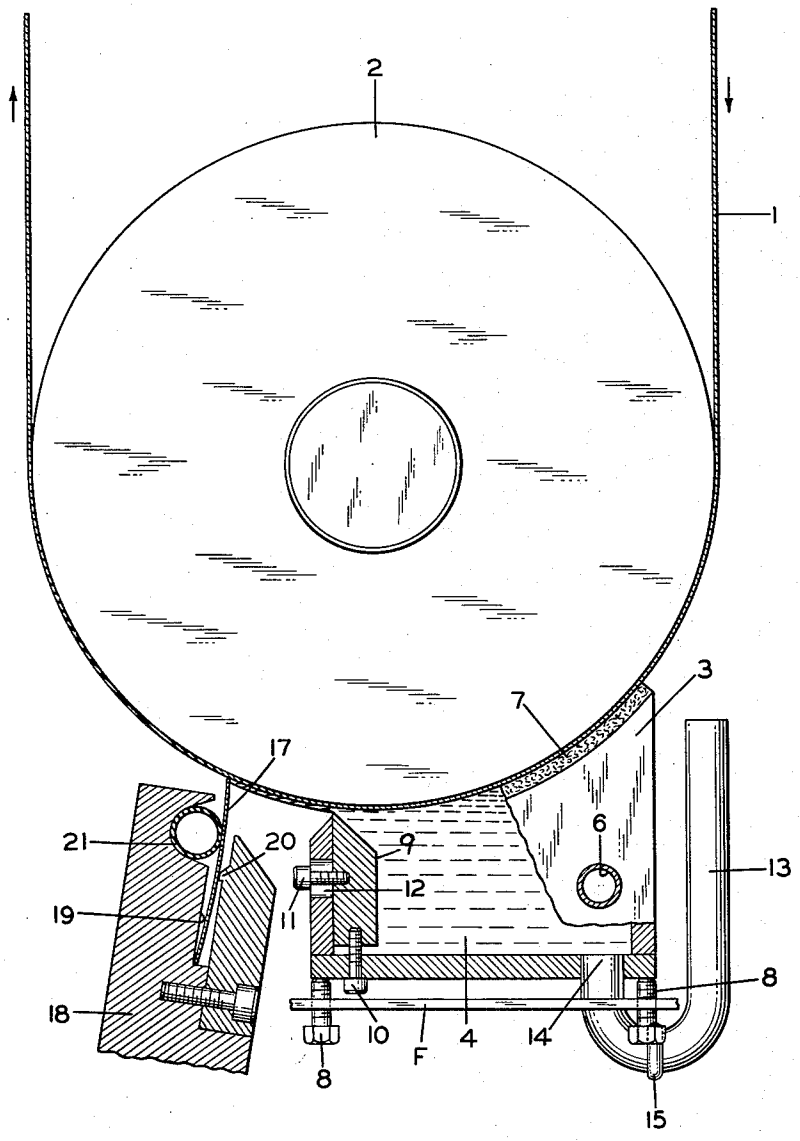
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WEB COATING APPARATUS

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INVENTOR
MERRILL F. GALER
BY
Brumbaugh, Free, Graves & Donlevy
HIS ATTORNEYS

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WEB COATING APPARATUS

Merrill F. Galer, Monroe, Conn., assignor to Time Incorporated, New York, N.Y., a corporation of New York

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This invention relates to a coating apparatus and more particularly, to a novel apparatus for imparting uniform coatings of controlled thickness on a web fed at high speed.

In conventional coating apparatus in which the coating material is fed by gravity to a coating blade which applies a film of the coating material onto the surface of a web, any lumps or particles in the coating material or skim formed thereon will eventually flow to the coating edge of the blade and prevent proper application of the coating material on the web.

In such coating apparatus, a pond builds up between the web to be coated and the coating blade, and the coating blade is the sole means of metering the application of coating material from this pond onto the web. It is not surprising that in such coating apparatus it is difficult to apply uniform coatings of desired thickness on the web.

In the coating apparatus of the present invention, the web to be coated is fed at high speed between a rotating cylinder and a tank for the coating material. The coating material supplied to the tank is discharged therefrom on the surface of the fast-moving web through a narrow opening between a metering bar and the web to be coated, and the coating material is then spread uniformly on the web by a coating blade which also removes the excess coating material from the web.

