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PAPER MACHINE STOCK INLET

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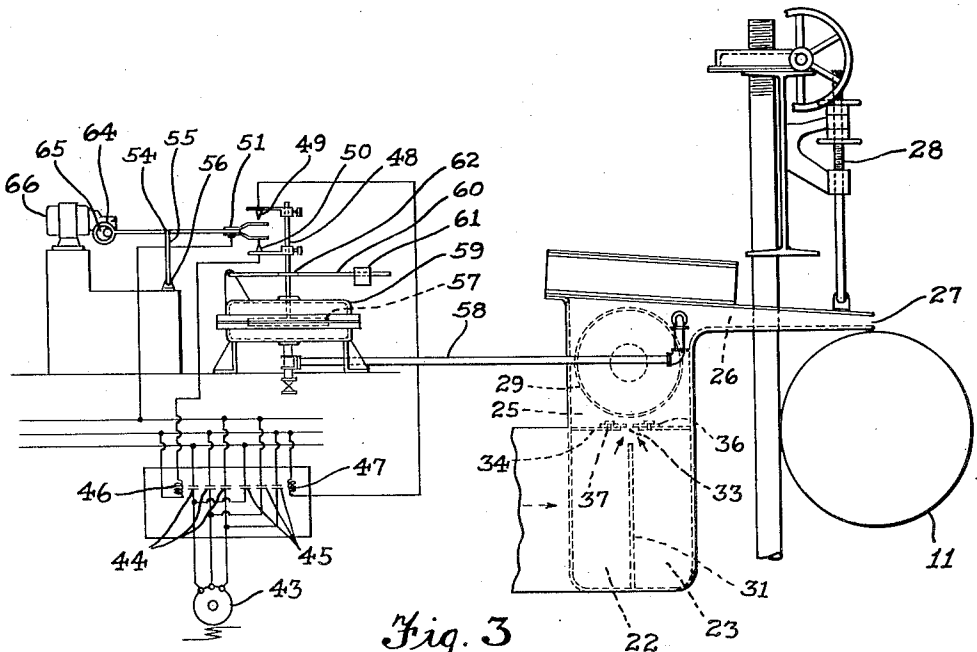


Fig. 3

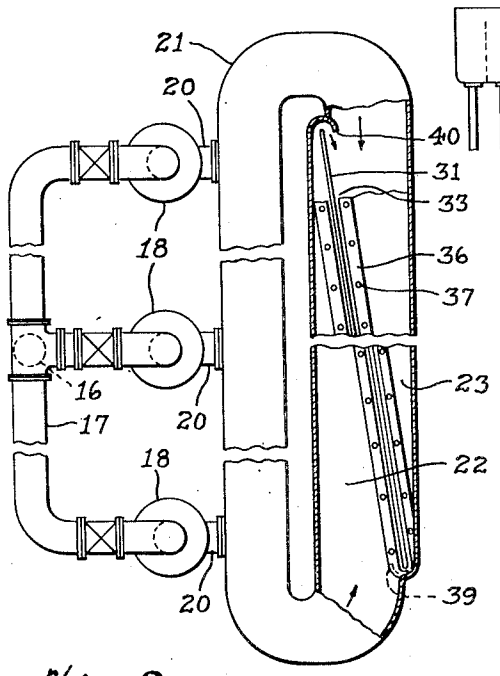


Fig. 2

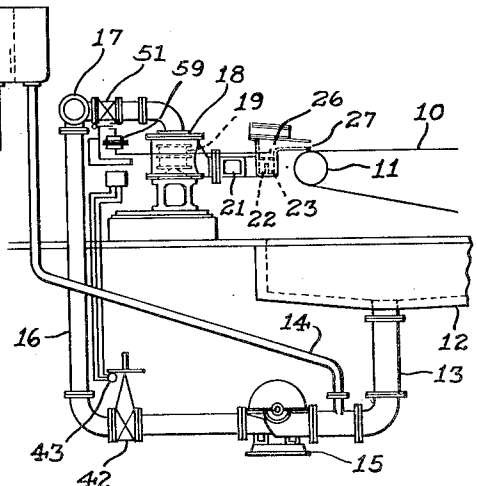


Fig. 1

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PAPER MACHINE STOCK INLET

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12 Claims. (Cl. 92—44)

This invention relates to paper making machinery, and more particularly to stock supply means therefor.

