

Nov. 11, 1958

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METHOD AND APPARATUS FOR FORMING PULP STOCK INTO A SHEET

Filed July 2, 1956

5 Sheets-Sheet 2

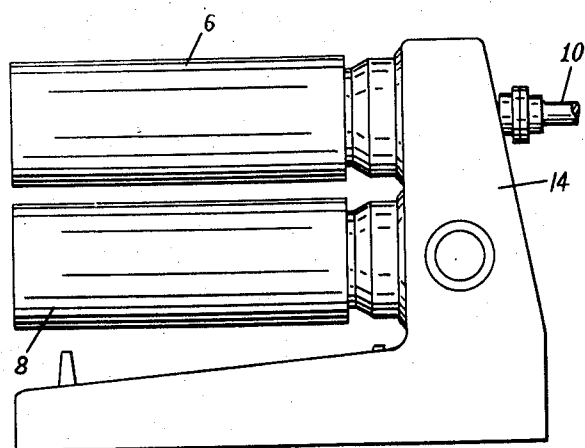


Fig 2

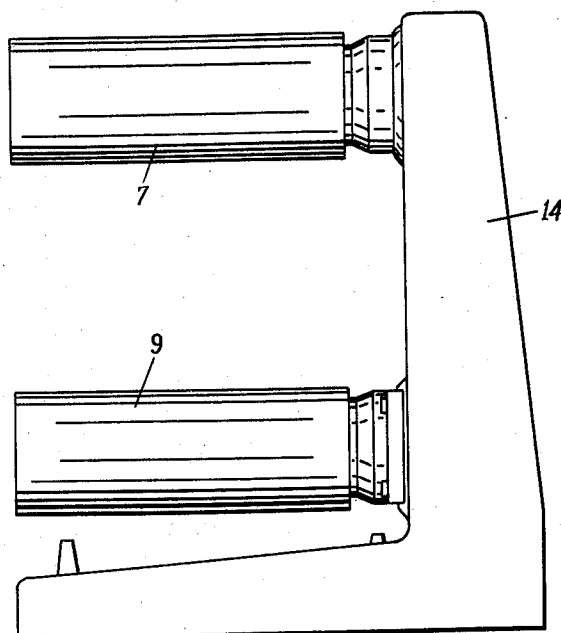


Fig 3

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5 Sheets-Sheet 3

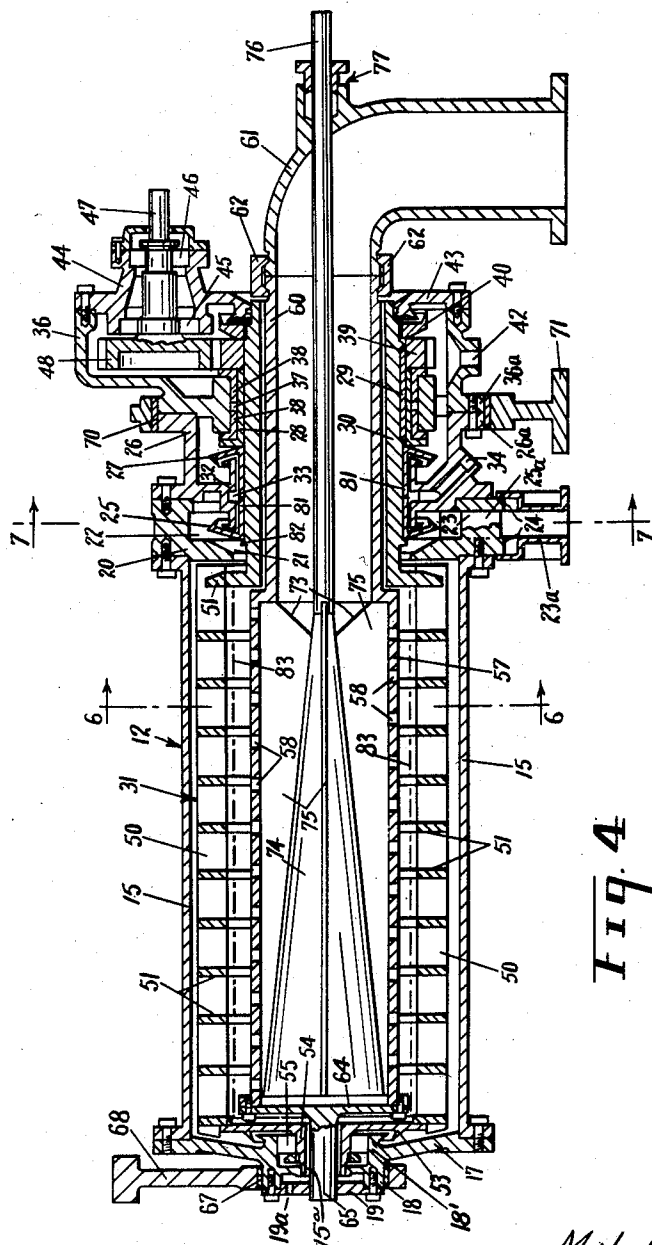


Fig. 4

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5 Sheets-Sheet 4

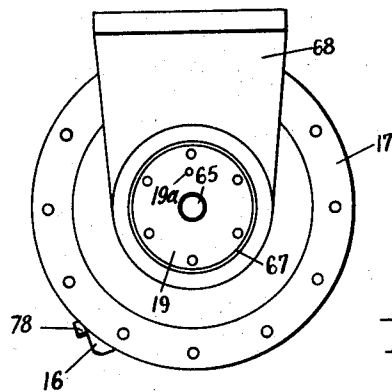


Fig. 5

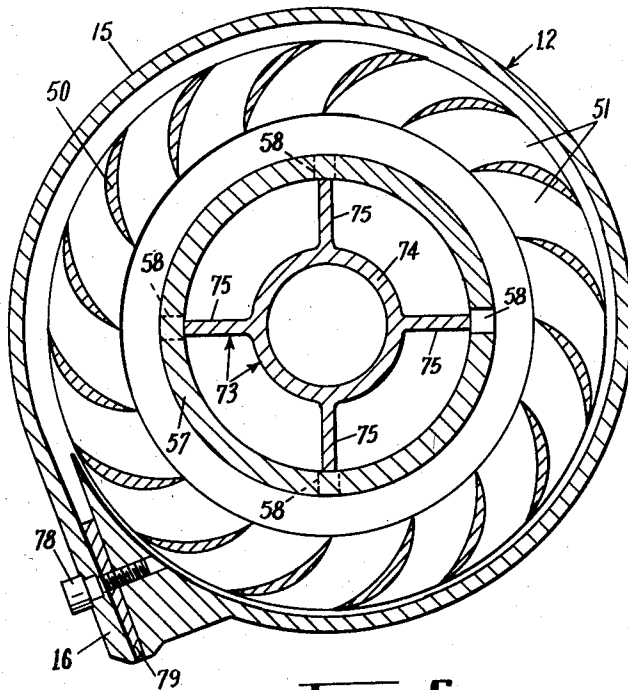


Fig. 6

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5 Sheets-Sheet 5

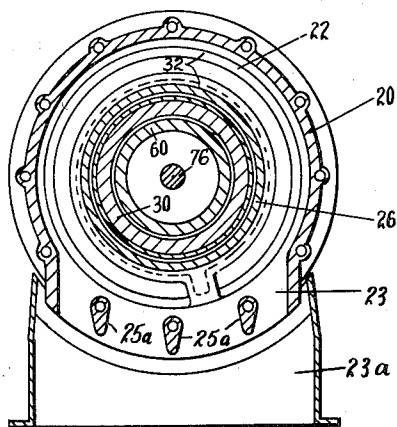


Fig. 7

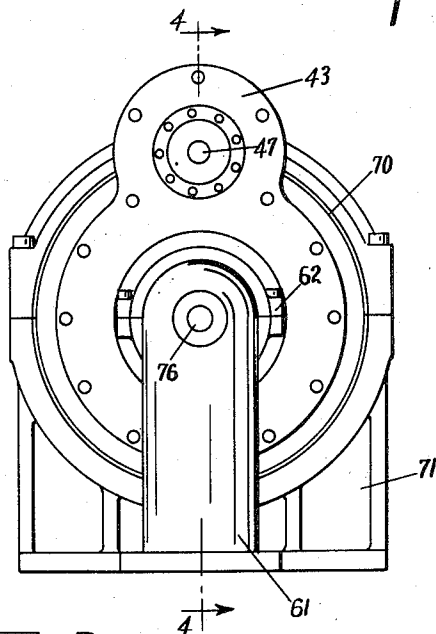


Fig. 8

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METHOD AND APPARATUS FOR FORMING PULP STOCK INTO A SHEET

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Application July 2, 1956, Serial No. 595,142

20 Claims. (Cl. 92-44)

This invention relates to the high-speed formation of pulp stock into a sheet on a travelling, foraminous, sheet-forming element such as the forming wire of a Fourdrinier machine.

In my co-pending applications Serial No. 574,741 filed March 19, 1956, and Serial No. 595,223 filed July 2, 1956, I have disclosed a radically new design of Fourdrinier section which enables the forming wire to be driven at speeds greatly in excess of the maximum practical speeds which are conceivably possible within the boundaries of traditional design philosophy.

