicator roll to simplify the control of the depth of the puddle of coating material with the resultant increase in efficiency and compactness of the coater.

Still another object of the invention is to improve upon the puddle coaters for coating travelling webs of paper applying coating material to the web by an applicator roll, by providing a weir extending across the coating pan and damming up the coating material to form a puddle along the uprunning side of the applicator roll with the resultant reduction in the quantity of coating material required in the puddle to coat the applicator roll and a simplification in the cleanup of the coating pan.

A still further object of the invention is to improve upon the flooded nip coaters heretofore in use in which a paper web travels about a backing roll and is coated as it passes in the nip between an applicator roll and a backing roll, in which the puddle of coating material for coating the paper web as it passes in the nip between the applicator roll and the backing roll is reduced in size by the use of the weir extending across the coating pan and damming up the coating material sprayed thereto, and in which the coating pan is mounted for withdrawal from the applicator roll and a simplified system of cleaning sprays is provided for readily cleaning the weir and coating pan in a relatively short period of time, compared with the coaters heretofore in use.

These and other objects of the invention will appear from time to time as the following specification proceeds

and with reference to the accompanying drawings wherein:

FIGURE 1 is a view in side elevation of a coating apparatus constructed in accordance with the principles of the present invention;

FIGURE 2 is a diagrammatic view diagrammatically illustrating the coating system of the present invention; and

FIGURE 3 is an enlarged detailed view showing the weir in vertical section and showing the adjustable mounting of the weir to the back wall of the coating pan.

In the embodiment of the invention illustrated in the drawings, **10** generally designates a coating device, which comprises a backing roll or drum **11**, which is partially wrapped by a travelling sheet or web of paper W, and an applicator roll **12** picking up coating material M and applying it to the sheet W partially wrapped about the backing roll **11**, as the sheet passes through a coating nip N.

The backing roll **11** is journalled at its ends in bearing supports **17** mounted on and extending from laterally spaced posts or columns **18** of a frame structure, which forms a supporting means for the coating structure. Spaced circumferentially from the outgoing side of the nip **10** between the rolls **11** and **12**, is a doctor blade **19** mounted on a blade support **20** extending from a doctor back **21**. The doctor back may be adjusted in a conventional manner to vary the pressure of the blade on the travelling web W and to vary the angle of the blade with respect to the web. A drip plate **25** extends along and downwardly of the blade support **20** for substantially the length thereof, for returning coating material to a coating pan **27**. The backing roll **11** is rotatably driven by a motor (not shown) in a suitable manner and receives the web **12** on its periphery for travel at the linear speed of the periphery of said roll. The drum **11** is of a greater length (or transverse dimension with respect to the web W) than the web W, so as to assure the web is backed by the drum **11** throughout its entire width.

The applicator roll **12** is also driven from a suitable motor (not shown) and is herein shown as being rotatably driven in the direction of web travel and is usually driven at a slower rate of speed than the speed of travel of the web, although it may be driven at the same speed or at a higher speed for individual coating requirements. The nip N formed between the backing roll **11** and the applicator roll **12** may be such as to merely permit contact between the web W and the applicator roll **12** to the extent necessary to apply a required thickness of coating material M at the nip N.

The extent of contact between the applicator roll **12** and the web W and their relative speeds may be correlated so that the web W removes coating material from the surface of the applicator roll **12** slightly more rapidly than the coating material is brought to the nip N, with the result that the coating material M is spread much more thinly on the web W than on the surface of the applicator roll **12**. As may be seen from FIGURE 2, a portion of the periphery of the applicator roll **12** is in contact with the bath of coating material M. The amount of coating material M that is filmed onto the uprunning side of the applicator roll **12** may be controlled by a weir **29**, adjustably mounted on a back wall **30** of the coating pan **27**, and extending between opposite side walls **31** of said pan, as will hereinafter more clearly appear as the specification proceeds.

The amount of coating material M that is filmed onto the uprunning side of the applicator roll **12** may be controlled by variations in spacing between the weir **29** and the roll **12** and by the depth of coating backed up by the weir **29** and supplied to said weir by a plurality of supply nozzles **33** extending across the pan **27** between the side

walls thereof and directed to the weir **29**. The spacing between the applicator roll **12** and the weir **29** and the amount of coating material backed up by the weir **29** may be controlled so that the desired amount of coating material M is applied to the web W; and as has been pointed out, this amount is much less per unit of area on the web than the amount of coating material per unit of area on the applicator roll surface.

The doctor blade **19** serves to smooth the coating material rather than to actually wipe off any excess of coating material, but if any excess coating material should occur, the drip plate **25** will return the coating material to the pan **27**.