In the coating apparatus of the present invention, skim, lumps or particles in the coating material will either remain in the tank or will be carried out of the tank by the circulation of the coating material without ever reaching the coating blade. Furthermore, because the coating material is being continuously withdrawn from the upper region of the tank by the moving web, the coating material in the tank will not tend to skim. Since skim, lumps and undesirable particles are less likely to be carried to the coating blade and it does not operate with a large pond of coating material against it, the coating blade in the apparatus of the present invention is capable of improved coating action.

The present invention may be fully understood from the following description in conjunction with the accompanying drawing in which:

The single figure is a view partly in side elevation and partially broken away of a coating apparatus embodying the invention.

Referring to the drawing, a paper web **1** to be coated is fed at high speed between a rotating backup cylinder **2** and a tank **3** containing the coating material **4**. The coating material is pumped continuously to the tank through a conduit which communicates with the inside of the tank through a port **6** in the side wall thereof.

The tank is supported by a pivotal frame F for movement toward and away from the backup cylinder. This permits the tank to be separated from the cylinder while the web is threaded through the apparatus and in the event the web breaks, so that the rotating cylinder will not pick up the coating material and throw it about. The upper edges of the side walls of the tank are curved in complementary fashion to the outer periphery of the backup cylinder, and they are provided with sealing strips **7** of felt, Teflon or other suitable material which engage either the web near the edges thereof or the cylinder beyond the edges of the web to confine the coating fluid between the side walls of the tank in contact with the surface of the backup cylinder. The tank can be properly oriented and adjusted relative to its supporting frame by adjusting the screws **8** at each corner of the tank, thereby also permitting the tank to be properly adjusted relative to the outer surface of the backup cylinder when it is in its operative position.

The upstream wall of the tank is substantially higher than the downstream wall. An adjustable metering bar **9** having a beveled straightedge is placed adjacent the inner surface of the lower wall of the tank. This metering bar can be adjusted as to height and aligned with respect to the web to be coated by adjusting the screws **10** at the bottom of the tank **3**. When the metering bar is properly adjusted, it can be locked in place by lock screws **11** which pass through narrow slots **12** in the wall of the tank and threadably engage the metering bar.

The level of the coating fluid within the tank **3** is controlled by an adjustable U-shaped overflow pipe **13**. One end of the overflow pipe communicates with the coating fluid within the tank through a discharge port **14** in the bottom of the tank. The outer end of the overflow pipe is connected to the inner end thereof by a swivel joint **15**, so that the upper end of the pipe can be adjusted throughout a range between the height of the higher upstream wall of the tank and the height of the upper edge of the metering bar. This adjustment of the overflow pipe determines the level of the coating fluid within the tank and permits it to be regulated between these two heights as desired.

The coating material is continuously supplied to the tank and discharged in part through the narrow opening between the upper edge of the metering bar and the web to be coated, and in part through the overflow pipe **13**. The coating fluid discharged through the overflow pipe is collected in an underneath basin and returned through a conduit to a supply tank from which the coating fluid is supplied to the tank. The coating fluid discharged from the tank between the metering bar and the web and in excess of that carried by the web is also collected in this same sump.

This continuous circulation of the coating fluid prevents skin from forming on the upper surface of the coating fluid within the tank. Moreover, the turbulence within the tank causes any undesirable lumps or particles in the coating material to be discharged through the overflow pipe. The rate of supply of the coating fluid to the tank is, however, sufficient to insure a continuous flow between the web and the upper edge of the metering bar, thereby insuring that the surface of the web carries away from the tank a quantity of coating material somewhat in excess of the amount to be coated thereon.

The coating material is spread uniformly and in the desired thickness to the surface of the web by a coating blade **17**. The coating blade is supported in a blade holder **18** which is mounted for pivotal movement toward and away from the backup cylinder **2**. The edge of the blade opposite the coating edge is received loosely within a slot **19** of the blade holder containing an internal projection **20** extending the length of the blade. The blade holder extends upwardly on the side of the blade opposite the cylinder, and it supports a partially recessed inflatable tube **21**, for example, a tube made of neoprene, latex, gum rubber or other inflatable material, which extends the length of the coating blade.

