

June 11, 1946.

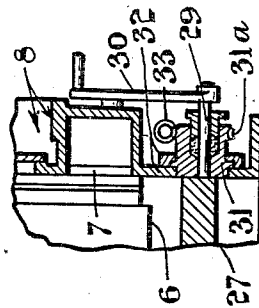
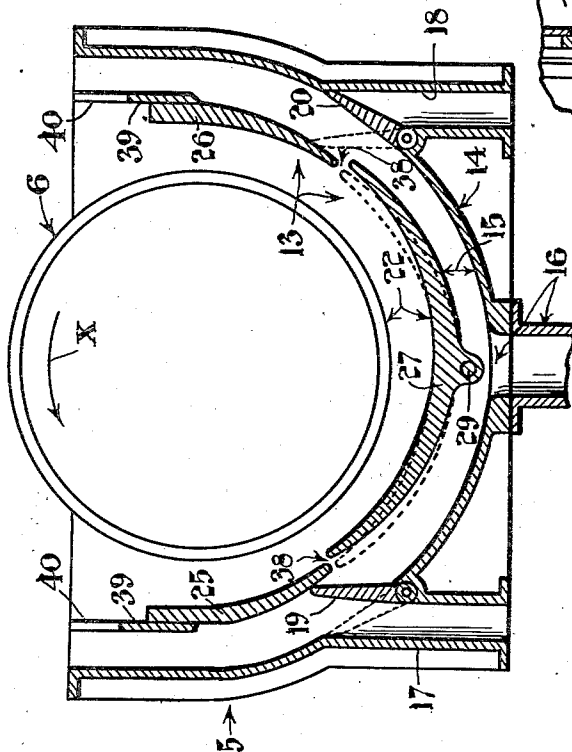
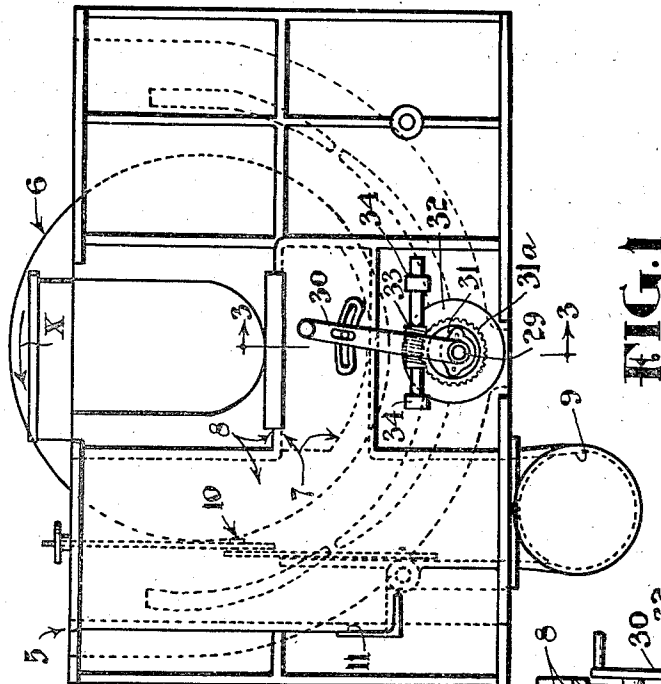
B. A. MALKIN