The applicator roll **12** is mounted at its ends on bearing supports **35, 35** spaced outwardly beyond the ends of the pan **27**. The bearing supports **35** at the ends of the applicator roll are supported on a vertical face **36** of a lever arm **37**. The lever arm **37** is pivoted intermediate its ends adjacent its upper end portion on a transverse shaft **38** extending between the posts **18, 18**, and suitably mounted thereon. The lever arm **37** has a depending arm **39** extending downwardly toward the bottom of the posts **18** and pivotally connected to a piston rod **40** extensible from a cylinder **41**, which is suitably trunnioned to the post **18**. The cylinder **41** may be an air cylinder and has a piston (not shown) therein connected with the piston rod **40**. Said cylinder and piston rod serve to retain the applicator roll **12** in position and to lower said applicator roll for cleaning or for training a new web about the backing roll **11**. An applicator roll shaft **42** extends through end dams **43** closing the ends of the pan **27** in the operative position of the applicator roll **12**. The end walls **31** of the pan **27** are recessed beneath the bearing supports and generally conform thereto. The recessed portions of said end walls have upwardly opening slots (not shown) formed therein for receiving the end dams **43** in the operative position of the pan **27** and applicator roll **12**. The end walls **31** slide out of the end dams **43** upon lowering movement of the pan **27** for cleaning.

In the present form of puddle coater, the complicated seals heretofore required between the end dams and end walls of the coating pan **27** to retain the coating material to the pan are dispensed with, since the coating material is backed up by the weir **29** and does not extend for the full depth of the coating pan.

The coating pan **27** is mounted on arms **45** at opposite ends thereof. The arms **45** are pivotally mounted on the shaft **38** to accommodate lowering of said coating pan for cleaning. As shown in FIGURE 1, an individual cylinder **46** is suitably trunioned to each post **18**, intermediate its ends, and has a piston rod **47** extensible therefrom. The piston rod **47** is pivotally connected between connector ears **48** extending rearwardly of the arm **45**. The cylinders **46** may be air cylinders and serve to hold the coating pan **27** in the operative position shown in FIGURE 1 and to lower said pan, independently of lowering movement of the applicator roll **12**, to accommodate cleaning of said pan.

In FIGURE 1, the coating pan **27** is shown in dotted in its clean-out position "B." A pipe **49** extends transversely of the coating pan in general alignment with the center line of said pan when in the clean-out position shown in FIGURE 1. The pipe **49** has a plurality of aligned nozzles **50** spaced therealong and facing the pan **27**, when in its clean-out position. The pan **27** when lowered to its clean-out position serves as a funnel and high pressure cleaning fluid supplied through the pipe **49** and nozzles **50** may readily clean the coating material from said pan.

Since the weir **29** backs up the coating material along the incoming side of the applicator roll **12**, very little coating material will actually be in the pan proper and the area exposed to the air will be relatively small, with the result that the cleaning fluid injected into the pan through the nozzles **50** may readily clean out the pan in a short interval of time, in contrast to the hours required to clean out such pans in conventional puddle coaters.

Referring now to FIGURE 3 and weir **29**, said weir is shown as being formed from an angle iron, the ends of the legs of which are welded or otherwise secured to a plate **53** extending between the end walls **31** along the inside of the back wall **30** for the length thereof. The weir **29** slopes from the wall **30** towards the applicator roll **12** and the angle of said weir with respect to the plate **53** is such as to form a sloping dam maintaining a supply of coating material to said applicator roll. The plate **53** is provided with spaced vertically extending slots **55** therein, through which extend bolts **56**. The bolts **56** extend through the back wall **30** from the pan **27** and have nuts **57** threaded on their outer ends for clamping the plate **53** to the back wall **30**, and accommodating adjustable movement of the terminal end of the weir **29** with respect to the applicator roll **12**, to vary the spacing between the terminal end of said weir and said applicator roll in accordance with the thickness of coating material to be picked up by said applicator roll.

The weir **29**, extending between the end walls **31** of the coating pan **27** along the back wall **30** of said coating pan and angularly downwardly to the periphery of the applicator roll **12**, maintains a puddle of coating material on the upcoming side of said applicator roll for substantially the length thereof, to be picked up by said applicator roll in a film for application to the web W as it passes through the nip N.

The supply of coating material to the pan **27** and weir **29** may be varied under the control of suitable valve means (not shown) adjusted by a hand lever **59** and forming an adjustable supply means for coating material to the weir **29**. The coating nozzles **33** may be spaced along the weir **29** and one or a series of individual valves may be provided under the control of one or a series of operating handles **59**, to vary the flow of coating material through the nozzles **33**. As herein shown, an individual valve and hand lever is provided for the nozzle **33** shown, and may control the flow of coating material from a common header **61**, supplying coating material to all of the nozzles **33** and forming a mounting therefor. The header **61** may be pivotally mounted on a support **63** extending between the posts **18** and may be adjustably moved about said support to vary the discharge positions of said nozzle with regard to the weir **29**.

It may be seen from FIGURE 2 that a relatively small volume of coating material is maintained in the pan **27** by the weir **29** with the result that if the web should break there would be little if any coating waste, the coating material dropping to the bottom of the pan **27** flowing to an outlet **65**, where it may be recirculated back to the header **61** and nozzles **33**.

It is also apparent that since the coating material is dammed up directly on the incoming side of applicator roll **12** there will be no stagnant areas along the length of said roll and only a small quantity of coating material will be exposed to the air, with the result that there will be less drying of the coating material during the coating operation and a better end product will be attained.

