SELF-CLEANING DECKLE RAIL FOR PAPERMAKING MACHINES
11 Claims, 4 Drawing Figs.

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ABSTRACT: A water-distribution tube is placed superjacent the deckle rail on a papermaking machine. The tube is provided with an aperture opening on its upper surface and directing notches which are formed on the upper surface of the rail and disposed transverse to the length of the tube. Water discharged from the aperture is directed by the notches downward along opposite sides of the tube and along the corresponding sides of the deckle rail. In this manner the rail is continuously washed and coated with water thereby eliminating corrosion loading.
SELF-CLEANING DECKLE RAIL FOR PAPERMAKING MACHINES

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to papermaking machines, and more particularly refers to a self-cleaning deckle rail assembly for a forming section of the machine.

2. Description of the Prior Art

Forming sections of papermaking machines of the type having a head box depositing a slurry onto a fourdrinier generally include a plurality of deckle rails or strips disposed at opposite side edges of the fourdrinier for confining and forming the slurry; the deckle rails generally extend from the head box along the fourdrinier for several feet. Due to spray from the rapidly advancing slurry, the deckle rails tend to become corrosion loaded.

A buildup of corrosion on the deckle rails may result in sludge spots in the finished paper product. Therefore, deckle rail assemblies have not included effective means for automatically cleaning the rails to prevent corrosion loading. Thus, it has been necessary to remove the rails from the machine and chip off corrosion and fibrous material. Such procedures are troublesome and time consuming and require wasteful downtime of the entire machine.

SUMMARY OF THE INVENTION

It is contemplated by the present invention to provide a pair of self-cleaning deckle rail assemblies at a forming section of a papermaking machine having a head box depositing a slurry of water or other suitable fluids and fibrous material onto a rapidly moving fourdrinier screen extending from the head box. The pair of deckle rail assemblies are disposed at opposite side edges of the fourdrinier and extend for several feet longitudinally along the fourdrinier from the head box, thereby to confine and form the slurry. Each deckle rail assembly comprises a horizontally elongated rail member having a longitudinal edge portion extending longitudinally and slightly spaced from the fourdrinier.

In accordance with this invention fluid distribution means are disposed along the rail member and diffuse a plurality of small, longitudinally spaced streams of fluid downwardly along opposite side surfaces of the rail member.

In an exemplary embodiment, the fluid distribution means comprises an elongated hollow wiper tube longitudinally disposed along an upper edge portion of the rail member and having a plurality of longitudinally spaced, outlet apertures opening upwardly to form a film of liquid extending over the top of the tube.

In order to direct water seeping from the outlet apertures downwardly along the opposite sides of the rail, each aperture has a discharge portion characterized by a notch which may be somewhat elliptical having a major axis thereof extending transversely of, and partially circumferentially around, the distribution tube.

The rail member has a strip form body portion carrying the hollow distribution tube and a flexible strip supported along a lower longitudinal edge of the body portion and extending downwardward toward the fourdrinier. A lowermost longitudinal edge of the flexible strip is spaced above the fourdrinier, thereby forming a small gap between the flexible strip and the fourdrinier. Means forming an adjustable fan shower directs fanlike sprays of water onto the fourdrinier along a line defined by an intersection line of a plane containing the flexible strips with the fourdrinier screen.

It is therefore a primary object of the present invention to provide a self-cleaning deckle rail assembly for use with a forming section of a papermaking machine.

More specifically, it is an object of the present invention to provide a self-cleaning deckle rail assembly comprising an elongated rail member disposed on edge at a side edge portion of a fourdrinier and having fluid distribution means directing fluid downwardly along opposite side surfaces of the rail, thereby continuously washing the rail for preventing corrosion loading.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects, features and advantages of the present invention will be readily apparent from the following description of a preferred embodiment thereof, taken in conjunction with the accompanying drawings, although variations and modifications may be effected without departing from the spirit and scope of the novel concepts of the disclosure or our contribu-

FIG. 1 is a top plan view of a forming section of a papermaking machine and illustrates a top plan view of a pair of deckle rail assemblies constructed in accordance with the present invention;

FIG. 2 is an enlarged isometric view illustrating one of the deckle rail assemblies of FIG. 1;

FIG. 3 is an enlarged, partial top plan view of a fluid distribution tube for the deckle rail assemblies and illustrates details of one configuration of fluid outlet apertures formed in the fluid distribution tube; and