2,402,063

PAPER MAKING MACHINE

Filed May 4, 1942

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

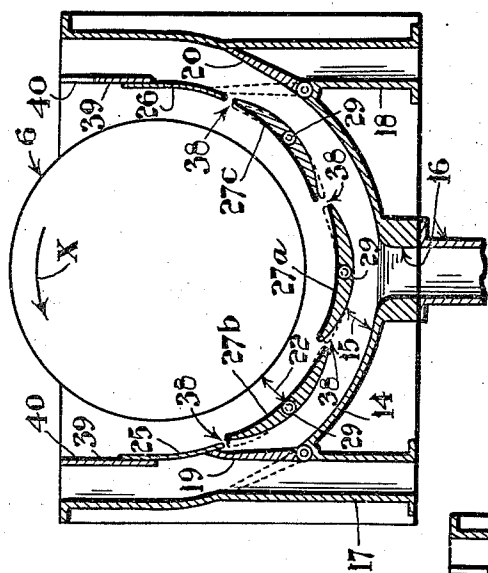


FIG. 4

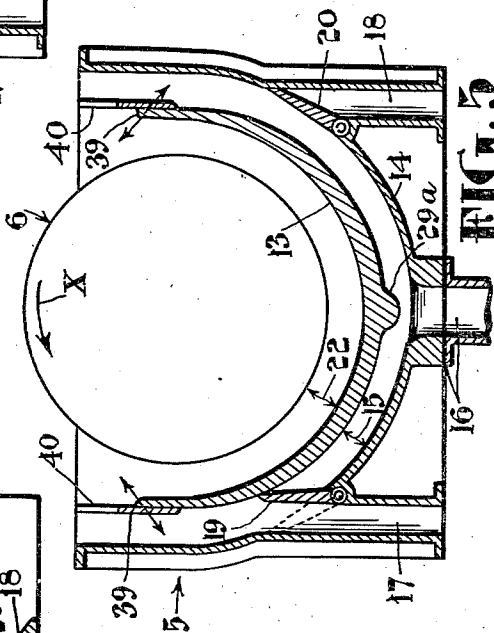


FIG. 5

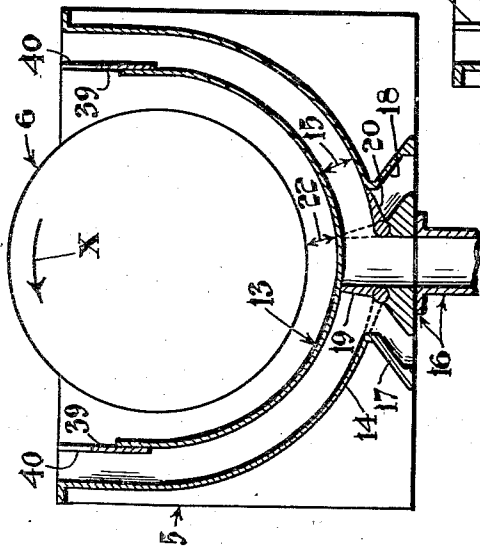


FIG. 6

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PAPERMAKING MACHINE

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11 Claims. (Cl. 92—43)

1

This invention relates to improvements in paper making machines of the cylinder mold type. The main object is the provision of a machine which is adjustable to establish the optimum relationship between all the variable factors which control the formation, weight, and other characteristics of sheets formed on said machine.

Another object is the provision of a machine which may be operated as a direct flow machine on which a wide variety of light weight sheets of exceptionally good quality formation may be made or as a counter flow machine on which a wide variety of heavy weight sheets of exceptionally good quality formation may be made.

Another object is the provision of a reversible flow machine which, when operated on the direct flow principle, is adjustable to produce either light weight or heavy weight sheets of exceptionally good quality formation at higher operating speeds than is possible with the direct flow machines now in use.

Another object is the provision of a reversible flow machine which, when operating on either the direct flow or counter flow principle, is adjustable to establish the best relationship between all the variable factors which affect the formation, weight and other characteristics desired in the finished sheet.

A more specific object is the provision of a machine provided with means of adjustment whereby the operating speed, the mold head, the consistency or freeness of the stock, and the velocity and direction of flow of the stock around the submerged or sheet forming portion of the mold, may be regulated independently or in such relation to each other to provide the optimum conditions for the production of a sheet of given formation and weight characteristics.

A further specific object is the provision of a machine in which the vat is provided with inner and outer vat circles defining an intervening approach passage through which the stock is delivered to a flow passage formed by the circle clearance reserved between the mold and the inner vat circle, suitable flow reversing valves being provided to permit operation of the machine on either the direct flow or counter flow principle.

A further object is the provision of a reversible flow machine in which the vat is provided with a fixed outer vat circle and an adjustable inner vat circle, the inner vat circle being adjustable relatively to the outer vat circle and the mold so that the velocity of flow of stock around the sheet forming portion of the mold may be so regulated in relation to the mold head, the speed of

2

the mold, and the freeness of the stock as to provide optimum conditions for the formation of the type of sheet which it is desired to produce.

Another object is the provision of a reversible flow machine of the inner and outer vat circle type in which the inner vat circle is constructed so as to permit stock to flow into the flow passage between the mold and inner vat circle at a plurality of points spaced around the submerged or sheet forming portion of the mold.

