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PAPER MAKING MACHINERY

Original Filed May 31, 1941

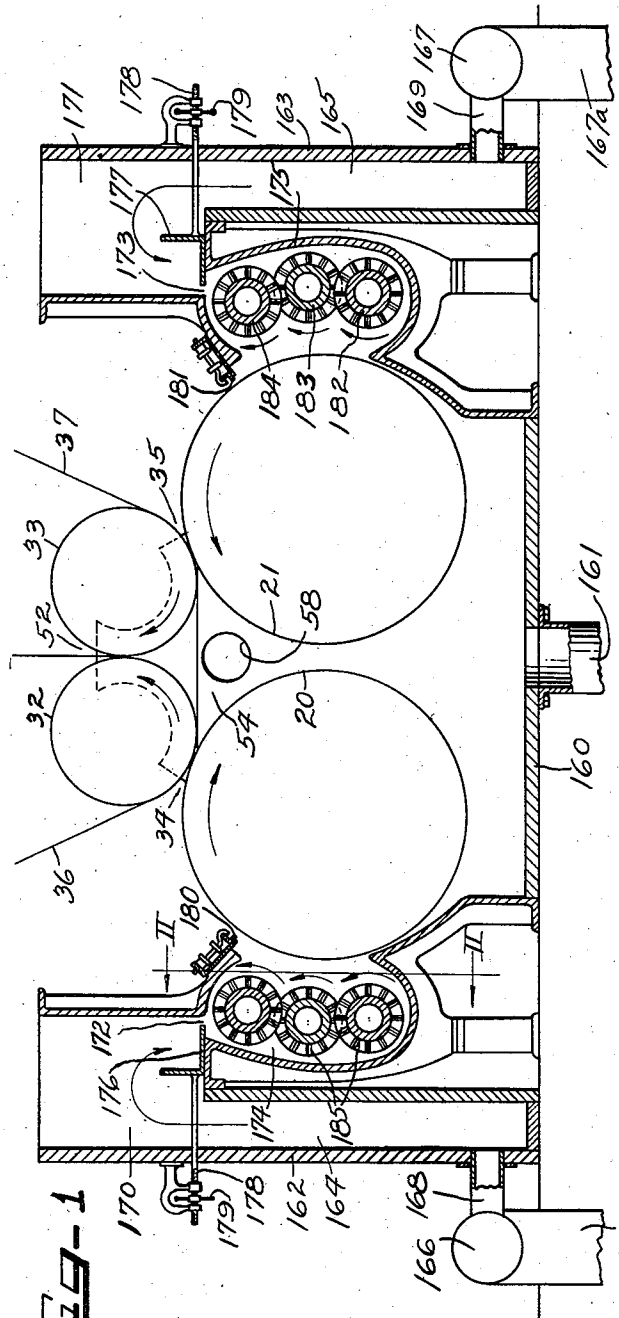


FIG-1

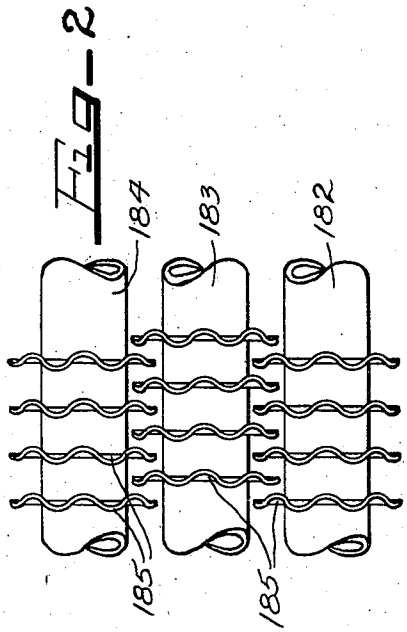


FIG-2

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PAPERMAKING MACHINERY

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3 Claims. (Cl. 92—43)

This invention relates to the creation of a circulating envelope of stock adjacent the forming surface of a paper machine to improve fiber formation in paper.

Specifically, the invention relates to machinery for and methods of improving fiber formation in paper as the paper stock is deposited onto a moving forming surface by creating, in a pond of the stock immediately adjacent the forming surface, a circulating envelope of stock with one elongated side adjacent the forming surface moving in the same direction as the forming surface.

This application is a division of a copending application filed by John E. Goodwillie and Earl E. Berry entitled: "Cylinder type paper making machines," Serial No. 396,066, filed May 31, 1941.

According to this invention, formation zones for paper machines are equipped with a series of corrugated disks which are rotated in timed relation to the speed of the machine for creating a random formation of fibers.