One object of the invention is the provision of a paper making machine having a stock supply means or slice passage providing an even distribution of the stock across the width of the forming wire and adapted for the supply of stock at different predetermined rates of flow.

Another object of the invention is the provision of a stock supply means for a paper making machine, providing an even distribution of the stock across the width of the forming wire, with automatic means for exactly maintaining any desired predetermined pressure in the stock supply means.

Another object of the invention is the provision of a stock supply means including a stock inlet passage which leads to the forming zone and a plurality of stock supply conduits extending transversely of the machine substantially throughout the lateral extent of the inlet passage and communicating throughout their length with the inlet passage and so arranged as to supply the stock from opposite sides of the machine with a flow through the conduits in opposed directions, providing an even distribution of the stock to the inlet passage.

Another object of the invention is the provision of an automatic regulating means for exactly maintaining a predetermined pressure condition.

Other objects and advantages of the invention will be apparent from the following description, the appended claims, and the accompanying drawing, in which

Fig. 1 is a side elevation of the supply end of a paper making machine;

Fig. 2 is a top plan view showing a portion of the stock supply devices of the machine; and

Fig. 3 is a side elevation of the stock supply end of the machine, including a diagrammatic showing of the regulating device.

Referring more particularly to the drawing, in which the preferred embodiment of the invention has been illustrated in connection with paper making machines of the Fourdrinier type, 10 designates the forming wire, arranged over the breast roll 11. The white water flowing through the forming wire is conducted to a trough or collector 12 and flows through a pipe 13, joining with new stock supplied through pipe 14 from a suitable regulator box, and flowing to a pump 15 which forces the stock up through a pipe 16 to a header 17 which communicates with a series of screening machines 18, provided with screen drums 19, and preferably of the character shown in my prior application for Letters Patent Serial No. 285,362, filed July 19, 1939.

The screened stock from the screens 18 travels through pipes 20 to spaced points along a header pipe 21 which extends transversely across the end of the Fourdrinier machine as will be apparent from Figs. 1 and 2. The pipe 21, at its opposite ends, communicates with a plurality of stock supply conduits 22 and 23, one end of the conduit 22 receiving stock from the pipe 20 at one side of the machine while the opposite end of the conduit 23 receives stock from the opposite end of the pipe 20 so that the flow through the two conduits 22 and 23 is in opposite directions, and in the general direction of the width of the machine.

The two conduits 22 and 23, as shown, are arranged side by side in a common housing structure which provides a chamber 25 having communication with both of the conduits and communicating with the stock inlet passage or slice passage 26 leading to the discharge orifice 27 through which the stock flows to the forming wire. Suitable adjusting means 28 is provided to vary the height of the orifice 27, and thus provide for the manufacture of sheets of different thickness. Within the chamber 25 is a suitable means such as a laterally vibratory system of parallel disks or plates 29 which breaks up any collection of fibre bundles, and provides a uniform distribution of stock fibers at a point just ahead of the zone of fiber application to the forming wire.

The conduits 22 and 23 are separated by a wall 31 extending substantially diagonally and providing a cross sectional taper in these two conduits, the taper being such that the axial rate of travel of stock through these conduits is about uniform throughout their length, to provide a uniform pressure of the streams injected into the chamber 25.