A basic novel feature of the unconventional Fourdrinier section disclosed in my aforesaid applications is that the Fourdrinier wire is in a slack condition and travels from the breast roll to the couch roll in a curved path free of contact with friction or supporting surfaces and with the concavely curved side of the wire facing upwardly. With this arrangement wire speeds of 100 feet per second and higher are feasible since the rapid movement of the upper run of the wire through its curved path of travel results in rapid centrifuging of water from the pulp suspension through the drainage openings of the wire and drastically reduces the drainage time.

The unconventional Fourdrinier design disclosed in said co-pending applications also reduces wire wear and cost; makes possible the provision of a relatively short and narrow-width high-speed, high-output Fourdrinier section having an open-side construction which drastically reduces the time and work required for wire changing; and has other important advantages as more fully set forth in said applications.

Maximum exploitation of the high speed and other potentialities of the unconventional Fourdrinier section disclosed in my said co-pending application requires a radically new design of headbox for feeding the pulp stock onto the sheet-forming wire and the present invention has been developed to meet this requirement.

Another aspect of the present invention is that it provides a radically new high-speed method of forming an aqueous suspension of pulp stock into a sheet. Broadly stated, this method consists in establishing and maintaining a substantially tubular whirling mass of pulp stock whirling about a horizontal axis and having a central core of air of controlled diameter and continuously feeding stock tangentially from the outer peripheral portion of the whirling mass onto a sheet-forming element provided with drainage openings and travelling in a suitably curved path at a sufficiently high rate of speed to effect rapid centrifuging of water from the pulp suspension through said drainage openings. As described and illustrated in the instant application, this new high-speed sheet-forming method is the result of combining the new headbox design with the unconventional slack wire Fourdrinier section. The invention, however, contemplates the use of other forms of apparatus for carrying out the essential steps of the new sheet-forming method.

The height of a hydrostatic headbox is a square function of the slice discharge velocity. In high-speed paper

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machines this consideration led to the development of the so-called "pressure headbox," because with increasing speeds, the physical dimensions of hydrostatic headboxes became inconvenient or intolerable.

5 Contemporary headboxes for high-speed paper machines suffer from several functional defects; numerous ancillary devices are employed to offset or eliminate these inherent troubles.