It may also be seen that since a large volume of coating material is not retained to the coating pan **27** by the end dams **43**, the complicated and expensive seals for said dams heretofore required may be eliminated with the resultant decrease in cost of the apparatus and increase in efficiency thereof.

It may further be seen that the coating apparatus is of an extremely simple construction and that the coating material may readily be cleaned from the weir **29** and pan **27** by the simple operation of lowering the pan and spraying the pan with a high pressure cleansing fluid, removing the small quantity of coating material left in the pan in a relatively short period of time in contrast to the hours formerly required to clean such pans.

While we have herein shown and described one form in which the invention may be embodied, it may readily be understood that various variations and modifications in the invention may be attained without departing from the spirit and scope of the novel concepts thereof as set forth in the claims appended hereto.

We claim as our invention:

1. In a device for coating a travelling paper web, in combination,
- a power driven backing roll partially wrapped by the travelling web,
- a single applicator roll disposed beneath said backing roll and with said backing roll defining a coating nip,
- a coating pan extending beneath said single applicator roll and upwardly along opposite sides thereof, and having a rear wall on the incoming side of the nip between said applicator roll and said backing roll,
- a weir mounted on the inside of said rear wall and extending across said pan and terminating into close proximity with said applicator roll,
- coating supply means on the incoming side of the nip between said rolls for maintaining a continuous supply of coating material to said weir,
- said weir forming a relatively low volume puddle of coating material on the uprunning side of said applicator roll maintained in the form of a low volume puddle by said coating supply means.

2. A device for coating a travelling paper web in accordance with claim 1.
- wherein the rear wall is inclined and converges toward the center of said applicator roll as it extends downwardly therebeneath,
- and wherein the weir is mounted on said rear wall for vertical adjustable movement therealong toward and from said applicator roll.

3. In a device for coating a travelling paper web, in combination,
- a power driven backing roll partially wrapped by the travelling web,
- an applicator roll disposed beneath said backing roll and defining a coating nip with said backing roll, through which the travelling web passes,
- a coating pan extending for the length of said applicator roll and beneath said roll and having a front wall, an opposite back wall on the incoming side of the nip between said applicator roll and said backing roll, and parallel end walls,
- a plurality of supply nozzles extending along said coating pan and disposed thereabove, on the incoming side of the nip between said applicator roll and said backing roll for supplying coating material to said pan, and
- a sloping weir mounted on said back wall of said coating pan and sloping downwardly from said wall and having a terminal end in close proximity to said applicator roll and damming the coating material supplied by said supply nozzles to extend upwardly along the uprunning side of said applicator roll, for the application of coating material to the web passing in the nip between said applicator roll and said backing roll.

4. A puddle coater in accordance with claim 3 in which the weir is vertically adjustable along said back wall of said coating pan.

5. A puddle coater in accordance with claim 3 wherein a plate extends along the inside of the back wall of said coating pan and is adjustably mounted on said back wall for vertical adjustable movement therealong, wherein a weir is mounted on said plate and is in the form of an angle in cross section secured to said plate at the ends of the legs of said angle, and wherein the upper leg of said weir slopes downwardly from said plate and terminates in a position closely adjacent the uprunning side of said applicator roll.

6. A coating device for coating a travelling paper web comprising a frame,
- a backing roll rotatably mounted on said frame and partially wrapped by a travelling web of paper,
- an applicator roll in coating nip defining relation with respect to said backing roll,
- bearing supports for opposite ends of said applicator roll and spaced lever arms pivotally mounted on said frame for movement about an axis parallel to the axis of rotation of said applicator roll, for supporting said bearing supports,
- fluid pressure cylinder and piston means mounted on said frame and operatively connected with said lever arm, for raising and lowering said applicator roll with respect to said backing roll,
- a coating bath pan pivotally mounted on said frame for movement about an axis parallel to the axis of adjustable movement of said applicator roll and having front and rear walls and end walls closing said front and rear walls,
- a weir mounted on said rear wall adjacent the upper end thereof and inclined downwardly from said rear wall toward said applicator roll and terminating in close proximity to said applicator roll, for damming up the coating material on the upgoing side of said applicator roll,
- fluid pressure cylinder and piston means for holding said coating bath pan in an upward operative position to extend partially about said applicator roll and lowering said coating bath pan with the front wall of said pan sloping downwardly toward the ground, and
- high pressure spray means extending across said frame into position to clean said applicator pan when said front wall is in a downwardly inclined cleaning position.

7. A coating device in accordance with claim 6 wherein the spray means comprises spray nozzles extending across the open end of said coating bath pan when in a cleaning position.

8. A coating device for coating travelling paper webs in accordance with claim 6 wherein a plate is adjustably mounted on said rear wall of said coating bath pan for vertical adjustable movement along said rear wall and forms a mounting for said weir, adjusting said weir with respect to the periphery of the uprunning side of said backing roll, and wherein at least one nozzle is disposed above said weir for supplying coating material thereto to form a puddle of coating material on the incoming side of the nip between said applicator roll and said backing roll.

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