In one embodiment of the invention formation zones for cylinder molds are provided and a pair of opposed oppositely rotating cylinder molds are mounted in the same vat to deliver their webs to separate felts trained through the nips provided by couch rolls cooperating with the top of each cylinder mold. These couch rolls, in turn, cooperate with each other to define a common nip for both felts and webs. The felts are directed around their respective couch rolls to bring the wire sides of the webs together and, as the webs pass through this common nip, they are pressed together to form a laminated sheet or board.

The nips between the cylinder molds and the couch rolls, together with the common nip between the couch rolls seal off the space between the cylinder molds through which the exposed forming surfaces must pass after delivering their webs to the felts. This facilitates the maintenance of vacuum within the molds.

It is, then, an object of this invention to isolate the web-forming zones of cylinder-type paper making machines from the web-transfer zones of the cylinder molds.

A specific object of the invention is to provide forming areas for cylinder-type paper making machines which insure the application onto the cylinder molds of a random mixture of fibers free from fiber bundles.

A further object of the invention is to provide apparatus which creates a circulating envelope of stock adjacent a forming surface on a paper making machine to produce improved fiber formation in paper.

A specific object of the invention is to provide corrugated disks rotating in stock ponds maintained adjacent stock forming surfaces for causing the stock to circulate in the direction of travel of the forming surface.

A still further object of the invention is to provide a paper making machine with stock impellers to move the stock along an elongated path in the same direction as the movement of the forming surface of the paper making machine.

Other and further objects of the invention will be apparent to those skilled in the art from the following detailed description of the annexed sheet of drawings, which, by way of preferred example only, illustrate one embodiment of the invention.

On the drawing:

Figure 1 is a vertical cross-sectional view, with parts in elevation, of a cylinder-type paper making machine wherein forming zones for the cylinder molds are equipped with corrugated disks to effect a random distribution of fibers.

Figure 2 is a fragmentary elevational view taken along the line II—II of Figure 1.

As shown on the drawing:

As shown in Figure 1, cylinder molds 20 and 21 together with cooperating couch rolls 32 and 33 are rotatably mounted in a vat-like structure 160 having a drain outlet 161 in the bottom thereof. Pick-up felts 36 and 37 are trained around the couch rolls 32 and 33 respectively. The pick-up felt 36 travels through a nip 34 between the couch roll 32 and the cylinder mold 20 to receive the paper web from the cylinder mold 20. The pick-up felt 37 travels through the nip 35 between the couch roll 33 and cylinder mold 21 to pick up the web from this cylinder mold. The pick-up felts 36 and 37, with the webs thereon, then pass through the common nip 52 between the couch rolls 32 and 33 whereupon the wire sides or cylinder mold sides of the webs are brought together at the common nip 52. A laminated web is thus formed.

Feed boxes 162 and 163 are provided at each end of the vat 160 and define passages 164 and 165 respectively receiving stock from inlet headers 166 and 167, which headers are respectively fed from feed pipes 166a and 167a. The stock is distributed across the full widths of the passages 164 and 165 by means of a plurality of branch pipes such as 168 and 169 connecting the headers with the bottom portions of the passageways 164 and 165 respectively.

Enlarged head boxes 170 and 171 are provided at the tops of the passageways 164 and 165 re-

spectively and communicate through the passageways 172 and 173 with formation chambers 174 and 175 which respectively open onto portions of the cylinder molds 20 and 21.

The passageways 172 and 173 are controlled by gates 176 and 177 which are conveniently operated by means of rods 178 and wheels 179. The gates will control the sizes of the passageways to regulate the flow of stock from the head boxes into the formation chambers.

Slices 180 and 181 are provided at the tops of the formation chambers and can be adjusted toward and away from the cylinder molds.

Three shafts 182, 183, and 184 extend through each formation chamber 174 and 175 in spaced superimposed relation. A plurality of corrugated disks 185 are mounted in spaced parallel relation on each shaft. The disks on adjacent shafts intermesh or overlap as best shown in Figure 2, so that their peripheries just clear the surface of an adjacent shaft. The corrugations of the disks run radially outward from the centers thereof. The three shafts in each formation chamber are rotated in the same direction by driving means (not shown) timed with the speed of the machine to be operated as desired either above, at, or below the machine speed. The speed reference is to the peripheral speed of the edges of the disks as compared with the peripheral speeds of the molds.

