

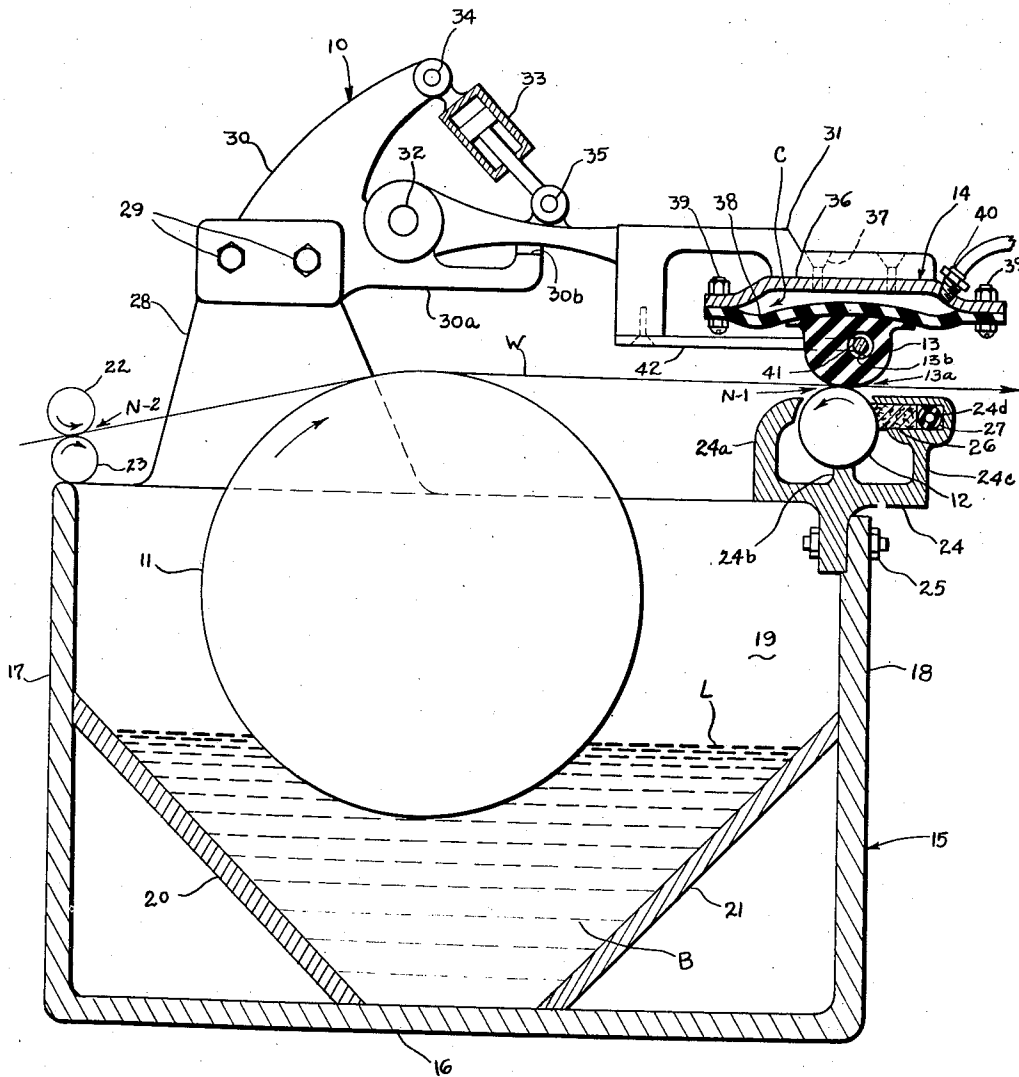
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DEVICE FOR COATING A TRAVELING SHEET

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DEVICE FOR COATING A TRAVELING SHEET

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This invention relates to the coating of a traveling sheet, and more particularly, to a device for applying coating to a traveling sheet.

Although the instant invention may be employed in a number of different arts wherein a coating or film of material is applied to a traveling sheet (whether or not the film is to be permanently retained on the sheet), the instant invention may be employed to particular advantage in applying a coating to a traveling paper web and the invention will be described primarily with respect to this use in the instant disclosure. As those skilled in the art well know, the application of coatings in liquid form to a traveling paper web provides a number of problems. No devices are known which are apparently adequate to apply a truly uniform coating initially on the web; and the usual procedure calls for the use of a first means to apply coating material on the web and a second means to smooth out the material and give the coating some uniformity. This arrangement also leaves something to be desired in that the traveling sheet or web is quite flexible and only a limited amount of tension can be maintained thereon. The forces which may be used to urge a wiping device or doctor against the traveling web are thus limited to the tension which the web will stand and these forces are relatively small so that it is often difficult to apply a coating uniformly to the web. Any slight irregularities in web thickness will tend to cause difficulty. Even substantial irregularities in the amount of coating initially applied can cause difficulty in such an arrangement.