10 It is a prime requirement that the stock be delivered to the Fourdrinier wire in a homogeneous state and free of entrained air. The exit velocity from the slice should be uniform over the entire span of its outlet; the stock should issue in a direction normal to the axis of the breast roll and should be entirely free of cross-flow currents, that is to say currents having components of velocity 15 parallel with the axis of the breast roll.

Various devices have been employed for the discouragement of coagulation of the fibrous content of the stock into flocs. If local coagulation takes place the flocs eventually break away from their anchorages and are carried in a stream of stock through the slice, thence on to the wire, and cause breaks in the sheet or unsaleable paper.

25 Build-up of slime or sludge on the inner surfaces of the headbox is another trouble which plagues some designs. Provided that the velocity of the stock is maintained above a certain critical value and nowhere is the system is permitted, even locally, to fall below this value then sliming does not occur.

30 Contemporary headboxes are usually designed with the foregoing, and other, considerations in mind. Priority is given to flow distribution transversely of the outlet, prevention of flocs, prevention of sliming, discouragement of vortices which would entrain air, and prevention of 35 intolerable components of cross-flow. The outcome is usually a design which is far from ideal as a pressure vessel, it is usually large and expensive, and often has a stock capacity such that, at normal operating speed, the charge it carries represents about a one-minute supply of stock.

40 For paper-making at speeds considerably above the highest contemporary practice, currently employed headbox designs are unattractive both functionally and structurally.

45 The most economical geometric form of pressure vessel for a headbox, the cylinder, does not lend itself favourably to the uniform discharge of stock from the slice if, as is customary, the pressure has been raised by an external pump and the stock fed into the headbox by 50 a pipe or pipes.

In this invention the pressure is raised in the headbox itself which is of substantially cylindrical form, by whirling the stock about the axis of the headbox shell. This is achieved by an impeller of approximately the same 55 axial length as that of the inside of the headbox shell, and having its axis parallel with the headbox axis. The stock is discharged from the headbox through a tangential slice outlet.

60 One advantage of this invention is that the discharge velocity from a slice tangential to the headbox shell is in linear relationship to the speed of rotation of the impeller. This is achieved in the following manner; provision is made to feed stock into the headbox at a rate somewhat greater than that at which it discharges from 65 the slice, a least one end of the headbox is provided with an opening concentric with the impeller, this opening acts as an annular weir over which the excess inlet stock spills, thereby establishing the diameter of the core of air in the hollow body of stock which is whirled around and against the inner surface of the headbox shell. Since the 70 diameter of the core of air in the "tube" of whirling stock is held under close control and since the pressure at the

inner periphery of the "tube" of whirling stock is always atmospheric, the pressure at any point on its outer periphery varies as the square of the R. P. M.; but the exit velocity from the slice varies as the square root of the pressure, therefore the exit velocity is a linear function of the R. P. M.

Another advantage of the invention is that the velocity of the stock everywhere in the headbox is well above the critical for sliming.

Another advantage is the elimination of radial vortices due to the whirling of the body of stock.

Another advantage is the elimination, gyroscopically, of components of cross-flow in the body of the stock.

Another advantage is the centrifugal de-aeration of the stock before it reaches the slice.

Another advantage is that the stock charge in the headbox is only about a one-second supply; this is conducive to very rapid shutdown when desired.

Another advantage is that the entire headbox lends itself to trunnion mounting for easy adjustment of the slice outlet position in relation to the breast roll.

Another advantage is that, due to its small size, efficient structure, small stock content, and consequent light weight, this headbox lends itself readily to "openside" construction; in certain arrangements this is highly desirable for quick and easy wire-changing.

Other advantages are the simple construction and low cost of a high speed headbox in accordance with this invention.

Proceeding now to a more detailed description of the invention, reference will be had to the accompanying drawings, wherein:

Fig. 1 is a schematic representation of a Fourdrinier section designed in accordance with my invention.