Other objects, advantages and characteristic features of the invention will be more readily understood from the following detailed description taken in connection with the accompanying drawings, in which—

Fig. 1 is an end elevation of one form of reversible paper making machine constructed in accordance with our invention.

Fig. 2 is a transverse sectional view of the machine shown in Fig. 1.

Fig. 3 is a fragmentary sectional view taken along the line 3—3 of Fig. 1.

Fig. 4 is a view similar to Fig. 2 but showing a slight modification of the inner vat circle.

Fig. 5 is a view similar to Figs. 2 and 4 but showing a further modification of the inner vat circle.

Fig. 6 is a view similar to Figs. 2, 4 and 5 but shows a still further modification of a vat circle.

Referring to the machine shown in Figs. 1 to 3 inclusive, 5 designates a pulp vat in which a cylinder mold 6 is rotatably mounted in the usual manner. Each end wall of the vat is provided with the conventional opening 7 through which white water passes from the mold 6 into a conventional spill gate chamber 8. The amount of white water thus delivered to chamber 8 is considerably greater than can be carried off by the main discharge pipe 9 so that the white water rises in chamber 8 to a level which is predetermined by the setting of the conventional adjustable spill gate 10, the excess water spilling over this gate and being discharged through a suitable overflow outlet 11.

As shown more particularly in Fig. 2, the vat 5 is constructed to provide an inner vat circle 13 and an outer vat circle 14 defining an intervening approach passage 15 provided with a pulp stock inlet opening 16 which is preferably located below the axis of rotation of the mold 6. The inlet opening 16 is flanked by outlet conduits 17 and 18, the inner ends of which communicate with approach passage 15 at some distance from inlet 16. A pivotally mounted flow controlling valve 19 is provided at the inner end of outlet

3

17 and a similar valve 20 is provided at the inner end of outlet 18. The valve 19 may be shifted from the dotted line to the full line position shown in Fig. 2 and vice versa. When valve 19 is in the dotted line position it closes off the inner end of outlet 17 and leaves unobstructed all that portion of the approach passage 15 which is located at the left of the inlet 16. When valve 19 is moved to its full line position it places the outlet 17 in communication with the left hand portion of passage 15 which is located directly above said outlet and closes off communication between the said left hand portion of the passage 15 and the remainder of said passage. Similarly the valve 20 may be shifted from the dotted to the full line position shown in Fig. 2 and vice versa. In its full line position valve 20 closes off the inner end of outlet 18 and leaves unobstructed all that portion of the approach passage 15 which lies to the right of the inlet 16. When valve 20 is shifted from the full to the dotted line position it places the outlet 18 in communication with the right hand portion of passage 15 which is located directly above the said outlet and closes off communication between the said right hand portion of passage 15 and the remaining portion of said passage. This arrangement of the valves 19 and 20 enables the machine to be operated on either the direct flow or counter flow principle, the direction of rotation of the cylinder mold 6 being indicated by the arrow X. When the machine is to be operated on the counter flow principle the valves 19 and 20 are both shifted to the full line position shown in Fig. 2. The stock admitted to the approach passage 15 through inlet 16 is prevented by the valve 19 from flowing to the left hand end of the approach passage. It therefore must flow to the right hand end of passage 15 and from thence into the right hand end of the flow passage 22 reserved between the cylinder mold 6 and the inner vat circle 13, the flow of stock around passage 22 and the submerged or sheet forming portion of mold 6 being opposite or counter to the direction of rotation of said mold. This method of operation is resorted to in cases where it is desired to increase the difference in speed between the mold and stock flow as compared with operation of the machine on the direct flow principle.

When the machine is to be operated on the direct flow principle the valves 19 and 20 are shifted from the full to the dotted line position shown in Fig. 2. In this position of the valves the stock admitted through inlet 16 flows to the left hand end of the approach passage 15 and from thence into the left hand end of the flow passage 22 so that the stock flows through the passage 22 in the same direction as the rotation of the cylinder mold 6.

