

Nov. 19, 1968

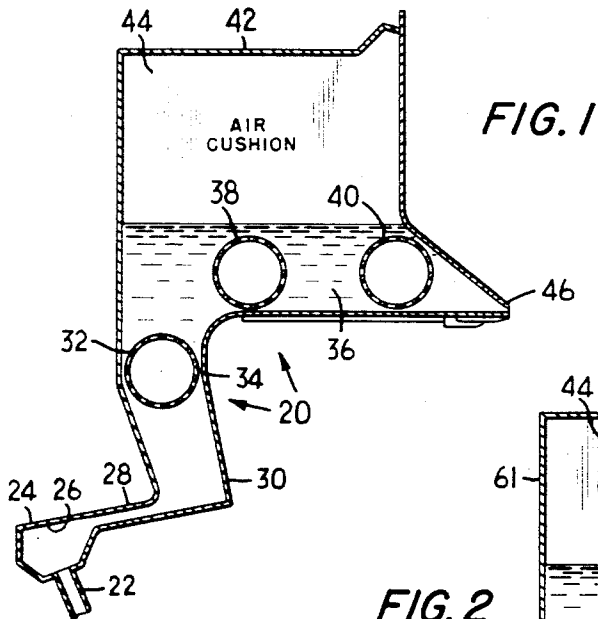
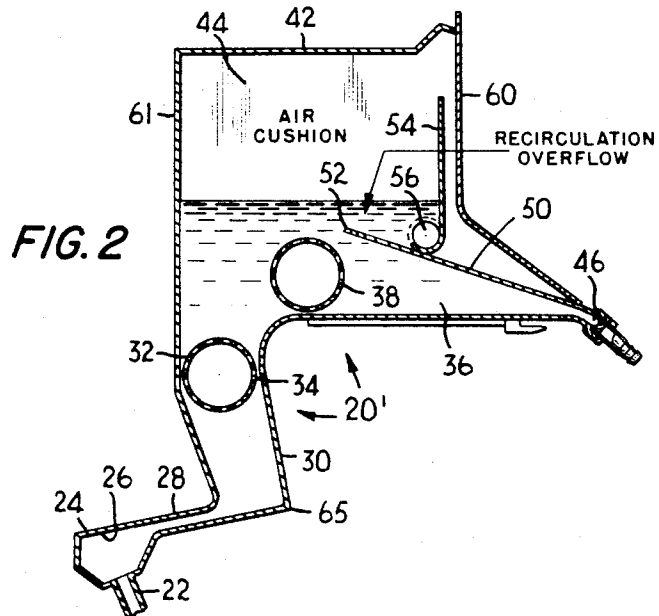
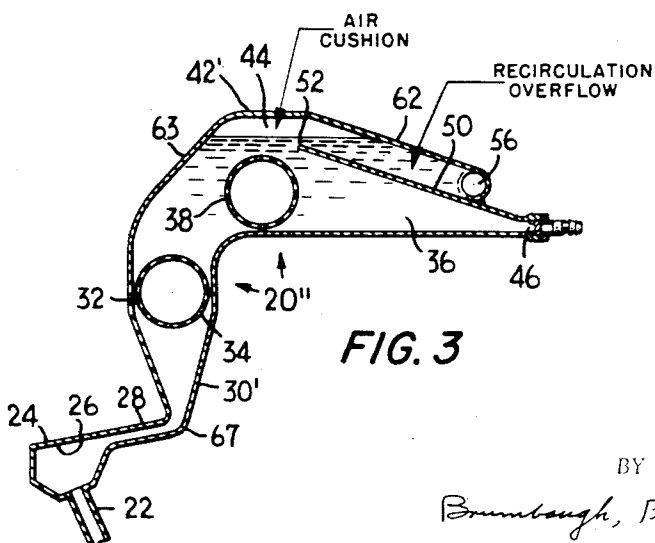
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PAPER-MAKING MACHINERY