FIG. 4 is a transverse sectional view of the deckle rail assembly taken substantially along line IV—IV of FIG. 2.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

Referring to the drawings, a forming section of a papermaking machine includes a head box 10 for depositing a slurry of fibrous materials suspended in water or other suitable fluids onto a fourdrinier 11. A pair of self-cleaning deckle assemblies generally indicated at 13, 13 is constructed in accordance with the principles of the present invention. The fourdrinier 11 generally includes a rapidly moving screen belt 14 trained around suitably arranged idlers as at 16 to form a horizontally disposed fourdrinier table extending from a lip portion of the head box 10. The slurry of fibrous material is deposited in a thin sheet as at 15 extending substantially across an entire width of the fourdrinier 11. In order to confine and form the sheet 15, the pair of deckle rail assemblies 13, 13 extend from the head box longitudinally of the fourdrinier and slightly overlap opposite side edge portions of the fourdrinier screen 14.

In accordance with the principles of the present invention, each deckle rail assembly 13 comprises support means 17, a rail member 18 and water distribution means 19 for diffusing water downwardly along opposite side surfaces of the rail member.

The rail member 18 has a horizontally elongated, strip-form body portion 21 characterized by an outwardly projecting lip portion 22 extending longitudinally along an upper edge portion. A pair of longitudinally spaced attachment flanges 23, 23 are welded or otherwise secured to the lip portion 22 and extend outwardly of the body portion at right angles thereto. A pair of the support means 17 are disposed on either side of the forming section, and each support means generally comprises an upstanding post member 24atably supporting an arm 26 extending from the post toward the fourdrinier screen 14. The arm 26 has a cylindrical body portion 27 and a flattened terminal end portion 28 characterized by a longitudinally elongated slot 29. The cylindrical portion 27 of the arm 26 is carried in a sleeve clamp 31 supported at an upper terminal end portion of the upstanding post 24. The sleeve clamp 31 is releasable to permit removal of the arm 26 and adjustment thereof toward and away from the fourdrinier screen 14.

The attachment flanges 23 of the rail members 18 underlie the flattened portions 28 of the support arms 26 and have apertures as at 32 aligned with the slots 29. The rail members 18 are suspended beneath the support arms 26 by adjustable attachment means as at 30 permitting both vertical and horizontal adjustment of the rails relative to the fourdrinier screen 14.
Each adjustable attachment means 30 comprises a bolt 33 passing upwardly through the apertures 32 of the flanges 25 and the slots 29 of the support arm 26. A first nut 34 is threaded over the bolt 33 and clamps the attachment flange 23 between a head 36 of the bolt and the nut. A pair of nut and washer assemblies 37 and 38 are threaded onto the bolt 33 and disposed on either side of the flattened portion 28 of the attachment arm 26, thereby to clamp the support arm 26 and suspend the rail assemblies 19 beneath the support arm and above the foundriner screen 14.

The bolt 33 is movable longitudinally of the support arms 26 within the slot 29, thereby permitting horizontal adjustment of the rail member transversely of the foundriner screen 14. Also, by threadingly adjusting the pair of nut and washer assemblies 37 and 38 axially along the bolt 33, the rail assemblies 19 may be vertically adjusted relative to the horizontal run of the foundriner screen 14.

In order to provide a flexible deckle rail portion disposed adjacent the foundriner screen 14, an elongated strip 41 composed of flexible rubberlike material is clamped to an outer side surface 42 of the rail body 21 along a lower longitudinal edge portion as at 43. A rigid strip 44 overlies the flexible deckle strip 41, and a plurality of longitudinally spaced fastening means, such as screws as at 46, pass through appropriately formed apertures 47 and 48 formed respectively in the rigid strip 44 and the flexible strip 41 and engage threaded apertures as at 49 in the body portion 21, thereby to clamp the flexible strip 41 to the rail body.

Each of the deckle rail assemblies 19 is vertically adjusted so that a lower longitudinal edge 51 of the flexible deckle strip 41 is slightly spaced above an upper surface 52 of the foundriner screen 14, thereby to provide a small gap 53 between the foundriner screen and the flexible strip, for example a vertical extent in the order of approximately one-quarter inch.