The inner vat circle 13 may be constructed in various ways. In Figs. 1 and 2 it is shown as comprising fixed side sections 25 and 26 and an adjustable bottom section 27. The section 27 is mounted so that it is capable of both vertical and angular adjustment with reference to the outer circle 14, the cylinder mold 6 and the fixed inner circle sections 25 and 26. In this connection it will be noted that section 27 is provided at each end and centrally of its width with a trunnion extension 29 equipped with an operating lever 30. The trunnion extensions 29 pass through and are rotatably supported by eccentrics 31 rotatably mounted in suitable bearings 32, each eccentric being provided with a worm wheel 31a engaged by an operating worm 33 journaled in suitable bear-

4

ing brackets 34. It will thus be seen that for any given angular position of the eccentrics 31 the levers 30 attached to the trunnion extensions 29 may be turned to swing the bottom section 27 of the inner vat circle to various positions of angular adjustment about the pivotal axis afforded by said trunnion extensions and without changing the elevation of said extensions. It will also be seen that the bottom section 27 of the inner vat circle may be raised and lowered as a whole and also shifted laterally by rotating the eccentrics 31 to different positions of angular adjustment about the trunnions 29 through the agency of the operating worms 33. The main purpose in making the bottom section 27 of the inner vat circle adjustable as herein described is to enable the circle clearance between the cylinder mold 6 and the bottom portion of the inner vat circle 13 to be varied so that the velocity of flow of stock around the bottom or sheet forming portion of the cylinder mold may be regulated to suit the mold head; the speed of operation; the freeness of the stock; and the type of sheet which it is desired to form on the machine.

Another advantage obtained by angular and/or vertical adjustment of the bottom section 27 of the vat circle is that it provides flow openings 38 between the side edges of the bottom section 27 and the adjacent lower side edges of the fixed side sections 25 and 26 of the inner vat circle. This permits the stock to pass from the approach passage 15 to the flow passage 22 through flow passages located at different points around the sheet forming portion of the cylinder mold as distinguished from arrangements in which the passages 15 and 22 are in communication with each other only at the end portions thereof. The additional flow passages 38 also make it possible to provide more uniform velocity conditions around the entire sheet forming portion of the cylinder mold. Adjustable weirs 39, working in suitable guides 40, are provided at the upper edges of the inner vat circle sections 25 and 26 and may be raised and lowered through the agency of any suitable type of weir adjusting mechanism (not disclosed).

Referring to the modification shown in Fig. 4, the bottom portion of the inner vat circle 13 is divided into a plurality of independently adjustable sections designated 27a, 27b and 27c, each of which is mounted for adjustment by the same means as that described in connection with the single adjustable bottom wall sections 27 shown in Fig. 2. As compared with Fig. 2, the arrangement shown in Fig. 4 provides a greater number of intermediate flow passages 38 through which stock may flow from the approach passage 15 to the flow passage 22 at points around the sheet forming portion of the cylinder mold 6. As compared with Fig. 2 the arrangement shown in Fig. 4 also provides for a closer regulation of velocity conditions around the sheet forming portion of the cylinder mold.

According to the modification shown in Fig. 5 the entire inner vat circle is adjustable in its entirety since it consists of a single section provided centrally of its width with trunnion extensions 29a which are adjustably mounted in exactly the same manner as described in connection with the trunnion extensions 29 of Fig. 2. In this case the tilting of the inner vat circle about the pivotal axis of the trunnion extensions 29a varies the clearance between the cylinder mold and the ends of the inner vat circle as well as between intermediate portions of the mold and opposing

5

portions of the inner vat circle. Likewise, in the arrangement shown in Fig. 5, vertical adjustment of the inner vat circle varies the elevation of the adjustable weirs 39 for any particular weir setting.

According to the modification shown in Fig. 6, the inner vat circle 13 consists of a single section which is fixed in relation to both the outer vat circle 14 and the cylinder mold 6. In this case it will also be noted that the inlet and outlet connections 17 and 18 and the flow reversing valves 19 and 20 are located immediately adjacent inlet 16 instead of spaced therefrom as shown in the preceding figures.