The instant invention is based upon a discovery that a number of these difficulties can be overcome by forming a nip between a first member and doctor means to receive the coated sheet therethrough and resiliently urging the first member against the doctor means to obtain the desired pressure load at the nip. Preferably also the first member is itself flexible or yieldable and is actuated by fluid actuated means so that a substantially uniform pressure will be applied across the full width of the sheet notwithstanding possible irregularities in sheet thickness, etc. which might cause low pressure differences if the first member were not flexible.

It is, therefore, an important object of the instant invention to provide an improved device for coating a traveling sheet.

It is another important object of the instant invention to provide an improved device for coating a traveling sheet comprising coating means on one side of the sheet applying coating thereto, doctor means on the same side of the sheet behind said coating means in the travel of said sheet wiping excess coating from the sheet, and shoe means on the opposite side of the sheet resiliently urging said sheet against said doctor means to control the extent to which excess coating is wiped from the sheet.

Other and further objects, features and advantages of the present invention will become apparent to those skilled in the art from the following detailed disclosure thereof

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and the drawings attached hereto and made a part hereof.

In the drawing:

The drawing shows a sectional elevational view of a device embodying the instant invention.

As shown in the drawing:

The device 10 of the instant invention may be described generally as comprising first means 11 on one side of the sheet W applying coating thereto, second means 12 on the same side of the sheet W behind said first means 11 in the travel of the sheet W urged against the sheet W to wipe excess coating therefrom, third means 13 defining with said second means a nip N-1 receiving the coated sheet W, and fourth means 14 resiliently urging the third means 13 against the second means 12 to control the pressure at the nip N-1 and the amount of excess coating wiped from the sheet W by the second means 12.

Referring to the drawing in detail, it will be noted that the device 10 comprises a tank structure 15 having a bottom 16, end walls 17 and 18 and side walls such as the side wall 19, all upstanding from the bottom 16. Also, the tank 13 has false bottom walls 20 and 21 slanting downwardly from the end walls 17 and 18 to provide a generally V-shaped cross-section to the bottom of the tank 15 and the tank 15 maintains a level L of coating bath B therein. The coating means or applicator roll 11 is partially submerged in the coating bath B and mounted on suitable bearings in the side walls (only one of which, 19, is here shown). The applicator roll 11 is provided with the usual bearings and drive means (not shown) to afford rotation thereof in the direction indicated by the arrow which is the same direction as the direction of travel of the sheet W. The applicator roll 11 itself may be used to drive the sheet W in its direction of travel, or additional drive means such as pinch rolls 22 and 23 may drive the sheet at a second nip N-2, as indicated. The driven sheet W receives coating from the surface of the applicator roll 11 in the usual manner, but the coating thus applied is not applied with the extent of uniformity desired. Actually, an excess of coating material is applied by the applicator roll 11. The thus coated sheet or web W moves forwardly in the direction indicated by the arrows over the second means or doctor roll 12. The doctor roll 12 is mounted on bearings (not shown) on a frame member 24 suitably secured to the end wall 18 of the tank 15, as by a bolt and nut assembly 25. The frame 24 has an arm portion 24a extending upwardly to close running relation to the doctor roll 12 to minimize loss of coating material thrown from the rotating doctor roll 12. To carry out this function the arm portion 24a, of course, extends the full length of the roll 12. Centrally mounted arm portions 24b in the frame 24 (mounted on opposite sides of the frame) carry bearings and drive means (not shown) for the doctor roll 12 so that the doctor roll 12 may be rotated preferably in the direction opposite to the direction of web travel so as to accomplish the desired wiping effect most satisfactorily. A third arm member 24c extends upwardly along the uprunning side of the doctor roll 12 and presents a flexible wiping member 26 which is received in a groove 24d in the arm 24c extending the full length of the doctor roll 12 or the full width of the tank 15 and the flexible wiping member 26 is urged against the uprunning side of the doctor roll 12 by an expandable fluid pressure actuated tube 27 (suitably connected to a source of air under pressure, not shown), so as to continuously wipe the uprunning side of the doctor roll clean just before it comes in contact with the bottom or coated side of the web W.

The mounting means for the shoe 13 or third means 13 hereinbefore mentioned are carried on the side walls of the tank 15 and only the mounting means on the side wall 19 will be described herein, because the mounting

means on the opposite side wall (not shown) are substantially identical. The side wall 19 carries a pedestal 28 extending upwardly therefrom which has secured thereto (as by nut and bolt assemblies 29, 29) a shoulder member 30. The shoulder member 30 has an arm 31 extending therefrom and connected thereto by a pivot pin 32 for swingable movement about the shoulder 30. A stop member 30a extends from the should 30 forwardly and presents a stop surface 30b which limits downward swinging movement of the arm 31. A fluid pressure actuated piston and cylinder assembly 33 (of standard construction) is connected to an upper portion of the shoulder 30 by a pivot pin 34 and to an intermediate portion of the arm 31 by a pivot pin 35 and the power cylinder 33 is used to effect limited swinging movement of the arm 31 upwardly from the stop surface 30b. The outer extremity of the arm 31 carries a rigid dish-shaped member 36 which forms the anchored or fixed part of the "fourth means" 14 or diaphragm means 14 hereinbefore mentioned. The bowed or dish-shaped member 36 extends the full width of the tank 15 or the full width of the traveling web W and is rigidly secured to the arm 31, as by bolts 37, 37. A flexible rubber diaphragm member 38 of substantially the same area as the rigid member 36 is sealed to the peripheral portions of the rigid member 36, as by bolt and nut assemblies 39, 39, so as to form an air-tight chamber C between the flexible member 38 and the rigid member 36.