Fig. 2 is an elevational view of the breast roll and wire guide roll assembly schematically shown in Fig. 1.

Fig. 3 is an elevational view of the couch roll and slack adjusting roll assembly schematically shown in Fig. 1.

Fig. 4 is a longitudinal sectional view of the headbox assembly schematically shown in Fig. 1, the section being taken substantially along the section line 4—4 of Fig. 8.

Fig. 5 is an end of the headbox assembly as it appears when looking toward the end remote from the drive end.

Fig. 6 is a transverse section taken substantially along the section line 6—6 of Fig. 4.

Fig. 7 is a transverse section taken substantially along the section line 7—7 of Fig. 4.

Fig. 8 is an end view showing the drive end of the headbox assembly.

As shown in these drawings, an endless, slack, Fourdrinier wire 5 (Fig. 1) is trained around a series of horizontal rolls including breast roll 6, couch roll 7 and wire return rolls 8 and 9.

Breast roll 6 is power driven and serves to impart high-speed travelling movement to wire 5 in the direction indicated by arrow A in Fig. 1. The driving means for breast roll 6 is represented in Fig. 2 by motor driven shaft 10.

In the embodiment selected for illustration, couch roll 7 is at a higher elevation than breast roll 6 and the upper run of the slack wire travelling from the breast roll to the couch roll is in a free catenary C between these rolls and is free of contact with supporting and friction surfaces such, for example, as the table rolls and suction boxes employed in conventional Fourdrinier machines.

The aqueous suspension of pulp stock to be formed into a sheet is fed onto the concavely curved upper side of the catenary portion of the wire at the breast roll 6 and the formed wet sheet is removed from the catenary portion of the wire at the couch roll 7.

The pulp stock is fed onto the breast roll end of the forming wire by means of my improved headbox generally indicated at 12 and the formed wet sheet *s* is preferably

removed from the couch end of the wire and passed through a roll press in the manner described in my afore-said co-pending application.

The upper suspension-carrying run of the Fourdrinier wire is driven through its curved path of travel from the breast roll to the couch roll with sufficient rapidity to effect a very rapid centrifuging of water from the suspension through the drainage opening of the wire. This rapid centrifuging of the water from the suspension reduces the drainage time sufficiently to enable a Fourdrinier wire of given length to be run at very much higher speeds than is now feasible. Put in another way, the drastic reduction of drainage time afforded by this invention makes it possible to increase the operating speed while decreasing the length of the Fourdrinier wire.

The great increase in the running speed of a Fourdrinier wire which is made possible by the drastically reduced drainage time afforded by this invention can be taken advantage of to narrow the width of a Fourdrinier machine without such loss of output capacity as this would entail in the case of conventional machines. At 100 feet per second a 66-inch width newsprint machine could produce approximately 250 tons of newsprint per 24 hours and it is obvious that, if such a machine could be made appreciably shorter in overall length than present newsprint machines, attractive economies in cost of machines and buildings would be realized. The provision of such a narrow width, high-speed, high-output machine is feasible if the Fourdrinier section is designed in accordance with the principles of this invention to effect rapid centrifuging of the water from the wire-carried pulp suspension during travel thereof from the breast roll to the couch roll.

In the case of the proposed high-speed, narrow-width Fourdrinier machine such, for example, as a 66-inch newsprint machine, the permissible reduction in the lengths of the breast roll 6, couch roll 7, and wire return rolls 8 and 9 makes it feasible to provide an open-side Fourdrinier section by cantilevering the said rolls in the manner illustrated in Figs. 2 and 3. As here shown, each of the rolls is supported, on the cantilever principle, from a frame structure 14 at one side of the Fourdrinier section so that the end of each roll remote from the frame structure is free. The open-side construction, the elimination of the conventional table rolls and suction boxes, and the slack condition and narrow width of the Fourdrinier wire enable wire changes to be effected with greater ease and rapidity than has heretofore been possible.

