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2 Sheets-Sheet 1

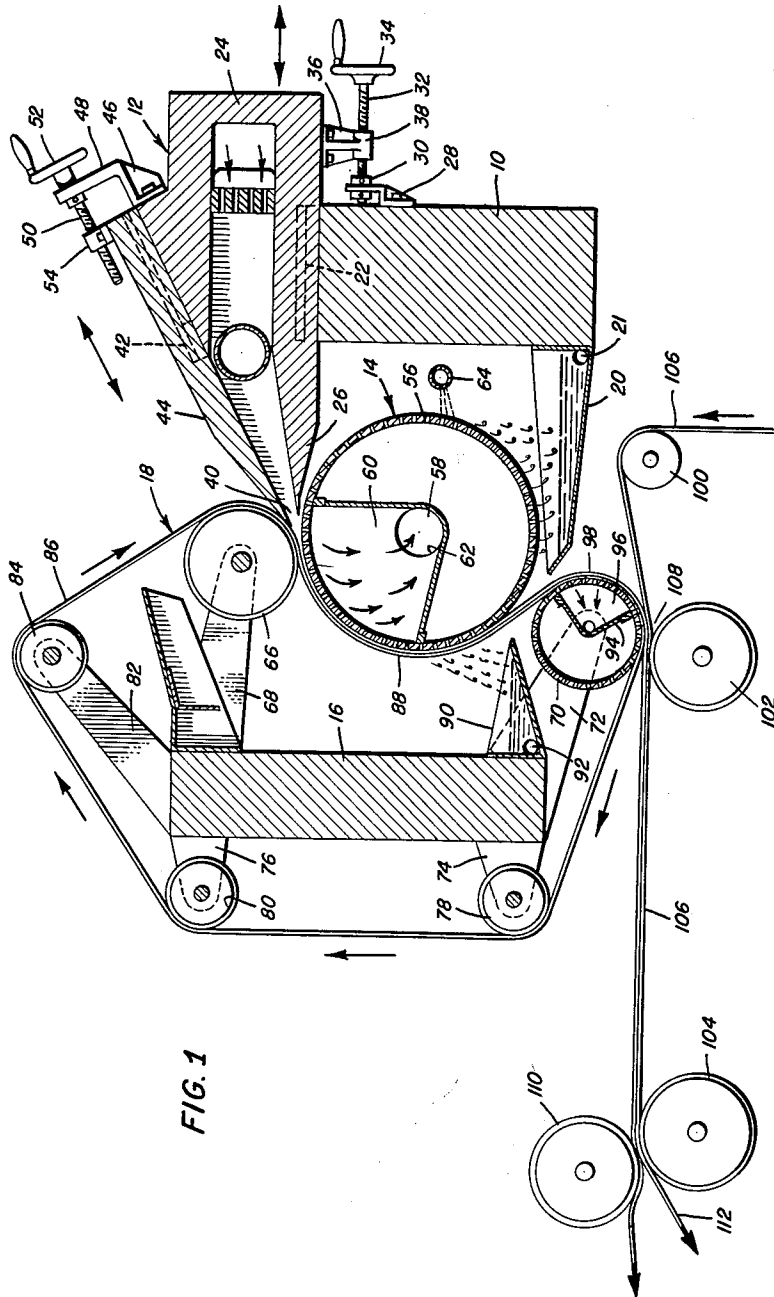


FIG. 1

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FIG. 3

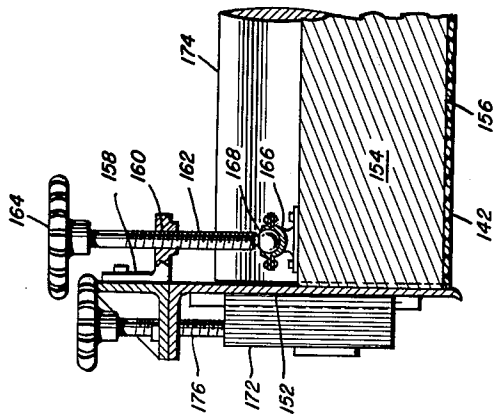
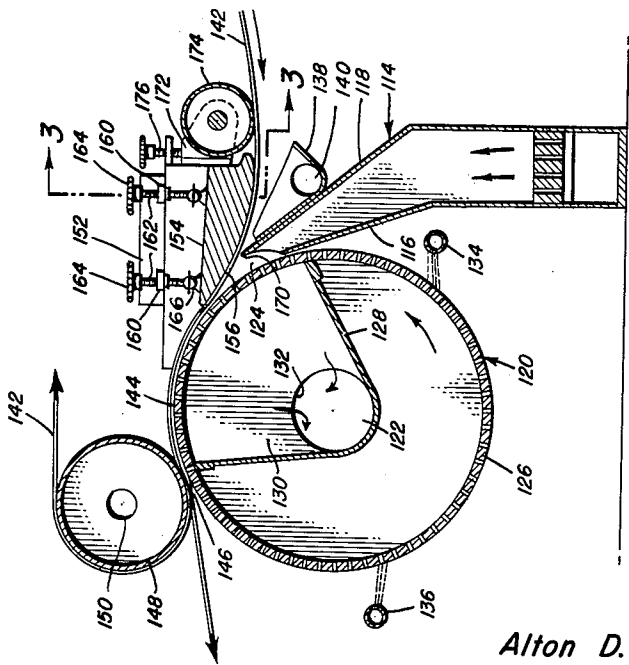


FIG. 2



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7 Claims. (Cl. 162-317)

This invention relates generally to paper making apparatus and is more particularly concerned with improvements in the apparatus for producing a continuous web of paper at a relatively rapid rate and yet maintaining a uniform quality of the product being produced, the apparatus being of the character disclosed in applicant's copending application Serial No. 117,377 filed June 15, 1961.

As is clearly disclosed in applicant's copending application, the present apparatus is of the character whereby a slurry of pulp stock can be introduced by controlled pressure into the nip of a pair of continuously moving, adjacent forming members, wherein the members include means forming a nip wherein a substantial portion of the residual water of the stock slurry is immediately removed thereat or ahead of the nip to insure that the continuous web of paper pulp material is essentially formed adjacent the nip of the adjacent forming members.

An object of the present invention is to provide an adjustable sluice whereby the sluice may be adjustable with respect to the nip of a pair of continuously moving forming discs to permit optimum control of the amount of stock directed into the paper forming nip.

Another object of the present apparatus is to provide, in apparatus of the character mentioned above, adjustable means controlling the full profile or configuration of the paper forming nip to facilitate uniform formation and control of the quality of a continuous web of paper product material being formed.