It is also contemplated by the present invention to provide a series of longitudinally spaced spray heads as at 54 directing a series of fan showers impinging the foundriner screen 14 along a longitudinal line defined by intersection of a plane containing the flexible strip 41, thereby to form and confine the sheet 15 carried on the horizontal surface 52 of the screen. The spray heads 54 are disposed along a hollow manifold tube 56 having an inlet end as at 57 disposed near the head box 10 and an opposite closed or plug end 58 terminating adjacent a termination end as at 59 of the rail body 21. The manifold tube 56 is spaced outwardly of the rail body 21 and supported within apertures as at 61 formed in a series of longitudinally spaced support flanges 62 extending outwardly at right angles of the rail body 21 and secured thereto by welding as at 63 or other suitable securement means.

In accordance with the principles of the present invention, the water distribution means 39 include an axially elongated hollow weeper tube 65 having a cylindrical wall 74 defining an axially throughborne 66, an outwardly turned inlet end portion 67 and an opposite end portion as at 68 closed by a plug 69. The water distribution or weeper tube 65 is carried on an upper longitudinal edge 71 of the rail body 21 with the plug end 68 disposed adjacent the terminal end 59 of the rail and is secured thereto by welding as at 72, or other suitable securement means. In order to provide fluid outlet means for distributing water or other suitable fluid downwardly along opposite sides of the rail members 18 the tube 65 has a longitudinally spaced series of upwardly opening weeper outlet apertures as at 73 formed through an upper portion of the cylindrical wall 74.

As best illustrated in FIG. 3, each outlet aperture 73 comprises a circular port 76 extending upwardly through the cylindrical wall 74 and a directing mouth portion or notch 77. The directing portions or notches 77 each have a substantially elliptical shape with a major axis of the ellipse disposed transversely of the tube 65 and extending partially around a circumference thereof, thereby to direct fluid such as water seeping from the port 76 downwardly along diametrically opposite sides of the weeper tube 65, and thus, downwardly along the outer side surface 42 and an inner side surface 78 of the rail 18. If desired, the longitudinally spaced series of outlet ports 76 may be formed with progressively smaller diameters, with larger diameters being provided for ports disposed toward the inlet end 67 of the tube 65, thereby providing a more even flow throughout the length of the water distribution tube. Also, if desired, the outlet ports 76 may be grouped into groups having equal diameter ports with the groups disposed near the inlet end 67 having larger ports than those toward the opposite end. The effect of the weeper tube is to establish an elongated source of liquid corresponding in length to the deckle rail so that the surface of the deckle rail can be, in effect, constantly coated with a corrosion resistant surface.

In order to supply water or other suitable fluids to both the water distribution means 19 and the fan shower spray heads 54, the present invention provides a water supply system generally indicated at 78 and comprising a source of water under pressure (not shown), a main supply pipe 79 leading from the water supply and terminating at a T connection 81. A cross pipe 82 and a nipple 83 respectively connect the main supply line 79, via the T connection 81, with the pair of deckle rail assemblies 13, 14 disposed on opposite sides of the foundriner 11.

At each of the opposite sides of the foundriner 11 the water supply is again divided by a T connection as at 84, thereby providing a pair of branch lines 86 and 87 respectively supplying water to the spray heads 54 and the water weeper tubes 65. The branch line 86 has an adjustable shutoff valve 88 controlling the water supply to the spray heads 54, while the branch line 87 has an adjustable shutoff valve 89 controlling the water supply to the weeper tube 65. Flexible tubing as at 91 and 92 respectively communicate the adjustable shutoff valves 88 and 89 with the spray heads 54 and the weeper tube 65.

In order to facilitate removal of the deckle rail assemblies 13, 14 quick start coupling means at as 93 and 94 respectively connect the flexible tubes 91 and 92 to the manifold tube inlet 57 and the weeper tube inlet 67.

In operation, the adjustable shutoff valves 89 controlling water supply to the weeper tube 65 is adjusted so that water seeps from the longitudinally spaced weeper apertures 73 and flows downwardly along the opposite side surfaces 42 and 78 of the deckle rail assembly 18, thereby continuously washing the opposite side surfaces of the deckle rail to prevent buildup or accumulation of fibrous material and corrosion loading, and in effect, constantly coating the deckle rail with a corrosion resistant surface.

Although various minor modifications might be suggested by those versed in the art, it should be understood that we wish to embody within the scope of the patent warranted hereon all such modifications as reasonably and properly come within the scope of our contribution to the art.