The flow of stock from the conduits 22 and 23 to chamber 25 takes place through a slot or orifice passage 33 in the wall 34 which provides the bottom of the chamber 25. This passage 33 extends diagonally, and above the wedge shaped top of the wall 31 so that the conduits, throughout their length, are in communication with one another just ahead of the orifice passage, and the streams of stock from the two conduits will merge and mix together as they enter the chamber 25. The flow throughout the length of the passage 33 will be uniform since the flow of stock

to the chamber 25 comes from two conduits of similar construction and opposite taper, extending transversely of the machine and receiving stock at opposite ends thereof, providing a symmetrical distribution of stock across the full width of the machine. The supply of stock to each conduit and the longitudinal travel therethrough to the passage 33 is substantially equalized and uniform. The tendency for the fibers to bunch or string together is also reduced because of the merging of the stock streams as they enter chamber 25 from the two conduits.

With a pair of supply conduits, tapering in cross-sectional area as described, and with a slot orifice of uniform width, the pressure differential across the slot orifice is the same at all points, and the discharge rate is uniform, and, furthermore, the resultant direction of flow through the orifice is parallel to the length of the sheet produced. The use of only one conduit would give an angular direction of travel as the stock emerges from the orifice. By having a common orifice for the two conduits that are supplied with stock from opposite sides of the machine the orifice width may be relatively larger than when separate orifices were to be provided, thus reducing the possibility of becoming plugged with stock.

The size of the passage 33 is preferably made adjustable, as by the provision of laterally adjustable orifice strips 36 which are held in adjusted position on the wall 34 by screws 37.

The wall 31 which separates the conduits 22 and 23 terminates at points near the ends of the conduits being slightly spaced from the wall portions of the conduits to provide a limited flow from the smaller end of each conduit into the larger end of the other conduit. At the larger end of the conduit 22 a small baffle 39 is arranged adjacent the end of the wall 31 so that the stream of stock entering the conduit 22, although of somewhat higher pressure than the stock in the smaller end of the conduit 23, will induce a small flow of stock from the smaller end of the conduit 23 in order to overcome the tendency for fibers to pack or collect in the smaller end of that conduit. A similar baffle 40 is provided for a similar purpose adjacent the other end of the wall 31, providing a restricted passage from the smaller end of the conduit 22 to the larger end of the conduit 23.

The differential pressure head of the stock at opposite sides of the opening 33 is preferably of the order of about one foot, while the pressure head on the stock at the inlet passage 26 may be several feet. This pressure at the stock inlet passage is maintained exactly constant at any predetermined or desired value by an automatic control or regulator by which pressure variations, resulting in uneven paper formation, are eliminated. As will be apparent from Figs. 1 and 3, the pressure of the stock supplied to the screens may be controlled by suitable means such as a valve 42 which throttles the flow from pump 15. The valve is operated as by means of a reversible motor 43 which, as shown, is a three-phase electric motor connected in one phase relationship when the three switches 44 are closed, and in another phase relationship, for reverse operation, when the three switches 45 are closed. Either set of switches 44 or 45 may be closed and the other set opened, peridically and temporarily, under the control of a pressure responsive device, by means including a coil 46 which, when energized, simultaneously closes the switches 44; and a second coil 47, which, when energized, simultaneously closes the switches 45. These coils 46 and 47 are selectively energized by means of a movable contact arm 48 provided with contacts 49, 50, selectively engagable with a contact arm 51 which is connected to the supply source. Contact arm 51 comprises two spring blades electrically connected together. The arm 51 is pivotally supported or fulcrumed at 54 on a swinging post 55 pivotally supported at 56. The arm 48 is fixed to a diaphragm 57 which is subjected to the pressure of the stock in the stock inlet passage through pipe connection 58. Pivotally carried on the casing 59 in which the diaphragm is arranged is a lever 60 having an adjustable weight 61, the lever 60 being pivoted at 62 to the arm 48. It will thus be apparent that the position of the arm 48 depends on the pressure in the passage 26 and may be initially set by adjustment of the weight 61 for any desired pressure which will then be automatically maintained by the temporary operation of the motor 43 which regulates the valve 42 to keep the pressure constant. By adjusting the contacts 49 and 50 towards or away from one another on the arm 48 the permissible limits of variation from a desired pressure condition can be adjusted.