When the blade holder is in operative position and the tube **21** is inflated, the coating edge of the blade is urged into the desired pressure contact against the web and the backup cylinder, arching the blade slightly between its line of engagement with the web and its line of engagement with the projection **20** to eliminate any ripples therein and to permit the blade to apply a smooth coating on the web. The tube engages the blade approximately midway between the coating edge and the projection **20**. The

pressure supplied to the inflatable tube can be regulated to obtain the desired coating action.

In addition to spreading a smooth and controlled coating on the web, the coating blade also removes the excess coating material. The excess coating material falls by gravity into the sump below from which, as explained above, the coating material is returned to the storage tank from which the coating material is supplied to the tank 3.

It is apparent that the operation of the apparatus can be varied in certain respects. For example, the coating fluid can be supplied at a rate merely to replenish the coating fluid picked up by the web in which case none of the coating fluid need be discharged through the overflow pipe 13. However, to insure that sufficient coating fluid is available to coat the fast-moving web, it may be preferred to supply the coating fluid at a faster rate than it is picked up by the web, permitting the excess to be discharged through the overflow pipe.

Also, the height of the metering gate can be adjusted to widen the narrow opening defined between the metering bar and the web and permit more coating fluid to pass through the opening, or to restrict the size of the opening to limit the coating fluid discharged therethrough to that which is to be carried by the web.

The invention has been shown and described in a single form and by way of example, and obviously, many variations and modifications can be made therein within the spirit of the invention. The invention, therefore, is not intended to be limited to any specified form or embodiment, except insofar as such limitations are expressly set forth in the appended claims.

I claim:

1. A coating apparatus for a moving web comprising a tank for a coating composition, said tank having a front wall extending transversely of the direction of the web and a side wall at both ends of the front wall, said side walls confining and directing flow of the coating composition toward the front wall, a rotatable cylinder above said tank for supporting a web of paper and passing it downwardly into said tank, the upper edges of the side walls near the front wall being substantially complementary to said cylinder, an adjustable metering bar on said front wall extending lengthwise of said cylinder in spaced relation thereto for regulating the flow of coating composition between said metering bar and the web, and a coating blade spaced from said front wall and outside said tank for spreading the coating composition evenly on the web and removing excess coating composition from said web.

2. A coating apparatus as set forth in claim 1 including means interposed between said complementary upper edges of the side walls and said cylinder for preventing leakage between said tank and said cylinder.

3. A coating apparatus as set forth in claim 1 including means for adjusting the spacing between said metering bar and said web.

4. A coating apparatus as set forth in claim 1 including an opening in said tank for admitting coating composition into said tank.

5. A coating apparatus as set forth in claim 1 including a pivotal overflow pipe communicating with the interior of the tank for regulating the level of the coating composition to the desired height above the metering bar.

6. A coating apparatus comprising a rotatable cylinder for guiding a moving web to be coated around the lower portion thereof, a tank into which a coating material is supplied, said tank having lower and higher walls which confine a quantity of the coating material within the tank, the lower wall being spaced beneath the cylinder and extending transversely of the web and co-operating with the web to define a discharge passage from the tank through which a metered quantity of the coating material can pass in contact with the surface of the moving web, a metering bar adjustable on said transversely extending wall of the tank to control the rate of flow through the discharge passage, and a coating blade spaced apart from the metering bar for spreading the coating material evenly on the surface of the web and remove the excess coating material.

7. A coating apparatus as set forth in claim 6 including means to provide a controlled overflow from the tank when the coating material is delivered to the tank at a rate in excess of the rate of flow through the discharge passage.

8. A coating apparatus as set forth in claim 7 in which the means providing said controlled overflow from the tank includes a pivotally adjustable overflow pipe communicating with the coating material within the tank and having an upwardly turned end which regulates the level of the coating material within the tank when an excess quantity of coating material is delivered to the tank.

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RICHARD D. NEVIUS, *Primary Examiner.*

JOSEPH B. SPENCER, *Examiner.*