In the operation of cylinder machines made in accordance with this invention it will be seen that the mold head may be regulated by adjustment of the spill gates 10. It will also be seen that, as regards the machine shown in Figs. 2 to 5 inclusive, the velocity of flow between the inner vat circle 13 and the mold 6 may be regulated, by appropriate adjustment of said circle, to suit any given mold speed, mold head and stock freeness or consistency. Machines constructed as disclosed in Figs. 2 and 4 are also adapted to handle a larger volume of flow owing to the provisions of the intermediate communicating passages 38 between the approach passage 15 and the flow passage 22. It may also be pointed out that adjustment of the inner vat circle to increase the area of the flow passage 22 enables the consistency of the stock to be varied while maintaining the same flow or velocity conditions around the sheet forming portion of the mold. The net result is that with machines constructed in accordance with this invention it is possible to form a wide variety of light weight and heavy weight sheets which could not previously be formed on a single machine of the cylinder mold type.

Having thus described my invention, what I claim is:

1. A cylinder paper machine comprising a vat, an inner vat-circle wall of generally cylindrical curvature in cross section extending between the end walls of the vat in spaced relation to the bottom and side walls of the vat, a cylinder mold journaled in said vat in spaced opposing relation to the inner vat-circle wall to form therewith an inner vat-circle space affording an inner flow passage connecting the ends of an outer flow passage afforded by the space between the inner vat-circle wall and the opposing bottom and side walls of the vat, the outer defining wall of said outer flow passage being provided with a stock inlet located intermediate the ends of said passage and with two stock inlets located at opposite sides of the inlet and between the latter and the ends of said passage, and a separate flow-directing valve controlling each outlet and movable across the outer flow passage from a position covering said outlet to a position blocking the portion of the outer flow passage located between said outlet and said inlet.

2. A cylinder paper machine as set forth in claim 1, in which each of said valves comprises a flap valve pivoted to the outer defining wall of said outer flow passage.

3. A cylinder paper machine as set forth in claim 1, including means mounting the inner vat-circle wall for pivotal adjustment about a pivotal axis located below the axis of rotation of the cylinder mold.

6

4. A cylinder paper machine as set forth in claim 1, including means mounting the inner vat-circle wall for vertical and angular adjustment in relation to the cylinder mold and the bottom and side walls of the vat.

5. A cylinder paper machine as set forth in claim 1, including means mounting the inner vat-circle wall for vertical and angular adjustment in relation to the cylinder mold and the bottom and side walls of the vat, said means comprising rotatably mounted eccentrics, trunnions carried by said inner vat-circle wall and journaled in said eccentrics, means for turning said trunnions relative to said eccentrics to thereby effect the aforesaid angular adjustment of the inner vat-circle wall, and means for turning said eccentrics relative to said trunnions to thereby effect the aforesaid vertical adjustment of the inner vat-circle wall.

6. A cylinder paper machine as set forth in claim 1, in which the inner vat-circle wall comprises fixed side wall sections, a separate adjustable central wall section, and means mounting said central wall section for vertical adjustment relative to the fixed side wall sections and the cylinder mold.

7. A cylinder paper machine as set forth in claim 1, in which the inner vat-circle wall comprises fixed side wall sections, a separate adjustable central wall section, and means pivotally mounting said central wall section for angular adjustment relative to the fixed side wall sections and the cylinder mold.

8. A cylinder paper machine as set forth in claim 1, in which the inner vat-circle wall comprises fixed side wall sections, a separate adjustable central wall section, and means mounting said central wall section for vertical and angular adjustment relative to the fixed side wall sections and the cylinder mold.

9. A cylinder paper machine as set forth in claim 1, in which the inner vat-circle wall comprises fixed side wall sections, a separate adjustable central wall section and means mounting said central wall section for angular and vertical adjustment relative to the fixed side wall sections and the cylinder mold, said mounting means comprising rotatably mounted eccentrics, trunnions carried by said central wall section and journaled in said eccentrics, means for turning said trunnions relative to said eccentrics to thereby effect the aforesaid angular adjustment of said central wall section, and means for turning said eccentrics relative to said trunnions to thereby effect the aforesaid vertical adjustment of said central wall section.

10. A cylinder paper machine as set forth in claim 1, in which the inner vat-circle wall comprises fixed side wall sections, a plurality of separate adjustable central wall sections, and means mounting each central wall section for vertical adjustment relative to the fixed side wall sections and the cylinder mold.

11. A cylinder paper machine as set forth in claim 1, in which the inner vat-circle wall comprises fixed side wall sections, a plurality of separate adjustable central wall sections, and means pivotally mounting each central wall section for angular adjustment relative to the fixed side wall sections and the cylinder mold.

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