A still further object of the present invention is to provide in apparatus of the character mentioned above, cantilever beam-supported, continuously moving forming members for facilitating the maintenance and repair of the apparatus inasmuch as the cantilever beam-support members will have an open free end over which forming wires and the like may be readily removed or installed; said cantilever beam-support members being supported at the free ends thereof during operation of the apparatus.

Other objects and advantages of the present invention will become apparent on a consideration of the following specification and drawings, wherein:

FIG. 1 is a somewhat diagrammatic vertical transverse section of one embodiment of the improved apparatus;

FIG. 2 is a somewhat diagrammatic vertical and transverse section showing another embodiment of the invention; and

FIG. 3 is an enlarged vertical section taken substantially on the plane of line 3-3 of FIG. 2.

Before referring to the drawings in detail, attention is once more directed to applicant's copending application Serial No. 117,377, in which details of similar embodiments of the invention are set forth.

Referring first to FIG. 1, a cantilever beam 10 has mounted thereon adjustable sluice means indicated generally at 12. Additionally, although not shown in detail, a foraminous forming cylinder indicated generally at 14 is supported on a cantilever beam 10. Supported on a second cantilever beam 16 is a continuously moving forming means indicated generally at 18 which comprises an endless, foraminous forming wire which extends over a portion of the forming cylinder means 14. The cantilever beams 10 and 16 will be suitably supported at their

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free ends, such supports being removable for redraping forming wires to be subsequently described.

The beam 10 has projecting laterally therefrom beneath the forming cylinder means 14 a liquid receiving tray 20 including a drainage portion 21.