Filed March 9, 1965

4 Sheets-Sheet 1



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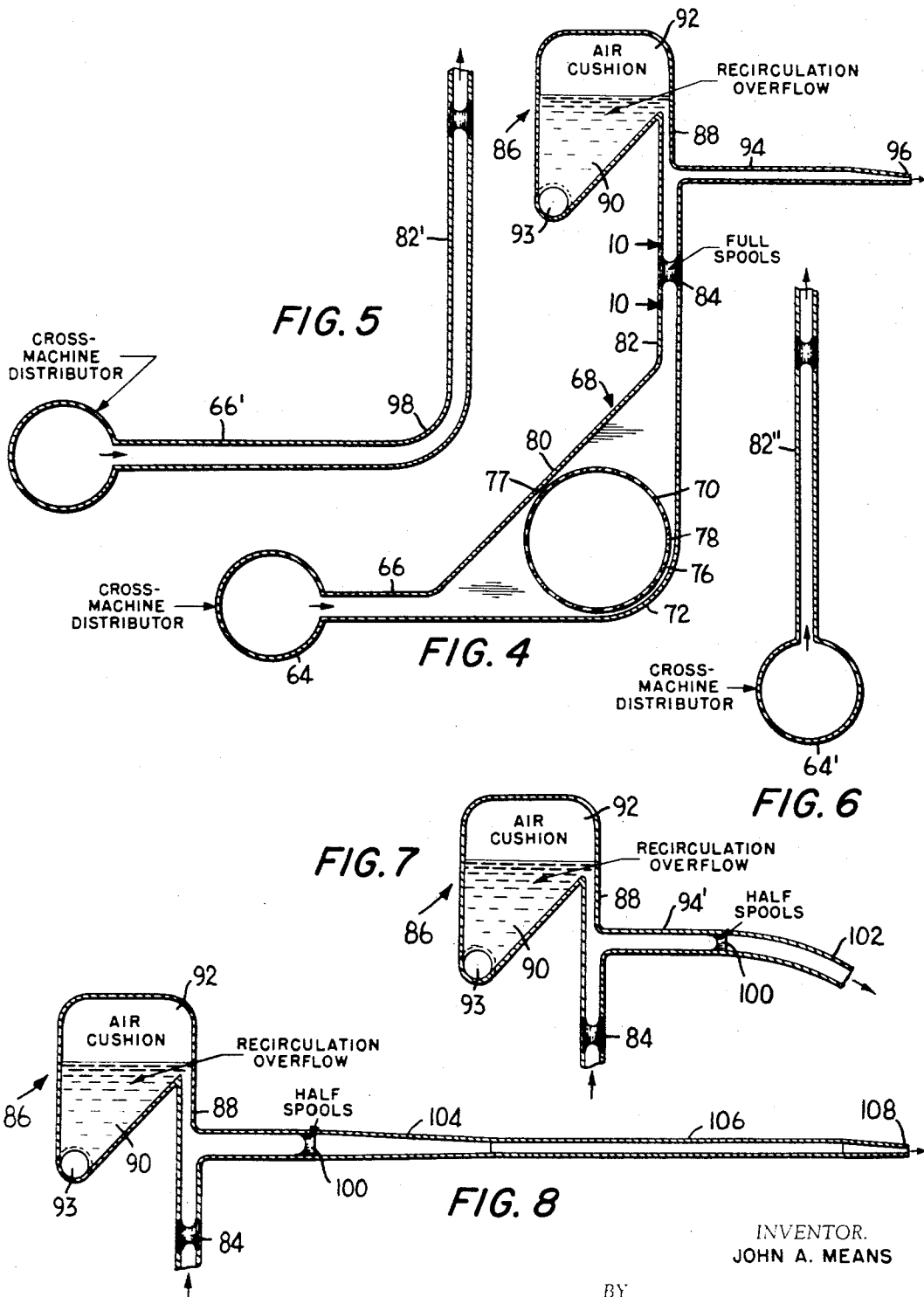
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PAPER-MAKING MACHINERY

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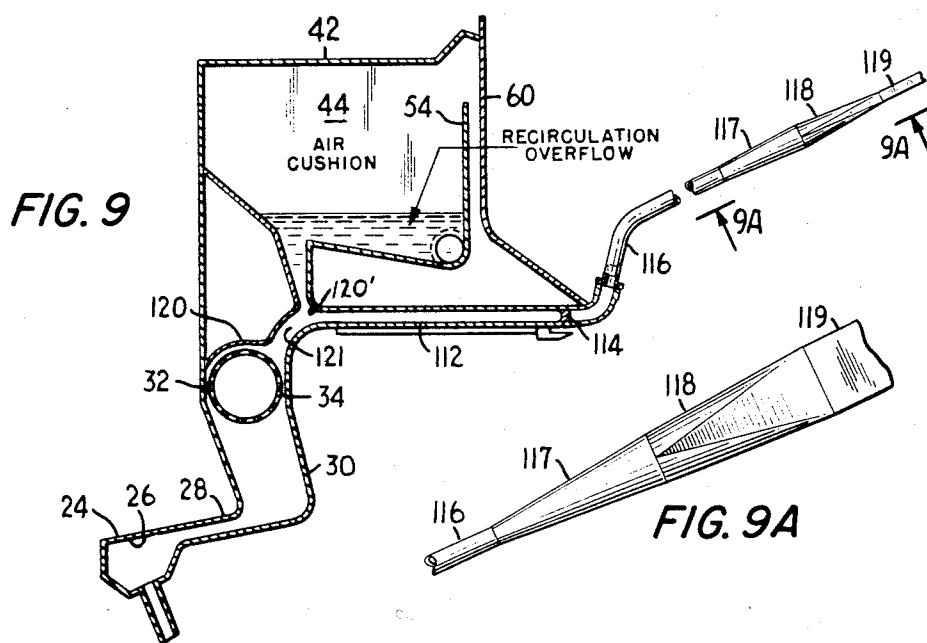
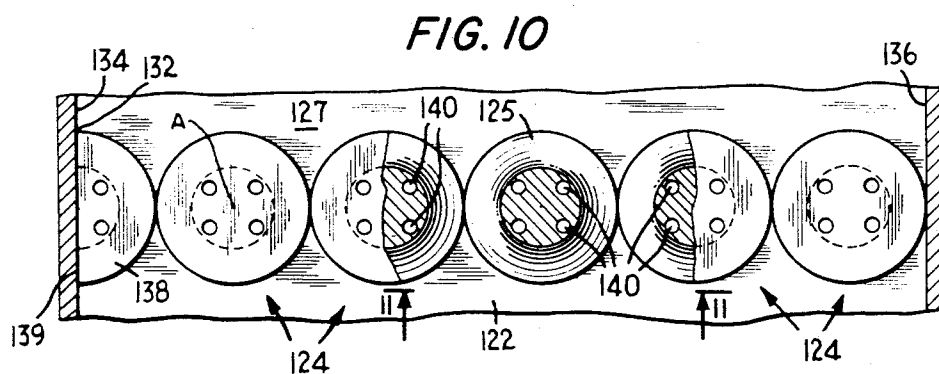
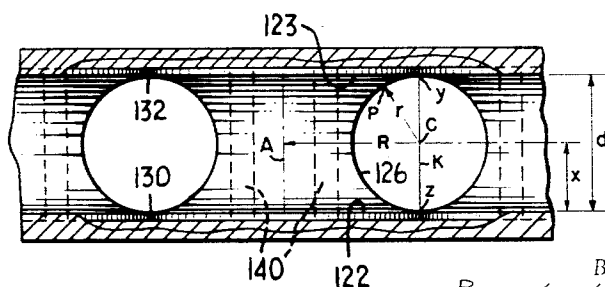