Fluid under pressure such as compressed air is supplied to the chamber C through the line 40 and may be, of course, controllably supplied thereto to the extent desired so as to urge the flexible member 38 downwardly. The shoe 13 is secured to the downward or bottom side of the flexible member 38 and moves therewith. The shoe 13 is preferably made of a flexible material, such as partially vulcanized rubber, so that it may bend at least to a limited extent at various places along its length, the length of the shoe 13 being the full width of the tank 15 or the width of the web W. The shoe 13 may be made of other materials having limited flexibility (since a great deal of bending or sharp bends thereof are not required) and preferably the shoe 13 is provided with a smooth frictionless surface 13a at the nip defining portion thereof. The shoe 13 is held against rotation and is flexibly yieldable to the diaphragm means 14 along the length of the shoe 13.

A cross-bar 41 extends the full length of the shoe 13 and is received in an oversize passageway 13b therein. The cross-bar 41 is suitably secured rigidly to the arm 31, as by a screw mounted support 42, so that the cross-bar 41 limits vertical movement of the shoe 13. The purpose of the cross-bar is to prevent unnecessarily great downward movement of the shoe 13 when the arm 31 has been lifted out of nip-engaging relationship and only the flexible diaphragm member 38 would ordinarily be supporting the shoe 13. On the other hand, the oversize passageway 13b permits the desired limited bending or flexible movement of the shoe 13 when such is necessary.

As will be appreciated the arms 31, 31 are mounted on opposite sides of the tank 15 in the manner here described so as to support therebetween the diaphragm means 14 carrying the shoe 13.

It will be understood that modifications and variations may be effected without departing from the spirit and scope of the novel concepts of the present invention.

I claim as my invention:

1. In a device for coating a traveling sheet, coating means on one side of the sheet applying coating thereto, rotary doctor means on the same side of the sheet behind said coating means in the travel of said sheet

wiping excess coating from the sheet, and flexible shoe means on the opposite side of the sheet held against rotation and resiliently urging said sheet against said doctor means throughout the full length thereof to control the extent to which excess coating is wiped from the sheet.

2. In a device for coating a traveling sheet, an applicator roll partially submerged in a coating bath and rotating in the direction of sheet travel to apply a coating to one side thereof, rotary doctor means on the same side of the sheet behind said roll in the travel of said sheet wiping excess coating from the sheet, and flexible shoe means on the opposite side of the sheet held against rotation and resiliently urging said sheet against said doctor means to control the extent to which excess coating is wiped from the sheet.

3. In a device for coating a traveling sheet, coating means on one side of the sheet applying coating thereto, a doctor roll rotating opposite to the direction of sheet travel and positioned on the same side of the sheet behind said coating means in the travel of said sheet wiping excess coating from the sheet, and flexible shoe means on the opposite side of the sheet resiliently urging said sheet against said doctor roll throughout the full length thereof to control the extent to which excess coating is wiped from the sheet.

4. In a device for coating a traveling sheet, coating means on one side of the sheet applying coating thereto, rotary doctor means on the same side of the sheet behind said coating means in the travel of said sheet wiping excess coating from the sheet, a flexible member defining with said doctor means a nip receiving the traveling sheet, and diaphragm means resiliently urging said member against the sheet throughout the full width thereof to control the extent to which excess coating is wiped from the sheet.

5. In a device for coating a traveling sheet, a tank maintaining a level of liquid coating bath therein, an applicator roll mounted on the tank partially submerged in the coating bath and rotating in the direction of sheet travel to apply a coating to one side thereof, a doctor roll rotating oppositely to the direction of sheet travel and positioned on said tank on the same side of the sheet behind said applicator roll in the direction of travel of said sheet for contacting and for wiping excess coating from the sheet, a flexible shoe pivotally mounted on said tank and defining with said doctor means a nip receiving the traveling sheet, and diaphragm means resiliently urging said shoe against the sheet throughout the full width thereof to control the extent to which excess coating is wiped from the sheet.

6. In a device for coating a traveling sheet, first means on one side of the sheet applying coating thereto, second rotary means on the same side of the sheet behind said first means in the direction of travel of said sheet rotatively urged against said sheet to wipe excess coating therefrom, third flexible means defining with said second means a nip receiving the coated sheet, and fourth means pneumatically loading said third means against said second means throughout the full width of the sheet to control the pressure at the nip and the amount of excess coating wiped from said sheet by said second means.

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