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PAPER MAKING MACHINE AND METHOD

Original Filed May 31, 1941

Fig-1

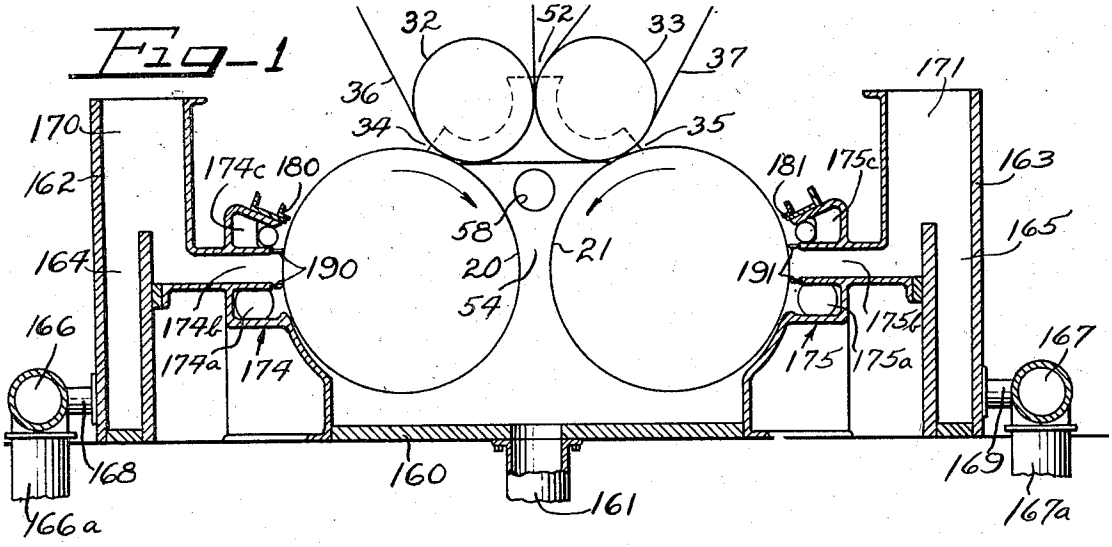
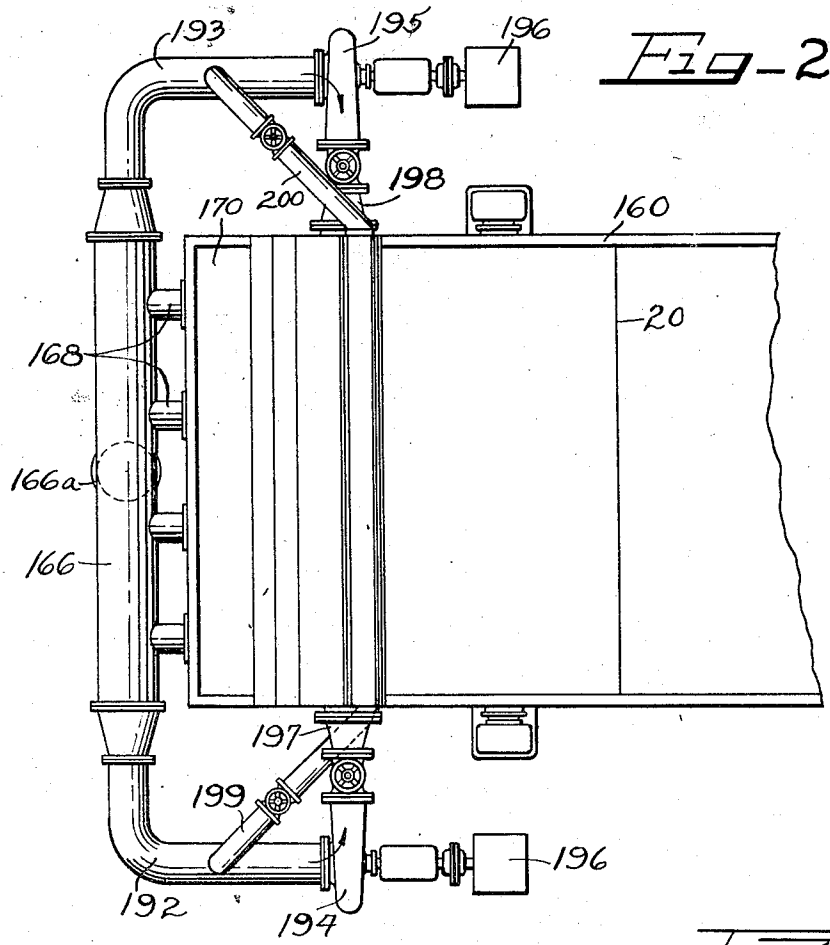