FIG. 11

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FIG. 12

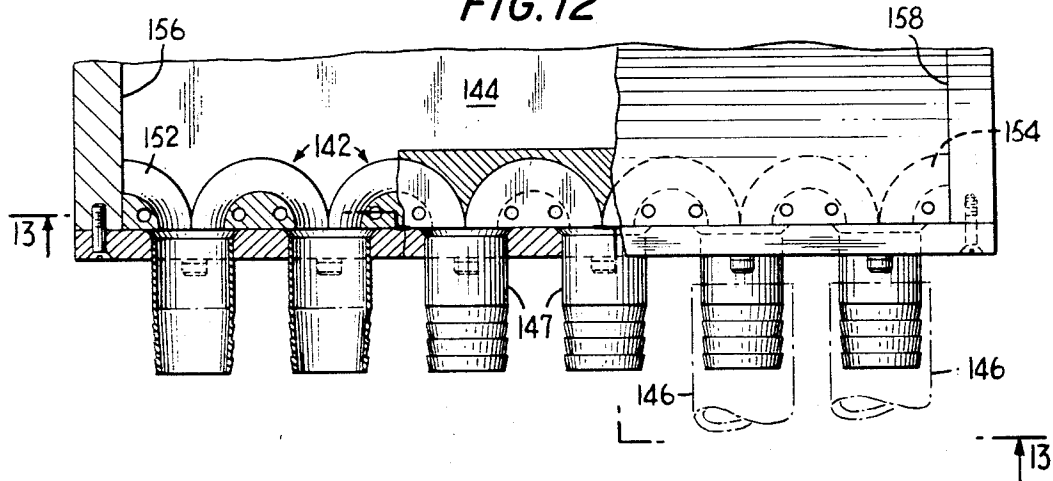


FIG. 13

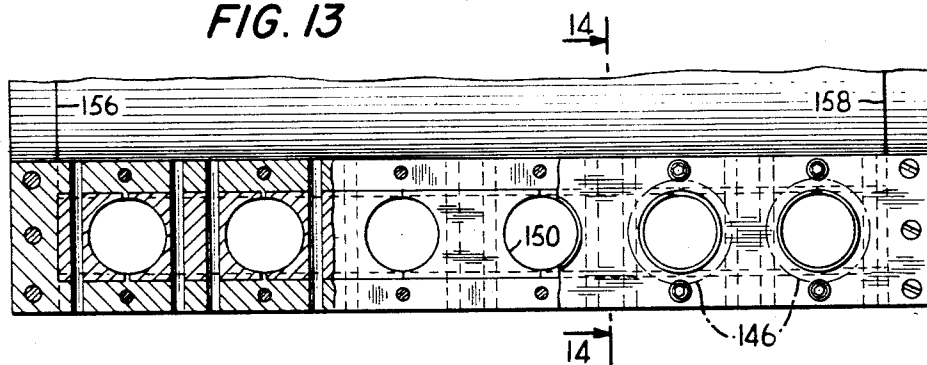
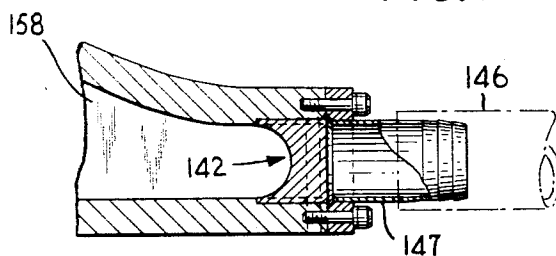


FIG. 14



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PAPER-MAKING MACHINERY

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6 Claims. (Cl. 162—212)

ABSTRACT OF THE DISCLOSURE

A paper-stock-flow system in which paper stock flows first through a flat channel and then through a plurality of parallel pipes in communication with the flat channel at the downstream end thereof is provided with spool-shaped deflocculation means in the flat channel and with rounded entrances to the pipes. The rounded entrances are shaped as portions of spools. A recirculation overflow is provided in the flow system for withdrawing the fastest-moving portion of the stock from the flow system so that the standard deviation of the speed of the portion of the stock remaining in the flow system for delivery to the wet end of a paper machine is reduced.