Reciprocally supported on the upper end of the beam 10, on suitable ways 22 is a stock inlet 24 including a lower tapered lip portion 26 extending in overlying relationship with respect to the upper outer surface of the cylinder forming means 14. The beam 10 has fixed thereto a support bracket 28 in which is journaled at 30 an elongated externally threaded adjusting screw 32 terminating in a manipulating handle 34.

The stock inlet 24 has depending from the undersurface thereof a bracket portion 36 terminating in an internally threaded sleeve 38 in which the adjusting screw 32 is received.

Rotation of the adjusting screw 32 by means of the manipulating handle 34 will result in movement of the lip portion 26 toward and away from the paper forming nip portion 40 formed at the intersection of the forming cylinder means 14 and the continuously moving forming means 18. Means will be provided to adjust the lip 26 vertically i.e. with respect to the outer surface of the cylinder means 14.

The stock inlet 24 includes an angular support surface or ways 42 upon which is reciprocally supported an independently adjustable lip element 44 disposed in overlying relationship to the lip portion 26 of the stock inlet 24. The stock inlet 24 has mounted at 46 a support bracket 48 which has journaled therein an adjusting screw 50 terminating at one end in a manipulating handle 52. The lip element 44 has extending vertically therefrom an internally threaded sleeve portion 54 through which the adjusting screw 50 extends, and rotation of the adjusting screw 50 will move the lip element 44 toward and away from the nip portion 40. In this manner, the flow of slurry into the nip portion 40 can be controlled, providing a greater or lesser degree of overflow at the terminal ends of the lip portion 26 and the lip element 44.

The cylinder forming means 14 includes a foraminous cylinder member 56 which is rotatable about its longitudinal axis 58, and which has fixed therein, within a quadrant extending substantially from the nip portion 40 in a counterclockwise direction, a suction or vacuum chamber 60, having a lateral drainage aperture 62 through which fluid will be removed from the slurry which is being substantially formed at or adjacent the nip portion 40. Liquid moves into vacuum chamber 60 due to the effect of gravity and suction forces, and also due to the tension of wire 18 which tends to squeeze the slurry of pulp discharged into the nip portion 40.

The excess of residual moisture will be received in the drainage pan 20, and overflow beneath the terminal end of the lip portion 26 will also be deposited within the drainage pan 20. The span of the vacuum chamber 60 can be extended or widened over entire span of the forming wire to be wrapped on cylinder means 14, or a second low head vacuum could be used in the portion of the cylinder means adjacent the chamber 60 to retain liquid in the surface holes of the cylinder means. The liquid will be subsequently, centrifugally discharged into pan 20.

Extending the length of the cylinder forming means 14, and projecting toward the inner surface thereof, opposite the vacuum chamber forming member 60 is an elongated perforated nozzle 64 or the like for the purpose of washing the outer surface of the foraminous cylinder member 56, the excess or drainage water also being received in the drainage pan 20.

The continuous moving forming means includes a nip roll 66, beneath which the lip element 44 terminates, the

roll 66 being mounted on suitable lateral support members 68 carried by the cantilever beam 16, a foraminous couch roll 70 substantially underlying the nip roll 66 and supported by means of support members 72 carried by the cantilever beam. Rolls 66 and 70, and those to be subsequently described, rotate on axis of rotation parallel to the axis of rotation 53 of the foraminous cylinder member 56. Supported on support members 74 and 76 and carried by the cantilever beam 16 are guide rolls 78 and 80, respectively, and journaled on a support member 82 is a stretch roll 84. Entrained over the rolls 66, 70, 78, 80, and 84 is an endless foraminous wire 86 which will be moved at substantially the same linear rate of travel as the foraminous forming member 56, and the nip roll 66 and couch roll 70 form a wrap portion 88, about the outer peripheral surface of the foraminous cylinder member 56. The forming wire 86, it will be noted, intersects or extends across the path of travel of the slurry being discharged into the nip 40. The foraminous cylinder member 56 will be rotated in the counterclockwise direction as indicated by the arcuate direction arrow, and the residual excess moisture will be discharged into the foraminous cylinder member 56 and through and exteriorly of the wrap portion 88 of the forming wire to be collected in a second drainage pan 90 disposed beneath the wrap portion 88 for drainage from a lateral drainage aperture 92. Liquid on the outer surface of the wire 86 will be centrifugally discharged into pan or tray 90 as shown.