The arm 51 is continuously moved through a limited path of travel towards and from the contacts 49 and 50. At one end of the arm is an eccentric strap 64 surrounding an eccentric 65. The eccentric 65 is operated continuously at a speed of the order of 20 R. P. M. by a small motor 66. This gives a small up and down movement of spring contact blades on the other end of the contact arm, providing an anti-hunting feature and preventing burning and freezing of the contacts, which will be quickly made and broken and have a slight relative sliding movement while contact is made. This prevents overcorrection and prevents any continued excess or undersupply of stock to the forming wire. Normally the continuous fluctuation of the arm 51 takes place without bringing its blades into engagement with either of the contacts 49 or 50. If the desired pressure condition changes just a little the proper contact will be made for a very short time and produce only a momentary movement of the motor 43, but with larger discrepancies in pressure the proper contact will be temporarily held closed for a longer time, and if the pressure existing is quite far from the correct value contact will be maintained continuously until the pressure approaches the desired value.

While the form of apparatus herein described constitutes a preferred embodiment of the invention, it is to be understood that the invention is not limited to this precise form of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. Stock supply means for a paper making machine comprising a stock inlet passage leading to the forming zone, a plurality of substantially parallel stock supply conduits each extending transversely of the machine substantially throughout the lateral extent of the inlet passage and each having communication substantially throughout its length with said inlet passage, said conduits tapering in cross sectional area from their supply ends to provide substantially uniform pressure distribution across the

entire width of said passage, means for supplying stock to one of the conduits at one side of the machine for flow through the conduit in one direction and for supplying stock to the other conduit at the other side of the machine for flow through said other conduit in the opposite direction.

2. Stock supply means for a paper making machine comprising a stock inlet passage leading to the forming zone, a plurality of substantially parallel stock supply conduits each extending transversely of the machine substantially throughout the lateral extent of the inlet passage and tapering in cross-sectional area from the supply ends thereof at a rate to provide a substantially uniform rate of flow into the inlet passage throughout the length of the conduit, each of said conduits having restricted communication throughout its length with said inlet passage, means for supplying stock to one of the conduits at one side of the machine for flow through the conduit in one direction and for supplying stock to the other conduit at the other side of the machine for flow through said other conduit in the opposite direction.

3. Stock supply means for a paper making machine comprising a stock inlet passage leading to the forming zone, a plurality of substantially parallel stock supply conduits each extending transversely of the machine substantially throughout the lateral extent of the inlet passage and tapering in cross sectional area from the supply end thereof, each of said conduits having restricted communication throughout its length with said inlet passage, means for supplying stock to one of the conduits at one side of the machine for flow through the conduit in one direction and for supplying stock to the other conduit at the other side of the machine for flow through said other conduit in the opposite direction, and means at the small end of each of said stock supply conduits for returning excess stock for recirculation through the conduits.

4. Stock supply means for a paper making machine comprising a stock inlet passage leading to the forming zone, a plurality of substantially parallel stock supply conduits each extending transversely of the machine substantially throughout the lateral extent of the inlet passage and tapering in cross sectional area from the supply ends thereof, means for supplying stock to one of the conduits at one side of the machine for flow through the conduit in one direction and for supplying stock to the other conduit at the other side of the machine for flow through said other conduit in the opposite direction, said conduits each having a narrow discharge orifice elongated laterally of the machine substantially throughout the lateral extent of the stock inlet passage, with the discharge orifices of the two conduits located substantially coincident for merging of the streams entering the inlet passage at the entering location.

5. Stock supply means for a paper making machine comprising a stock inlet passage leading the forming zone, a pair of substantially parallel stock supply conduits each extending transversely of the machine substantially throughout the lateral extent of the inlet passage and each having restricted communication substantially throughout its length with the inlet passage, each of said conduits tapering in cross-sectional area from the respective supply ends thereof to provide substantially uniform pressure distribution across the extent of the inlet passage, means for supplying stock under pressure to one of the conduits at one side of the machine for flow through the conduit in one direction and for supplying stock under pressure to the other conduit at the other side of the machine for flow through said other conduit in the opposite direction, and control means for adjusting the pressure head of stock at the stock inlet passage, and means responsive to pressure conditions in the stock inlet passage for automatically maintaining the stock pressure at a desired value.