This invention relates to paper-making machinery and, more particularly, to a novel and highly-effective paper-making-machine flow system providing a stock flow of maximum homogeneity and uniformity of velocity at the slice and minimum tendency to "hang up."

A never-ending quest of paper manufacturers is for a stock-flow system providing at the slice of a paper-making machine a flow of deflocculated or homogeneous paper stock which is of uniform velocity from one side of the slice to the other. Another quest, no less urgent, is for a flow system adapted to accept a wide variety of paper stocks without giving rise to "hang-up" of the stock.

Numerous improvements facilitating these ends have been made, but present-day machines are still deficient in that parts of the paper stock emanating from the slice have a velocity, even in the case of the most advanced machines, substantially exceeding that of other parts of the stock. It is particularly the fastest-moving 10% to 30% or so of the stock emanating from the slice which is objectionable from the standpoint of producing detectable imperfections in the resulting web of paper. Similarly, attempts to deflocculate stock without promoting hang-up thereof have met with limited success, because these attempts are to some extent incompatible with attempts to deliver paper stock to the slice a uniform velocity from one side of the slice to the other.

An object of the present invention is to overcome the deficiencies of conventional paper-making machines pointed out above.

In particular, an object of the invention is to produce a paper-stock-flow system adapted to produce at the slice of a paper-making machine a flow of stock having a virtually uniform velocity from one side of the slice to the other. Another object of the invention is to produce a paper-stock-flow system which is adapted to deflocculate stock and guide the flow thereof and which has a minimum tendency to promote hang-up.

Certain objects of the invention are accomplished by providing, in a paper-stock-flow system for delivering a paper stock to a paper-forming machine, means for establishing a flow of paper stock in the system, various parts of the stock at a given location in the system moving at different speeds, and stock-withdrawal means at that location for withdrawing from the flow a portion of the stock to reduce the standard deviation of the speeds of the parts of the stock remaining in the flow system and to permit independent adjustments of the rate of delivery of stock

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to the flow system and the rate of delivery of stock by the flow system to the paper-forming machine.

Other objects of the invention are accomplished by the provision of a deflocculation chamber having first and second opposed walls generally parallel to each other and separated from each other a distance d and stock deflocculation means mounted between and connected to the walls, the stock deflocculation means having an axis of length d normal to the walls and extending therebetween and a peripheral surface of revolution generated by a semicircle. The semicircle has a center a distance x from the first wall and R from the axis and is a line of partial revolution generated by a point. The point is located a distance r from the center and revolved about the center through an arc of 180° . The arc lies between the axis and a limiting diametric chord of the semicircle parallel to the axis and is in the plane of the chord and axis. The semicircle described above generates the peripheral surface of the stock-deflocculation means by revolution about the axis.

An understanding of other aspects of the invention may be gained from a consideration of the following detailed description of several representative embodiments thereof, taken in conjunction with the accompanying figures of the drawings, in which:

FIG. 1 is a sectional schematic side elevation of a portion of a conventional paper-stock-flow system;

FIG. 2 is a sectional schematic side elevation of a portion of a first representative embodiment of a paper-stock-flow system constructed in accordance with the present invention;

FIG. 3 is a sectional schematic side elevation of a portion of a second representative embodiment of apparatus constructed in accordance with the invention;

FIG. 4 is a sectional schematic side elevation of a portion of a third representative embodiment of apparatus constructed in accordance with the invention;

FIG. 5 is a sectional schematic side elevation of a first modification of a lower part of the structure of FIG. 4;

FIG. 6 is a sectional schematic side elevation of a second modification of a lower part of the structure of FIG. 4;

FIG. 7 is a sectional schematic side elevation of a first modification of the upper part of the structure of FIG. 4;

FIG. 8 is a sectional schematic side elevation of a second modification of the upper part of the structure of FIG. 4;

FIG. 9 is a sectional schematic side elevation of a portion of another representative embodiment of apparatus constructed in accordance with the invention;

FIG. 9A is a view substantially along the line 9A—9A of FIG. 9 and looking in the direction of the arrows;

FIG. 10 is a view substantially along the line 10—10 of FIG. 4 and looking in the direction of the arrows;

FIG. 11 is a view taken substantially along the line 11—11 of FIG. 10 and looking in the direction of the arrows;

FIG. 12 is a detailed plan view of a portion of apparatus shown, for example, in FIG. 3;

FIG. 13 is a view substantially along the discontinuous line 13—13 of FIG. 12 and looking in the direction of the arrows; and

FIG. 14 is a view substantially along the discontinuous line 14—14 of FIG. 13 and looking in the direction of the arrows.