The nip roll support 68 will be adjustable vertically so that nip roll 66 can be adjusted with respect to cylinder member 56 for varying the nip volume, and the roll 66 may have a gridded or grooved surface whereby liquid moving upwardly through the wire 86 is centrifugally cast into pan 90.

The couch roll 70 may include therein an angular vacuum chamber-forming member 94 forming a vacuum chamber 96 for removing additional moisture from the web of the paper product material formed on the outer surface of the forming wire indicated at 98.

Entrained over a guide roller 100 and pressure rolls 102 and 104 is a wire or woven felt belt 106 which is juxtaposed on the lower surface of the forming wire 98, it being noted that the pressure roll 102 engages the belt 106 adjacent point 108, and the belt passes between the outer surface of the pressure roll 102 and the lower surface of the forming wire 98. The roll 102 may be described as a transfer press roll, and the roll 104 cooperates with a web take-off roll 110, the felt continuing in its path of travel as indicated at 112.

Referring to FIGS. 2 and 3, indicated generally at 114, is sluice means including converging lip portions 116 and 118.

Indicated generally at 120 is a cylindrical forming means rotatable about the longitudinal axis 122 thereof. The cylindrical forming means forms one side of a nip portion 124 into which the lip portions 116 and 118 converge. Contained within the cylindrical forming means, which comprises a foraminous cylindrical member 126, is a fixed vacuum chamber forming member 128 forming a vacuum chamber 130 which extends from the terminal end of the lip portion 116 through approximately 90° of the interior of the foraminous cylinder member 126, the vacuum chamber having a lateral outlet 132 for removing residual water from the interior of the cylindrical forming member.

Extending the length of the cylindrical forming member and being directed toward the outer surface thereof are suitable wash water nozzles 134 and 136.

Fixed on the outer surface of the lip portion 113 of the sluice means 114 is a drainage pan 138 which includes a lateral outlet 140 for collecting excess water and pulp slurry ejected into the nip portions 124. In some cases a large percentage of the water will drain over the lip portion 118 and a relatively small percent will enter the nip 124.

Indicated at 142 is a continuous web receiving felt which includes a wrap portion 144 extending over the outer periphery of the upper portion of the foraminous cylindrical forming member 126, and intersecting the path of travel of the pulp slurry being ejected from the sluice means 114 into the nip portion 124. The trailing end of the felt 142 is engaged at 146 by a suitable couch roll 148 which is rotatable on an axis of rotation 150 parallel to the axis of rotation 122 of the cylindrical forming member 126.

Suitably supported on members 152 disposed at opposite ends of the cylindrical forming member 126 (only one of the support members being shown) is an elongated nip board 154 having an arcuate undersurface 156 beneath which the felt 142 passes. The nip board undersurface portion 156 together with the adjacent outer surface portion of the cylindrical forming member 126 form the nip portion 124, and the continuous web of paper product material will be deposited on the undersurface of the felt 142 and be substantially formed in or adjacent the nip portion 124.

The support member 152 includes a laterally extending support bracket 158 including an internally threaded portion 160 which threadingly receive adjusting screws 162 having manipulating handles 164.

The nip board 154, as seen in FIG. 3, includes a plurality of upwardly opening bearing portions 166 receiving therein a cylindrical lower end portion 168 of the adjusting screws 162. The adjusting screws 162 will permit the nip portion to be adjusted for controlling the amount of slurry which will be ejected into the nip portion 124 partially formed by the nip board.

The nip board 154 will include at opposite ends thereof suitable cheek plates (not shown) for sealing the nip portion 124. Additionally, vertical adjustment of the nip board 154 controls the spacing between the undersurface of belt 142 and the upper edge 170 of the lip portion 118 of the sluice means 114. Overflow over the edge 170 will be received in the drainage pan 138. Further, as the cylindrical forming means 120 is rotated, residual moisture in the slurry being discharged in the nip portion 124 will be removed by suction into the cylindrical forming member resulting in substantial formation of a web of endless paper product material in or adjacent the nip portion 124.