In addition to facilitating wire changes the elimination of the conventional table rolls and suction boxes, as contemplated by the present invention, increases the useful life of the wire by reducing the frictional drag and wear thereon and also reduces the power to drive the wire.

Another advantage of the invention is that, in the embodiment shown in the drawings, the design of the Fourdrinier section is simplified and made more economical by the cantilever mounting of the rolls and by the fact that only four wire rolls are employed for moving and guiding the wire through its prescribed path of travel.

The details of mounting and adjusting the rolls 6, 7, 8 and 9 are not dealt with in the instant application since these details are fully set forth and claimed in my afore-said co-pending application Serial No. 595,223 filed July 2, 1956.

The headbox assembly 12 (Figs. 4 to 8 inclusive) includes a substantially cylindrical horizontal casing 15 provided with a full length tangential slice outlet 16. One end of casing 15 is equipped with an end cover 17 having an extended hub-like boss 18 closed by closure plate 19. The opposite end of casing 15 is equipped with an end cover 20 provided with a circular lipped opening 21 and an internal chamber 22 having an outlet passage 23 whose walls 24 are tied together by streamlined bosses 25a (Figs. 4 and 7). The circular wall portion of cover

20 defining opening 21 serves as an annular weir over which excess stock fed into casing 15, as hereinafter described, spills into chamber 22 and passes through passage 23 into waste hopper 23a. The diameter of the overflow opening 21 determines the diameter of the core of air at the center of the previously mentioned substantially tubular whirling mass into which the pulp stock is formed within the headbox casing 15 by the impeller means hereinafter described.

Cover 20 encloses a stock slinger 25 located in chamber 22 and is bolted to a casing 26 enclosing an oil slinger 27 and a combined journal and thrust flange 28 which is fastened, by key 29, to a cylindrical extension 30 of a rotary impeller 31 operating in headbox casing 15.

Casing 26 is formed with an internal wall structure 32 which serves as a dividing wall or partition between the interior of this casing and the chamber 22 of cover 20. This wall structure 32 is provided with an annulus 33 and a passage 34 through which air under pressure is fed to annulus 33 to prevent blending or commingling of the pulp stock overflowing into chamber 22 with lubricating oil supplied to casing 26.

A casing 36, bolted to casing 26, carries the bearing housing 37 for the combined journal and thrust bearings 38 which are interposed between said bearing housing and the previously mentioned combined journal and thrust flange 28 keyed to cylindrical extension 30 of impeller 31.

Casing 36 also encloses a drive gear 39 which is keyed to cylindrical extension 30 of impeller 31 by key 29. Gear 39 is clamped against the adjacent combined journal and thrust bearing 38 by a combined clamping nut and oil slinger 40 which is screwed onto the cylindrical extension 30 of impeller 31. Gear 39 thus serves as a thrust collar for said cylindrical extension 30.

Casing 36 is provided with a lubricating oil inlet 42 and a removable cover 43. Cover 43 carries the bearing housing 44 for the bearings 45 and 46 of a pinion shaft 47 which carries a drive pinion 48 meshing with and driving gear 39.

Impeller 31 includes a series of longitudinally extending impeller blades 50 which are preferably transversely curved as shown in Fig. 6 to avoid undesirable pulsation effects which could result from the use of radially disposed impeller blades of the flat paddle type. The impeller blades 50 are preferably uniformly spaced around the central horizontal axis of the impeller and are interconnected at their ends and at various intermediate points along their length by circumferentially extending blade reinforcing and stiffening webs 51.

Impeller 31 is provided at one end with an end cover 53 bolted to the adjacent blade stiffening and reinforcing webs 51. A hub extension 54 of end cover 53 is journaled in bearing 55 housed in the bore of the hub-like boss 18' carried by the closure plate 19 of headbox casing 15.

The impeller blade reinforcing webs 51 at the end of impeller 31 remote from end cover 53 are carried by the inner end of the cylindrical impeller extension 30.