FIG. 1 shows a portion of a conventional flow system designated generally by the numeral 20. The flow system 20 includes a conduit 22 for carrying a paper stock. The conduit 22 communicates with an explosion chamber 24 adapted to deflocculate the stock by causing it to impinge on a flat surface 26, to acquire random agitated move-

ment of various parts thereof, and abruptly to change its overall direction of movement. The stock passes from the explosion chamber 24 through a channel 28 and a channel 30 forming an angle with the channel 28 and through a first distributing or rectifying roll 32. The distributing roll 32 is a cylindrical member provided with perforations 34 in its periphery and adapted to be rotated about its axis at a speed of 10 to 30 r.p.m. to assist in deflocculation of the stock. The stock then forms a layer or pond 36 within which are mounted a pair of distributing rolls 38, 40 similar to the distributing roll 32 for the purpose of further assisting the deflocculation of the stock. A chamber 42 above the pond 36 provides a pressure dome 44 within which compressed air is maintained for the purpose of controlling the flow rate of the stock through a slice 46.

The structure described above provides imperfectly for stock deflocculation. The requirement that all of the stock passing through the flow system 20 also pass through the slice 46 establishes the flow rate through the flow system 20 as a function of the rate at which stock emanates from the slice 46. Thus, a reduction in the latter rate necessitates a corresponding reduction in the former with the result that the velocity necessary to facilitate complete deflocculation of the stock by the distributing rolls 32, 38, and 40 and to prevent reflocculation may not be maintained.

The structure described above also provides imperfectly for uniform stock velocity at the slice 46. The fastest 10% to 30% or so of the stock emanating from the slice 46 is the most objectionable from the standpoint of producing unevenness in the flow rate of the stock across the slice from one side to the other.

FIG. 2 shows a first embodiment of apparatus constructed in accordance with the invention. The apparatus improves the conventional apparatus of FIG. 1 by eliminating, as by recirculation, a variable proportion of the stock from the flow system so that the stock-flow rate past the distributing rolls 32 and 38 is not a unique function of the rate at which stock is discharged from the slice. Parts of the apparatus of FIG. 2 are identical to corresponding parts of FIG. 1 and bear the same reference numerals. In FIG. 2, however, the distributing roll 40 has been removed and replaced by a sloping partition plate 50 having its upstream end 52 raised with respect to the slice 46 and located at an elevation approximately equal to that of the highest point of the distributing roll 38. A vertical panel 54 in the chamber 42 is connected in fluid-tight relation to the sloping partition 50, and an adjustable stock drain 56 is provided at the junction of the panels 50 and 54 to remove a variable proportion of the stock from the main stock-flow stream. The drain 56 is maintained covered by stock, so that the pressure dome or air cushion 44 is sealed. The drain 56 has sufficient capacity to remove all the stock spilling over the upper edge 52 of the partition plate 50, regardless of the speed of operation of the machine within its intended limits. Thus, the system is adapted to operate in equilibrium, the level of the water in the pond 36 being, for example, that shown in FIG. 2.

The upper edge 52 of the partition plate 50 is so disposed that substantially all of the stock not passing through the distributing roll 38 is removed from the main stock-flow stream. Preferably, the drain 56 returns the removed stock to the source of stock for recirculation.

The flow system 20' of FIG. 3 is similar to the apparatus of FIG. 2 except that portions of the apparatus of FIG. 2 rendered unnecessary by the modified design have been eliminated. Thus, the chamber 42 have been reconstituted as the chamber 42', the vertical walls 54 and 60 (FIG. 2) have been merged into a single sloping wall 62, and the vertical wall 61 has been replaced by a wall 63 sloping upwardly toward the sloping wall 62. Also, the angular junction 65 has been replaced by a rounded junction

tion 67, the channel 30' diverging markedly from the junction 67 to the distributing roll 32.

FIG. 4 shows another embodiment of the invention, in which a cross-machine distributor 64 is employed. The distributor 64 feeds the stock through a flat channel 66 and a generally prismatic chamber 68 in which is mounted a rotatable rectifier roll 70. The outer wall 72 of the chamber 68 is cylindrically curved about the axis of the rectifier roll 70. A small space 76 between the outer circumference of the rectifier roll 70 and the inner circumference of the rounded wall 72 is of sufficient size to prevent stock hang-up but small enough to ensure that substantially all of the flow is through rather than around the roll 70. The rectifier roll 70 is provided with apertures 78 to facilitate the deflocculation of the stock and the rectification of stock flow. The wall 80 of the chamber 68 opposite the cylindrically-curved wall 72 is generally flat and, in a flow system in which stock flow is changed from a horizontal direction in the section 66 to a vertical direction in the section 82, lies in a plane forming an angle of about 45° to the horizontal. A small space 77, similar in function and operation to the space 76, is left between the outer circumference of the rectifier roll 70 and the wall 80. Stock passes principally through the interior of the roll 70, the function and operation of the roll 70 being similar to those of the rolls 32, 38, and 40.