Fig-2



INVENTOR

EARL E. BERRY, DECEASED

BY WILMA E. BERRY, EXECUTRIX

by Howes & Wills Attys

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PAPERMAKING MACHINE AND METHOD

Earl E. Berry, deceased, late of Beloit, Wis., by Wilma E. Berry, executrix, Beloit, Wis., assignor to Beloit Iron Works, Beloit, Wis., a corporation of Wisconsin

Original application May 31, 1941, Serial No. 396,066. Divided and this application February 25, 1944, Serial No. 523,806

12 Claims. (Cl. 92—43)

This invention relates to paper making machinery wherein separate stock chambers communicate with a forming surface and flow stock in different directions onto the forming surface.

Specifically the invention relates to a cylinder type paper making machine including spaced opposed cylinder molds and formation zones on nonadjacent sides of the cylinder molds equipped with partition zones providing isolated compartments together with means for supplying stock to these compartments so that the stock will flow along the lengths of the cylinder molds from some of the compartments and radially onto the cylinder molds from other compartments.

The invention includes a method of making paper having improved fiber formation characteristics.

This application is a division of the John E. Goodwillie and Earl E. Berry application entitled: "Cylinder type paper making machines," Serial 396,066, filed May 31, 1941.

In accordance with this invention, a plurality of cylinder molds are arranged with a pair of transfer rolls or couch rolls defining a nip receiving the web from each mold therebetween to consolidate the webs into a single laminated sheet or board.

In a preferred embodiment of the invention 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 the 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.

The cylinder molds are equipped with formation zones on the nonadjacent sides thereof, and each formation zone is divided into three superimposed parts. The lower part of each zone receives stock flowing across the length of the cylinder mold in one direction. The top part receives stock flowing in the opposite direction. The middle part receives stock directly from the head box to flow radially onto the cylinder mold.

It is, then, an object of this invention to provide cylinder-type paper making machines with web-forming zones having different stock areas.

A further object of this invention is to provide paper making machinery with a plurality of adjacent stock chambers communicating with the forming surface of the paper machine and equipped with means for flowing the stock in opposite directions across the width of the forming surface in some of said chambers as well as means for flowing stock directly onto the forming surface from other of said chambers.

A still further object of the invention is to provide a cylinder-type paper making machine with a localized formation zone containing a plurality of stock chambers in which stock can be circulated to produce desired fiber formations on the cylinder mold.

A still further object of the invention is to provide a cylinder-type paper making machine with three superimposed stock chambers having open ends directly communicating with the cylinder molds, together with means for flowing stock in opposite directions through the top and bottom chambers along the lengths of the cylinder molds, and means for flowing stock through the middle chamber radially onto the cylinder molds.

A still further object of the invention is to provide a process of making paper with improved fiber formation characteristics produced from different streams of stock.

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, illustrates one embodiment of the invention.

On the drawing:

Figure 1 is a vertical cross-sectional view of a cylinder-type paper making machine having forming zones for the cylinder molds divided into a plurality of parts or compartments receiving stock flowing in different directions.

Figure 2 is a fragmentary top plan view of the machine shown in Figure 1.

As shown in Figure 1, the 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. The couch rolls 32 and 33 cooperate with the cylinder molds 20 and 21 respectively to define transfer nips 34 and 35 at the top portions of the molds for effecting transfer of the

webs on the molds to pick-up felts 36 and 37 respectively. As shown, the pick-up felt 36 is directed over the top of the mold 20 and around the couch roll 32. The felt 37 has a similar path and travels over the mold 21 around the couch roll 33. The couch rolls 32 and 33 have a common nip 52 therebetween receiving the felts 36 and 37 together with the fibrous webs carried by the felts. The mold-engaging sides of the fibrous webs are thus brought together by the felts 36 and 37 in the common nip 52 to form a laminated sheet.