The impeller blades 50 have approximately the same axial length as the inside length of the headbox casing 15. These blades are positioned relatively close to the circumferential wall of casing 15 and travel around a stationary, axially extending, cylindrical stock-distributing manifold 57 centrally located in said casing. Manifold 57 is provided with a multiplicity of openings 58 through which pulp stock supplied to the interior of the manifold passes into casing 15. The openings 58 are uniformly distributed along the length and around the circumference of manifold 57 and are staggered as shown to ensure uniform distribution of the streams or jets of stock passing from the manifold to the casing 15.

Manifold 57 is concentrically located with reference to overflow opening 21 of casing 15 and has an outside diameter less than the diameter of said opening.

One end of manifold 57 is provided with a cylindrical

pipe extension 60 of reduced diameter which extends outwardly through cylindrical extension 30 of impeller 31 and has its outer end attached to elbow 61 by split clamping ring 62. Pulp stock is fed into manifold 57 under pressure via the elbow 61 and pipe extension 60.

A closure plate 64 is bolted to the downstream end of manifold 57 and is provided with a pintle 65 which extends outwardly through the hub extension 54 of impeller end cover 53 and is supported by the closure plate 19 of the headbox end cover 17.

The extended hub-like boss 18 of headbox end cover 17 is carried in a trunnion bearing 67 in supporting bracket 68.

The contiguous flanges 26a and 36a of casings 26 and 36 are carried in a trunnion bearing 70 in supporting bracket 71.

Inside the bore of manifold 57 is a slowly rotated scraper 73 which performs the dual functions of creating a variable area for the passage of pulp stock at constant axial velocity throughout the length of the manifold and of sweeping aggregations of fibrous or other non-liquid matter from the surface of the bore of the manifold. As here shown scraper 73 includes a body portion 74 from which scraper blades 75 extend radially into scraping engagement with the surface of the bore of the manifold. The body portion 74 of the scraper is circular in cross-section and is made of gradually increasing diameter from the upstream to the downstream end to provide the aforesaid variable area for the passage of pulp stock at constant axial velocity throughout the length of the manifold. Scraper 73 is driven through the medium of a shaft 76 attached to the upstream end of the scraper and extending outwardly through a stuffing box 77 carried by elbow 61.

As shown more clearly in Fig. 6 the slice outlet 16 of headbox casing 15 is preferably provided with tie bolts 78 which pass through streamlined fairings 79.

The stock slinger 25 operating in chamber 22 and the oil slinger 27 operating in casing 26 (Fig. 4) may conveniently be formed as integral flange-like extensions of sleeve-like members 81 which are fitted on cylindrical extension 30 of impeller 31 and clamped in place between the combined journal and thrust flange 28 and an annular rib 82 formed on said cylindrical extension.

In the operation of the headbox assembly described herein the stock supplied to the substantially cylindrical headbox casing 15 via elbow 61, pipe extension 60 and manifold 57 is formed, by the rotating impeller 31, into a substantially tubular whirling mass whirling around and against the circumferential wall of the casing and having a central core of air 83 as indicated in Fig. 4 by chain-dotted lines. As previously stated the diameter of this core of air in the hollow whirling body of stock is established by the diameter of the headbox overflow opening 21 and is held under close control. The whirling tubular mass of stock thus established in the headbox casing is maintained by continuous feeding of stock from manifold 57 to the inner peripheral portion of the whirling mass. Through the medium of the tangential slice outlet 16 a high velocity stream of stock is continuously fed tangentially from the outer peripheral portion of the whirling mass onto the breast roll end of the curved rapidly travelling upper run of the Fourdrinier wire 5.

As previously stated the pulp stock is supplied to manifold 57 at a rate somewhat greater than that at which it discharges through the slice outlet 16. The rate of supply to manifold 57 via elbow 61 is regulated by the rate of overflow of stock through the headbox overflow opening 21.