The vertical section 82 is provided with structure which for convenience may be referred to as a row of "full spools" 84. As described in detail hereinafter, the full spools 84 facilitate the deflocculation of the stock without contributing to stock hang-up.

A chamber 86 is connected by a short passage 88 with the vertical section 82. The fastest moving 10% to 30% or so of stock rising through the section 82 passes through the passage 88 and spills into a pond 90 within the chamber 86. An adjustable overflow drain 93 is provided at the bottom of the pond 90 to remove the accumulated stock and return it to the stock source for recirculation. The chamber 86 contains an air pressure dome 92 providing an air cushion to absorb surges in the stock flow and to maintain a head of pressure upon the stock in a channel 94 extending horizontally from the junction of the channels 82 and 88 toward the slice 96.

As a close approximation, the fastest moving 10% to 30% of the stock is removed from the main stockflow stream when a corresponding percentage by volume of the stock is withdrawn through the drain 93. That is because the portions of the stock having the highest velocities tend to continue in a straight line into the recirculation overflow, while the portions of the stock having lower and more nearly uniform velocities are amenable to diversion through a substantially ninety-degree bend. Thus segregated, the portions of the stock having lower and more nearly uniform velocities are directed to the slice 96.

The fragmentary structure shown in FIG. 5 is identical to that of FIG. 4 except that the chamber 68 is removed, and a channel 66' similar to but longer than the channel 66 curves through a section 98 directly into the vertical channel 82' similar to but longer than the channel 82 shown in FIG. 4. The rectifier roll 70 is thus eliminated in the structure of FIG. 5.

The structure of FIG. 6 is even simpler than the structure of FIG. 5. In the embodiment of FIG. 6, the cross-machine distributor 64' is similar to the cross-machine distributor 64 shown in FIGS. 4 and 5 but ejects the stock upwardly through a channel 82''. The horizontal channel 66' and the curved section 98 shown in FIG. 5 are eliminated in the embodiment of FIG. 6.

The embodiment of FIG. 7 is similar to that of FIG. 4 except that the upper portion of the embodiment of FIG. 7 is modified to include a row of what for convenience may be referred to as "half spools" 100 mounted in the horizontally-extending channel 94'. The half spools 100 are described in detail hereinafter. Briefly, their function is to convert the flow from a wide flat stream in the channel

94' to flow through a plurality of tubes (only one of which, a tube 102, is shown in FIG. 7) without promoting hang-up of the stock and without giving rise to unwanted variations of stock velocity across the slice.

The embodiment of FIG. 8 is identical to that of FIG. 7 but discloses a duck-bill tube 104 connected to a flat section 106 which in turn communicates with a tapering slice 108. The duck-bill tube 104, a transition piece of circular cross section at its upstream end or entrance and of rectangular cross section at its downstream end or exit, is narrower in the plane of FIG. 8 at its downstream end than at its upstream end. In plan view, however, the tube 104 is wider at its downstream end than at its upstream end. Compare, for example, FIGS. 9 and 9A.

The embodiment of FIG. 9 is similar to that of FIG. 2 but eliminates the second rectifier roll 38 and includes a flat section 112 and half spools 114 mounted at the downstream end of the flat section 112 in a transition area between the flat section 112 and tubes 116. The tubes 116 include a conically-divergent portion 117 which provides increasing cross-sectional flow area for the stock passing therethrough. The conically-divergent portion 117 communicates with a duck-bill tube 118 which is narrower in the plane of FIG. 9 at its downstream end than at its upstream end. In the plane of FIG. 9A, the tube 118 is wider at its downstream end than at its upstream end. Thus, the tapering tube 117 causes deceleration of the stock flowing therethrough, and the tube 118 converts the shape of the cross-sectional flow area from circular at the upstream end of the tube 118 to rectangular at the downstream end of the tube 118. The tube 118 is connected to a flat section 119 in which stock flowing from the various tubes 118 is united into a single stream and "quieted." The flat section 119 in turn communicates with a slice.

The embodiment of FIG. 9 further differs from that of FIG. 2 in having a stock-acceleration plate 120 and an impingement surface 120'. The stock-acceleration plate 120 curves above a substantial portion of the circumference of the roll 32 in closely-spaced-apart relation thereto to provide a restricted stock-flow channel 121 immediately adjacent to and downstream of the roll 32. The impingement surface 120' is so located with respect to the flow of stock through the channel 121 that the stock impinges on the surface 120'. This impingement serves three purposes. First, it dissipates some of the energy in the stock, thereby tending to slow some of the fastest moving parts thereof. Second, it facilitates diversion of a portion of the stock flow into the recirculation overflow, with advantageous results set forth above. Third, it facilitates deflocculation of the stock. It should be noted, in connection with this last point, that the distributing roll 32, though intended to facilitate deflocculation, to some extent facilitates flocculation. That is because the relatively large cross-sectional flow area which must prevail in the vicinity of the distributing roll 32 is a region where stock moves relatively slowly. Further, the distributing roll 32 (or any other distributing roll) may generate lumps because of its rotation. In particular, stock fibers which collect on a surface of the roll 32 when the roll is in a given orientation may break free as a conglomerate mass when the roll rotates through 180°.