The disks, as best shown in Figure 1, are spaced rather close to the confining sides of the formation chambers, and somewhat further from the faces of the molds. They are rotated upwardly as indicated by the arrows since the cylinder molds rotate upwardly at these points. With the formation chambers 174 and 175 filled with stock, the rotation of the shafts and disks will create a rotating envelope of stock in the confined formation chamber. The flow will be generally downward on the side remote from the molds and upward or in the mold direction on the side adjacent to the mold. When the shafts are rotated at peripheral speeds higher than that of the mold, the speed of the rotating stock envelope at the face of the mold can, if desired, be arranged to coincide with the surface speed of the mold.

As white water drains through the faces of the molds 20 and 21 from the formation chambers 174 and 175, a corresponding amount of stock will be drawn from the head boxes 170 and 171 through the regulated passageways 172 and 173. Some of this stock will pass down beside all three shafts to come to the face of the mold at its start in the formation area. Another portion of the stock will pass between the lower and middle shafts to make up the amount passing from the face of the mold toward the center of the formation area and the remaining amount of stock will pass between the upper and middle shafts. Now all parts of this stock will be completely agitated by the actions of the disks, thus breaking up fiber bundles and causing the fibers to take entirely random arrangements in the rotating envelope of stock.

The pressures in the formation areas can be regulated by varying the height of the stock in the head boxes above the entering passageways, as well as by regulating the sizes of these passageways. The white water draining through the face of the cylinder molds at the formation chambers enters into the interiors of the molds and can again drain back through the faces of the molds at the bottoms thereof into the vat chamber 160. This drain water can be removed from the vat through the drain pipe 161. In this arrangement the molds will run substantially empty or freed from white water.

The fibrous webs formed on the cylinder mold pass under the slices 180 and 181 into the nips 34 and 35 whereupon they contact the felts 36 and 37 as indicated above. The webs and felts then pass through the nips 34 and 35 and the webs follow the felts around the couch rolls 32 and 33 through the common nip 52.

End seals such as the seal shown in Figure 1 behind the couch rolls 32 and 33 can be provided to seal off a space 54 between the cylinder molds which is bridged by the couch rolls 32 and 33, and this space can be evacuated through a suction conduit 58. Alternatively, of course, the molds could be run at atmospheric pressures relying upon gravity drainage for web formation.

From the above descriptions it will be understood that the invention now provides for the rapid formation of webs under positive pressures if desired together with rapid drainage of white water through the forming surfaces. The invention also provides for the controlled handling of stock to insure thorough criss-crossed arrangement of fibers as the same are formed into webs thereby eliminating one of the main objections of cylinder-type paper making machines, which generally produce sheets having the fibers mainly lying in the machine direction.

It will, of course, be understood that various details of construction may be varied through a wide range without departing from the principles of this invention and it is, therefore, not the purpose to limit the patent granted hereon otherwise than necessitated by the scope of the appended claims.

I claim as my invention:

1. In a paper making machine having a movable forming surface and means defining a stock chamber along a portion of said forming surface, the improvements of a plurality of rows of stock impeller disks in said chamber adjacent said forming surface, the impeller disks in adjacent rows being in overlapping relation, said rows of impeller disks extending along a portion of the length of said forming surface and being effective to create an envelope of stock circulating in the chamber adjacent the forming surface, and means for driving the rows of stock impellers in the same direction whereby the overlapping relationship of the impellers will eliminate localized circulation of stock in the envelope around the axes of the impellers.

2. In a paper making machine, a movable forming wire, means defining a stock chamber along a portion of said wire to deposit stock onto the wire, a plurality of rows of corrugated disks in said chamber adjacent said forming wire, and disks in each row being in spaced relation and the disks in adjacent rows having their peripheries in overlapped relation, each corrugated disk having the corrugations thereof arranged to define radial pockets for impelling stock, and means for rotating all of said disks in the same direction to create a circulating envelope of stock in the chamber adjacent the forming wire for moving the stock in the direction of movement of the forming wire immediately before the stock is deposited onto the wire.

3. In a paper making machine having a movable forming surface and means defining a stock formation chamber on a localized portion of said forming surface, the improvement of a plurality of rotatable shafts extending in spaced relation

through said formation chamber, radially corrugated disks in spaced relation on each shaft, the peripheral portions of the disks on each shaft overlapping the peripheral portions of the disks on the adjacent shaft and said disks on adjacent shafts being in staggered relation to provide clearance between the overlapping peripheries of the disks, said shafts being rotatable in the same direction to drive the disks for creating a circulating envelope of stock in the formation chamber adjacent the localized portion of the forming surface for moving the stock at any desired speed relative to the speed of movement of the forming surface and in the same direction as the forming surface.

JOHN E. GOODWILLIE.