Suitably supported at the leading end of the nip board 154 on suitable support brackets 172 is an optional anti-friction roller 174 which is vertically adjusted by means of manipulating screws 176, the roller 174 extending the length of the nip board 154 and engaging the upper surface of the felt 142. The roller 174 will guide the felt into engagement with the undersurface 156 of the nip board 154, and the moisture from the slurry being deposited into the nip portion 124 will generally afford sufficient lubrication between the undersurface 156 and the felt 142.

The adjustable nip board 124 will permit different nip profiles to be formed, thus controlling the character of the continuous web of paper product material being formed. It will be readily apparent to those skilled in the art that the substantially horizontal felts 106 and 142 lend themselves for use in the formation of a multiply continuous web.

It will be obvious to those skilled in the art that various changes may be made without departing from the scope of the invention and, therefore, the invention is not to be limited to what is shown in the drawings and described in the specification, but only as defined in the appended claims.

What is claimed is:

1. In a cylinder mold-type paper product producing apparatus comprising continuously rotatable forming-cylinder means for having formed thereon a continuous web of paper product material deposited from an aqueous suspension of pulp stock, continuously movable forming

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means having a portion disposed adjacent to a portion of the outer periphery of said forming-cylinder means and forming therewith a converging nip portion, and sluice means for introducing a continuous flow of pulp stock toward said converging nip portion, at least one of said forming-cylinder means and said continuously movable forming means including a substantially free-draining portion at said nip portion for removing a substantial portion of the residual moisture from said pulp stock at said nip portion whereby the continuously produced web of paper product material is essentially formed adjacent said nip portion, said sluice means including a terminal outlet portion converging into said nip portion, said outlet portion being adjustable transversely of said nip portion for controlling the amount of pulp stock fed into said nip portion, said outlet portion comprising a pair of converging lip elements, the improvement wherein one of said lip elements is adjustably mounted for movement into and out of said nip portion, the other lip element is adjustably mounted on said one lip element and is independently adjustable into and out of said nip portion.

2. The structure of claim 1, wherein said nip portions are formed at the uppermost portions of said forming cylinder means, and drainage pans disposed beneath said forming cylinder means for receiving discharged liquid therefrom.

3. The structure of claim 1 wherein said forming cylinder means and continuously movable forming means comprises foraminous members forming said substantially free-draining portions, said continuously movable forming means comprising an endless wire wrapped in converging relationship about a portion of the outer periphery of said cylinder means, a take-off roll over which said endless wire is entrained, a pressure roll disposed beneath said take-off roll, and an endless take-off belt extending between said take-off and pressure rolls beneath said endless wires.

4. In cylinder mold-type paper product producing apparatus comprising continuously rotatable forming-cylinder means for having formed thereon a continuous web of paper product material deposited from an aqueous sus-

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pension of pulp stock, continuously movable forming means having a portion disposed adjacent to a portion of the outer periphery of said forming-cylinder means and forming therewith a converging nip portion, sluice means for introducing a continuous flow of pulp stock toward said converging nip portion, at least one of said forming-cylinder means and said continuously movable forming means including a substantially free-draining portion at said nip portion for removing a substantial portion of the residual moisture from said pulp stock at said nip portion whereby the continuously produced web of paper product material is essentially formed adjacent said nip portion, said sluice means including a terminal outlet portion converging into said nip portion, said forming cylinder means comprising a foraminous member, the improvement wherein said continuously movable forming means comprises a web-receiving felt overlying said cylinder means and converging therewith to form said nip portion, and nip board means overlying and engaging said web-receiving felt and determining the nip cross section thereat.

5. The structure of claim 4, wherein said nip board means is adjustable relative to said cylindrical forming means for controlling the cross section of said nip portion.

6. The structure of claim 5, wherein said nip board means includes anti-friction means engageable with said web-receiving felt for guiding the same into engagement with said nip board means.

7. The structure of claim 4, wherein said sluice means includes a lip portion underlying said web-receiving felt and spaced therefrom upstream of said nip portion for permitting excess fluids to pass thereover, and drainage pan means below said lip portion for receiving and carrying away said excess fluids.

References Cited in the file of this patent

UNITED STATES PATENTS

2,859,668 Berlyn Nov. 11, 1958

FOREIGN PATENTS

345,191 Great Britain Mar. 19, 1931
614,901 Canada Feb. 21, 1961