6. Stock supply means for a paper making machine comprising a stock inlet passage leading to the forming zone, a plurality of substantially parallel stock supply conduits arranged side by side and extending transversely of the machine substantially throughout the lateral extent of the inlet passage and each communicating through a common laterally elongated restricted orifice with the inlet passage, said conduits tapering in cross sectional area from their supply ends and providing a uniform rate of flow to the inlet passage throughout the width of the machine, means for supplying stock to one of the conduits at one side of the machine for flow through the conduit in one direction and for supplying stock to the other conduit at the other side of the machine for flow through said other conduit in the opposite direction, and means providing restricted flow of stock from the small end of each conduit to the large end of the other conduit.

7. Stock supply means for a paper making machine comprising a stock inlet passage leading to the forming zone, a pair of substantially parallel stock supply conduits each extending transversely of the machine substantially throughout the lateral extent of the inlet passage and each having restricted communication substantially throughout its length with the inlet passage, each of said conduits tapering in cross-sectional area from the respective supply ends thereof to provide substantially uniform pressure distribution across the extent of the inlet passage, means for supplying stock to one of the conduits at one side of the machine for flow through the conduit in one direction and for supplying stock to the other conduit at the other side of the machine for flow through said other conduit in the opposite direction, control means for adjusting the pressure head of the stock at the supply side of said conduits, and means responsive to the pressure of the stock in said inlet passage for automatically operating said control means to maintain the stock in said inlet passage at constant pressure.

8. Stock supply means for a paper making machine comprising a stock inlet passage leading to the forming zone, a plurality of substantially parallel stock supply conduits each extending transversely of the machine substantially throughout the lateral extent of the inlet passage, said conduits tapering in cross-sectional area from the supply ends thereof at a rate to provide a substantially uniform rate of flow into said inlet passage throughout the length of the conduits, means for supplying stock to one of the conduits at one side of the machine for flow through the conduit in one direction and for supplying stock to the other conduit at the other side of the machine for flow through said other conduit in the opposite direction, said conduits each having a narrow discharge orifice elongated laterally of the machine substantially throughout the lateral extent of the stock inlet passage, with the discharge orifices of the two conduits located substantially

coincident for merging of the streams entering the inlet passage at the entering location.

9. In a stock inlet, a conduit box, a partition wall in said box extending diagonally between opposite ends thereof to divide the box into a pair of tapered conduits, a stock inlet pipe communicating with the wide ends of said conduits, and said partition wall terminating short of the box walls to join the narrow ends of the conduits with the wide ends whereby excess stock can recirculate between the conduits.

10. In a stock inlet, a conduit box, a partition wall in said box extending diagonally between opposite ends thereof to divide the box into a pair of tapered conduits, a stock inlet pipe communicating with the wide ends of said conduits, means defining a slot in the top wall of said box overlying said partition wall and extending in substantial alignment therewith, said partition wall terminating a short distance below the level of said slot forming a common path of flow for stock from both said conduits through said slot.

11. In a stock inlet, a conduit box, a partition wall in said box extending diagonally between opposite ends thereof to divide the box into a pair of tapered conduits, a stock inlet pipe communicating with the wide ends of said conduits, means defining a slot in the top wall of said box overlying said partition wall and extending in substantial alignment therewith, said partition wall terminating a short distance below the level of said slot forming a common path of flow for stock from both said conduits through said slot, and means for regulating the flow through said slot.

12. In a stock inlet for a paper making machine, a conduit box adapted to extend across the width of the machine, a partition wall in said box extending diagonally between opposite ends thereof and dividing said box into a pair of tapered conduits positioned adjacent each other and in direct communication with each other above said partition wall, and means forming a diagonal slot in the top of said box overlying said diagonal partition wall providing a discharge passage for the flow of stock at substantially uniform pressure throughout the extent thereof.

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