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. The stock is received into the headers 166 and 167 from feed pipes 166a and 167a respectively and is then distributed across the full width of the passageways 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 along the entire lengths of these passages.

Enlarged head boxes 170 and 171 are provided at the tops of the passageways 164 and 165 respectively.

Formation chambers designated generally by the reference numerals 174 and 175 are provided for the cylinder molds 20 and 21 respectively. These formation chambers 174 and 175 are divided into three compartments including bottom compartments 174a and 175a, middle compartments 174b and 175b, and top compartments 174c and 175c.

The head boxes 170 and 171 communicate directly with the middle compartments 174b and 175b respectively and the top and bottom walls of these middle compartments carry slices 190 and 191 respectively extending from the ends thereof toward the cylinder molds to better isolate the compartments.

The bottom compartments 174a and 175a taper in size across the width of the chamber, being larger at one end than at the other end thereof. The top compartments 174c and 175c taper in the opposite direction as best shown in Figure 2.

The headers 166 and 167, as best shown at 166 in Figure 2, have the stock feed pipes 166a and 167a communicating with the midportions thereof, and end pipes 192 and 193 extend from the ends of the headers to pumps 194 and 195. The pumps are driven individually by means of motors such as 196. The pump 194 communicates through a valved pipe 197 with the top chamber 174c. The pump 195 communicates through a valved pipe 198 with the bottom chamber 174a. Thus, the pumps discharge into the large ends of the top and bottom chambers respectively. The small end of the bottom chamber is connected through a valved pipe 199 with the pipe 192. The small end of the top chamber 174c is connected through a valved pipe 200 with the pipe 193. Thus stock is flowed in opposite directions through the chambers 174a and 174c from the large inlet ends thereof to the small outlet ends thereof, and excess stock is removed from these outlet ends through the pipes 199 and 200 back to the pipes 192 and 193. Similar pumps and pipe connections are provided for the chambers 175a and 175c.

As a result, the top and bottom compartments of each formation chamber have streams of stock flowing in opposite directions therethrough along the full lengths of the cylinder molds. The intermediate or middle compartments 174b and 175b, on the other hand, receive stock directly from the head boxes and this stock flows radially onto the cylinder molds 20 and 21. In this manner, crossing of the fiber structure in various parts of the webs being formed on the cylinder mold as the same advance through the formation chambers is insured. Pressures in the various chambers are controlled largely by the heads of stock carried in the head boxes 170 and 171, while the cross velocity in the top and bottom chambers is controlled by the speeds of the pumps and the settings of the valves in the valved pipes.

By this arrangement, it is possible to obtain a sheet arrangement on each cylinder mold with the fibers lying at reversed angles to the lengthwise direction of the sheets in the upper and lower portions, while the formation in the center has the fibers lying substantially in the machine direction.

White water drains through the faces of the molds 20 and 21 from the formation chambers 174 and 175 and can again drain back through the faces of the molds at the bottoms thereof into the vat chamber 160. This drained white water can be removed from the vat through the drain pipe 161. In this arrangement the molds will run substantially empty. Alternatively, of course, conventional drain outlets for the cylinder molds could be provided in the side walls of the vats.

Fibrous webs formed on the cylinder molds pass under slices 180 and 181 provided on the formation chambers at the tops of the compartments 174c and 175c respectively, and, as the cylinder mold rotates, the webs are carried into the nips 34 and 35 where they contact the felts 36 and 37. The webs and felts then pass through the nips and the webs follow the felts around the couch rolls 32 and 33 through the common nip 52. The couch rolls 32 and 33 seal off a space 54 between the cylinder molds and end seals can be provided to close off the ends of this space. The space can be evacuated through a vacuum port 58, or, alternatively the molds can be run at atmospheric pressures, relying upon gravity drainage for web formation.

From the above descriptions it will be understood that the invention provides for controlled handling of stock to insure desired fiber formation in the paper produced by the machine, thereby eliminating one of the main objections of cylinder-type paper making machines, which generally produce sheets having the fibers lying mainly in the machine direction.

I claim:

1. In a paper making machine including a forming surface, the improvement which comprises means defining a plurality of adjacent stock chambers communicating directly with said forming surface, means for flowing the stock through spaced chambers in opposite directions across the width of the forming surface and in contact with said surface, and means for flowing stock directly toward and radially onto the forming surface from a chamber between said spaced chambers.