The stock-acceleration plate 120 and impingement surface 120' assure that the stock is deflocculated, and the flat section 112 is of sufficiently small cross-sectional flow area to assure that reflocculation does not occur. The half spools 114, tubes 116, conically-divergent portions 117, duck-bill tubes 118, and flat section 119 facilitates the establishment of a uniform stock-flow at the slice from one side to the other.

FIGS. 10 and 11 show the whole spools 84 in detail. The spools 84 are preferably made of stainless steel for corrosion and hang-up resistance. The spools 84 constitute stock-deflocculation, stock-flow-obstruction, or stock-flow-channeling means 124 and are mounted between and

connected to a first wall 122 (FIGS. 10 and 11) and a second wall 123 (FIG. 10) spaced apart therefrom a distance d . The walls 122 and 123 and side walls 134 and 136 define a deflocculation chamber 127. Each spool 84 has an axis of length d normal to the walls 122 and 123 and a peripheral surface 125 of revolution generated by an imaginary semi-circle 126. The semi-circle 126 has a center C a distance x from the first wall 122 and R from the axis A of the spool 84. The semi-circle 126 is in turn a line of partial revolution generated by a point P which is a distance r from the center C and which is revolved about the center C through an arc of 180° extending from a point y to a point z. The arc lies between the axis A and a limiting diametric chord K of the semi-circle parallel to the axis A and is in the plane of the chord K and axis A. The semi-circle thus generated is revolved about the axis A to generate the peripheral surface of the spool 84.

Preferably, the distance d separating the walls 122 and 123 is equal to twice the radius r of the semi-circle which generates the peripheral surface of the spool 84, though it may be somewhat less than twice the radius r . In the preferred case where the distance d is exactly twice the radius r , the spool 84 is tangential along a circle at its end 130 to the wall 122 and at its end 132 to the wall 123.

The distance between the center C of the semi-circle 126 and the axis A of the spool 84, namely the distance R, is preferably equal to or greater than the distance r between the center C of the semi-circle 126 and a point P on the semi-circle.

Preferably also, the distance x between the center C and the wall 122 or 123 is equal to the radius r of the semi-circle 126.

Thus, preferably, a pair of adjacent spools 84 define between them, in a plane through the axes of the spools, a cross-sectional flow area of circular section. See FIG. 11. The cross-sectional flow area through that plane is about 27% to 50%, and preferably 30% to 35%, of the total cross-sectional area of the portion of the chamber in which the spools 84 are mounted. Accordingly, the spools 84 occupy in that plane from about 73% to about 50%, and preferably 70% to 65%, of the total cross-sectional area of the portion of the chamber in which the spools 84 are mounted. In general, the smaller the ratio of flow area to total area in that plane, the more violent the deflocculating action produced by the spools.

Fastening means such as bolts 140 passed through the stock-deflocculation means 124 facilitate tying together opposite walls of the channel in which they are mounted and hence contribute to the strength of the flow system.

At the edges 134 and 136 of the portion of the flow system containing the full spools 84, half spools may be mounted.

At the left end of the row of whole spools 84 shown in FIG. 10, a half spool 138 is illustrated. The half spool 138 is identical, except as regards its orientation, to the half spools shown in FIGS. 12 and 13. From another standpoint, the half spool 138 is identical to the half of a whole spool 84 on either side of a plane containing the axis of the whole spool 84. The half spool 138 is mounted with its flat side 139 parallel to the general direction of stock flow therepast and flush against the wall 134.

A whole spool 84 is illustrated at the right end of the row of spools shown in FIG. 10. This arrangement is preferred to the arrangement illustrated at the left end of the row of spools shown in FIG. 10, because the arrangement at the right end of the row of spools 84 shown in FIG. 10 eliminates the angular junction 132 between the half spool 138 and the wall 134 and thus further minimizes the possibility of hang-up. In the arrangement shown at the right end of the row of spools 84 of FIG. 10, the section of the right-hand flow channel in the plane of the axes of the spools 84 is of course semicircular.

In accordance with the invention, the stock is caused to flow past the stock deflocculation means 124 at a velocity sufficient to cause turbulence in the stock on passing the

stock-deflocculation means. Typically, the required velocity is at least 10 feet per second. An air cushion such as the cushion 92 (FIG. 8) and a quieting channel such as the channel 106 (FIG. 8) are employed to advantage downstream of the full spools 84 to facilitate subsidence of the turbulence.

FIGS. 12-14 show an arrangement in which half spools 142 constitute stock-flow-channeling means arranged in a row to provide a transition between a flat flow channel 144 and a plurality of tubes 146 secured to hollow fittings 147. The semicircle 150 shown in FIG. 13 is rotated not through an arc of 360°, as in the case of the full spools, but, rather, through an arc of 180° which is angularly limited by a plane substantially normal to the direction of stock flow, the arc lying upstream of the plane.

Quarter spools 152 and 154 border the edges 156 and 158 of the flow channel 144. The quarter spools 152 and 154 have a peripheral surface of revolution generated by a semicircle which is revolved about an axis through an arc of substantially 90°, the arc being angularly limited by a first plane substantially normal to the direction of stock flow and a second plane substantially normal to the first plane. The semicircle lies entirely upstream of the first plane.