We claim as our invention:

1. In a forming section of a papermaking machine of the type having a deckle rail assembly including a pair of horizontally elongated rail members disposed on edge respectively along opposite side edges portions of a foundriner screen, the improvement of water distribution means having an elongated weeper tube superjacent a corresponding rail member, said weeper tube having aperture means opening at an upper surface thereof, said weeper tube having transversely disposed directing notches formed in the upper surface thereof for directing water discharged from said aperture means downwardly on opposite sides of said tube and on correspondingly opposite sides of the rail member, whereby the rail member is continuously washed and coated by water to eliminate corrosion loading.

2. In a forming section of a papermaking machine, as defined in claim 1, said aperture means comprising a plurality of longitudinally spaced, upwardly opening weeper apertures formed along an upper portion of said weeper tube.
3. In a papermaking machine, a deckle rail assembly including a horizontally elongated rail member disposed on edge along a side edge portion of a fourdriner screen of the papermaking machine and means for supporting the rail member, wherein the improvement comprises:

water distribution means for directing a flow of water downwardly along opposite side surfaces of the rail member and including an elongated hollow weeper tube disposed along an upper edge of said rail and having a plurality of longitudinally spaced, upwardly opening weeper apertures formed along an upper portion thereof, said weeper apertures having a port portion extending into said hollow tube and having directing notches cut into an upper surface of said tube and extending transversely thereof in opposite directions for directing water seeping from said ports downwardly along diametrically opposite sides of said tube; and

means for supplying water to said distribution means, whereby said rail member is continuously washed and coated by water, thereby eliminating corrosion loading.

4. In a forming section of a papermaking machine as defined in claim 1, said water distribution means comprising an adjustable shutoff valve for controlling water supply to said weeper tube whereby water supply to said distribution means may be selectively regulated.

5. In a forming section of a papermaking machine as defined in claim 1, a plurality of longitudinally spaced spray heads spaced outwardly of said weeper tube and its corresponding rail member and directed inwardly for projecting fanlike showers and forming a water barrier.

6. In a forming section of a papermaking machine as defined in claim 2, said plurality of longitudinally spaced outlet apertures having progressively smaller cross-sectional areas with ones of said apertures disposed nearer an inlet end of said weeper tube having larger cross-sectional areas than those disposed nearer a closed end of said weeper tube.

7. In a forming section of a papermaking machine as defined in claim 1, means for supporting the rail member and having an upwardly extending post member secured to a frame of the papermaking machine and an arm member attached to said post and extending toward, and partially overlying, the rail member;

an attachment flange underlying a portion of said arm, secured to, and extending at right angles from the rail member; adjustable attachment means interconnecting said arm and said attachment flange and being configured to permit horizontal adjustment of the rail transversely of the adjoining fourdriner screen and vertical adjustment toward and away from a horizontal run of the screen.

8. In a forming section of a papermaking machine as defined in claim 1 a rail member underlying each said weeper tube and comprising:
a rigid, horizontally elongated, strip-form body portion disposed on edge;
a flexible strip extending longitudinally along a lower longitudinal edge portion of said body and projecting downwardly therefrom toward the adjoining fourdriner screen; and clamp means securely attaching said flexible strip to said rigid body portion.

9. For use in a papermaking machine, a deckle rail comprising water distribution means having a weeper tube disposed superjacent the deckle rail and including aperture means opening at an upper surface thereof and directing notches on an upper surface of said tube and disposed transversely of said tube length to direct water seeped from said aperture means downwardly on opposite sides of said tube and on corresponding opposite sides of said deckle rail.

10. A deckle rail assembly according to claim 9, wherein said directing notches each have a generally elliptical shape with a major axis of the ellipse disposed transversely of said tube and extending partially around a circumference thereof, thereby to direct fluid downwardly along diametrically opposite sides of said tube.

11. A deckle rail assembly according to claim 9, wherein said weeper tube has an inlet end, an opposite closed end and said aperture means comprising a plurality of longitudinally spaced weeper apertures opening at the upper surface of said weeper tube and having one of said directing notches associated with each of said weeper apertures, said weeper apertures having progressively smaller cross-sectional areas with said apertures disposed near said inlet end having larger cross-sectional areas than those disposed near said closed end of said tube.