2. In a cylinder type paper making machine including a rotating cylinder mold, the improvement which comprises three superimposed stock chambers having open ends directly communicating with said cylinder mold, means for flowing stock in opposite directions through the top and bottom chambers along the entire length of the cylinder mold, and means for flowing stock

through the middle chamber radially onto said cylinder mold.

3. In a cylinder type paper making machine, the improvement which comprises a head box having three superimposed chambers in direct communication with the cylinder mold along the length thereof, a header pipe having branch pipes along the length thereof communicating with the middle chamber, end pipes on said header pipe, pumps communicating with said end pipes and with non-adjacent ends of the top and bottom chambers respectively, recirculation pipes at the ends of said top and bottom chambers remote from said pump ends, and means for supplying stock to said header pipe whereby part of the stock will flow laterally from said middle chamber onto the cylinder mold and whereby other parts of the stock will flow in opposite directions through said top and bottom chambers along the length of the cylinder mold.

4. In a cylinder type paper making machine including a pair of spaced opposed cylinder molds and means defining formation zones at nonadjacent sides of said cylinder molds, the improvements which comprise partition walls separating said formation zones into superimposed compartments, means for flowing stock in opposite directions through the top and bottom compartments along the lengths of the cylinder molds, and means for flowing stock through the intermediate compartments radially onto said cylinder molds.

5. The method of making paper which comprises depositing stock onto a rotating cylinder mold from a first isolated stream flowing in one direction along the length of the mold, depositing additional stock onto said deposited stock from a second isolated stream flowing radially onto the cylinder mold, depositing a top layer of stock onto the previously deposited layers from a third isolated stream flowing along the length of the cylinder mold in a direction opposite to said first mentioned stream, and damming off stock flow between the streams along the mold to simultaneously control the thickness of the deposited stock layers on the mold.

6. In a cylinder type paper making machine including a forming surface, the improvement which comprises means defining a plurality of adjacent stock chambers communicating with the forming surface, means for flowing stock through one of said chambers in a direction across the width of the forming surface and in communication with said surface, and means for flowing stock directly toward and onto the forming surface from another of said chambers.

7. In a paper making machine including a forming surface, the improvement which comprises means defining a plurality of stock chambers communicating with said forming surface, means for flowing stock through some of said chambers in opposite directions across the width of the forming surface, and means for flowing stock directly toward the forming surface from another of said chambers.

8. In a cylinder type paper making machine, structure defining a localized formation zone on a portion of the cylinder mold of said machine, compartments in said localized formation zone, means for flowing stock through one of said compartments parallel with the length of the cylinder mold for deposit onto the mold from a stream flowing parallel with the mold, and means for flowing stock from another of said compartments radially onto the mold.

9. The method of making paper which comprises depositing stock onto a forming surface from a first isolated stream flowing across the width of the forming surface, depositing additional stock onto said deposited stock from a second isolated stream flowing directly toward the forming surface, depositing a top layer of stock onto the previously deposited layer from a third isolated stream flowing across the width of the forming surface in a direction opposite to said first mentioned stream, and slice-gauging the thickness of each stock layer deposited on the forming surface from each stream.

10. The method of making paper which comprises depositing stock onto a forming surface from a first isolated stream flowing in one direction across the width of the forming surface, depositing additional stock onto said deposited stock from a second isolated stream flowing directly toward the forming surface, and damming off stock flow between the streams along the forming surface.

11. A head box for a paper making machine comprising means defining a stock chamber for extending across the width of a paper making machine, means for feeding stock into the bottom of said chamber, said means having a passageway for connecting said chamber directly with the forming surface of a paper machine, and means defining elongated compartments on opposite sides of said passageway for also communicating with said forming surface.

12. A paper machine head box comprising a box, a header pipe extending along the length of said box and communicating therewith for supplying stock thereto, said box having a first passageway for communicating directly with the forming surface of a paper machine, said box having compartments on opposite sides of said passageway for also communicating with said forming surface, and stock-propelling means communicating with said header for flowing stock from said header in opposite directions along the lengths of said compartments.

WILMA E. BERRY,
Executrix of the Estate of Earl E. Berry, Deceased.