The preferred relations between d , r , R , and x are the same for the half and quarter spools as for the full spools.

The full spools described above facilitate the deflocculation of stock, and the partial spools facilitate the division of stock flowing in a single wide flat channel into a plurality of separate streams. These functions are performed without promoting hang-up of the stock, inasmuch as there are no flat surfaces to produce "dead spaces" and no sharp edges to promote stapling. Further, the means disclosed herein for removing the fastest moving 10% to 30% of the stock from the stream of stock en route to the slice facilities the provision of a substantially uniform stock velocity across the slice and permits independent adjustments of the rate of delivery of stock to the flow system and the rate of delivery of stock by the flow system to the paper-forming machine.

Thus, there is provided in accordance with the invention a novel and highly-effective paper-stock-flow system adapted to provide a flow of deflocculated stock to a slice of uniform velocity across the slice and to operate substantially free of hang-up.

Many modifications in form and detail of the representative embodiments of the invention disclosed herein will readily occur to those skilled in the art. For example, the peripheral stock-contacting surfaces of the spools need not be generated by a semicircle and need not in fact be surfaces of revolution or symmetrical with respect to a plane parallel to and equidistant from the walls 122 and 123. It is sufficient that the intersections of each surface with all planes containing the axis of the spool to which such surface is proper be generally concave outward. Accordingly, the invention is to be construed as including all of the modifications which fall within the scope of the appended claims.

I claim:

1. In a paper-stock-flow system for delivering a paper stock to a paper-forming machine, first and second opposed walls facilitating formation of a flow channel therebetween and stock-deflocculation means mounted in said flow channel, said stock-deflocculation means having an axis extending between said walls and a peripheral surface in contact with said stock, the intersections of said peripheral surface with all planes containing said axis being generally concave outward.

2. In a paper-stock-flow system for delivering a paper stock to a paper-forming machine, first and second opposed walls generally parallel to each other and separated from each other a distance d , stock-flow-channeling means mounted between and connected to said walls, and

means for establishing a flow of stock in a given direction past said stock-flow-channeling means, said stock-flow-channeling means having

(I) an axis of length equal to d normal to said walls and extending therebetween, and

(II) a peripheral surface of partial revolution generated by a semicircle, said semicircle

(A) having a center a distance x from said first wall and R from said axis.

(B) being a line of partial revolution generated by a point, said point being

(1) located a distance r from said center and

(2) revolved about said center through an arc of 180°, said arc lying

(a) between said axis and a limiting diametric chord of said semicircle parallel to said axis and

(b) in the plane of said chord and axis, and

(C) being revolved about said axis through an arc of substantially 180° which

(1) is angularly limited by a plane substantially normal to said direction of flow and

(2) lies upstream of said plane.

3. In a paper-stock-flow system for delivering a paper stock to a paper-forming machine, first and second opposed walls generally parallel to each other and separated from each other a distance d , a plurality of stock-flow-channeling means mounted between and connected to said walls, and means for establishing a flow of stock in a given direction past said stock-flow-channeling means, each of said stock-flow-channeling means having

(I) an axis of length equal to d normal to said walls and extending therebetween and

(II) a peripheral surface of partial revolution generated by a semicircle, said semicircle

(A) having a center a distance x from said first wall and R from said axis,

(B) being a line of partial revolution generated by a point, said point being

(1) located a distance r from said center and

(2) revolved about said center through an arc of 180°, said arc being

(a) between said axis and a limiting diametric chord of said semicircle parallel to said axis and

(b) in the plane of said chord and axis, and

(C) being revolved about said axis through an arc of substantially 180° which

(1) is angularly limited by a plane substantially normal to said direction of flow and

(2) lies upstream of said plane

and successive ones of said stock-flow-channeling means being substantially tangent to each other to define a flow channel for said stock of substantially circular cross section in said plane.

4. Apparatus as defined in claim 3 further comprising tube means communicating with said flow channel and extending away therefrom in said direction of flow, said tube means having a cross section complementary in shape to said flow channel.

5. In a paper-stock-flow system for delivering a paper stock to a paper-forming machine, first and second opposed walls facilitating formation of a flow channel therebetween, means for establishing a flow of paper stock in said system, various parts of said stock at a given location in said system moving at different speeds, stock-deflocculation means mounted in said flow channel, said stock-deflocculation means having an axis extending between said walls and a peripheral surface in contact with said stock, the intersections of said peripheral surface with all planes containing said axis being generally concave outward, and stock-withdrawal means at said location

for withdrawing from said flow a portion of said stock to reduce the standard deviation of the speeds of the parts of said stock remaining in said flow system.

6. In a paper-stock-flow system for delivering a paper stock to a paper-forming machine, a channel for establishing a flow of paper stock in said system, said system including stock-withdrawal means for withdrawing from said flow a proportion of said stock, said means being variable to permit independent adjustments of the rate of delivery of said stock to said flow system and the rate

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of delivery of said stock by said flow system to said paper-forming machine.

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