The headbox described herein requires no rotary pressure seals for its bearings since the manifold 57 is stationary and the journals of the impeller 31 are of smaller diameter than the air core in the whirling mass of stock.

The velocity of the stock in the headbox, at a maximum near its contact with the substantially cylindrical shell 15,

eliminates sludging. Radial vortices and cross-flow are effectively inhibited by the whirling motion of the stock which also ensures deaeration of the stock, by centrifuging, before it reaches the slice outlet 16.

The downstream end of casing 15 is vented to atmosphere via the clearance space between hub extension 54 and pintle 65 and a vent opening 19a provided in closure plate 19. The upstream end of casing 15 is vented to atmosphere via the clearance space 15a reserved between cylinder impeller extension 30 and the pipe extension 60 of manifold 57. This venting of casing 15 provides for the escape of entrained air which migrates from the outer to the inner peripheral portion of the whirling mass of stock within the headbox casing.

The trunnion mounting of the headbox in the supporting brackets 68 and 71 provides for easy adjustment of the position of the slice outlet 16 in relation to the forming wire 5.

As shown in Fig. 1, the upwardly extending headbox supporting bracket 68 located at the open-side of the Fourdrinier section is fastened to a horizontal supporting beam 84 which lies above and clear of the upper run of the wire 5 and is carried by uprights 85 positioned outwardly of the breast roll and couch roll ends of the wire. By virtue of this arrangement, there is no obstruction of the open-side of the Fourdrinier section by the headbox supporting means.

The specific arrangement of the component parts of the Foudrinier section shown in the present drawings is intended to be illustrative rather than limiting since, in practice, various modifications of the illustrated arrangement may be referred to. For example, the extent to which the couch roll is elevated in relation to the breast roll is variable to give any desired variation of the catenary curvature of the path through which the upper run of the wire travels from the breast roll to the couch roll. The breast roll and couch roll may also be arranged with their axes in a common horizontal plane or with the breast roll positioned at a higher elevation than the couch roll. The headbox may be provided with an overflow opening at each end thereof and the pulp stock may be fed axially into both ends of the manifold 57 by duplicating the arrangement described for feeding the stock into one end of the manifold or in any other desired manner. When the stock is fed into both ends of the manifold 57, the body 74 of the scraper 73 may, if desired, be made of gradually increasing diameter from both ends toward the centre to provide for constant axial velocity at all points along its path of flow through the manifold. These and other modifications are within the scope and spirit of the invention as claimed herein.

What I claim is:

1. A method of forming an aqueous suspension of pulp stock into a sheet which comprises establishing and maintaining a substantially tubular whirling mass of stock of controlled radial thickness whirling about a central axis and having a central core of air of controlled diameter and continuously feeding stock tangentially from the outer peripheral portion of the whirling mass onto a travelling sheet-forming element provided with drainage openings and travelling at such a high rate of speed and in a path of such curvature as to effect rapid centrifuging of water from the stock suspension through said drainage openings.

2. A method of forming an aqueous suspension of pulp stock into a sheet which comprises establishing and maintaining a substantially tubular whirling mass of stock of controlled outer diameter and radial thickness whirling about a horizontal axis at a preselected maximum whirling velocity and having a central air core of controlled diameter and continuously feeding stock tangentially from the outer peripheral portion of the whirling mass onto a travelling sheet-forming element provided with drainage openings and travelling at a sufficiently high rate of speed and in a path of such curvature

as to effect rapid centrifuging of water and the stock suspension through said drainage openings.

3. Apparatus for forming an aqueous suspension of pulp stock into a sheet including an endless, slack, Fourdrinier wire running at high speed around a series of rolls including a breast roll and a couch roll between which the run of the wire travels in a curved path, a substantially cylindrical headbox casing having a tangential slice outlet through which pulp stock is delivered from said casing onto the breast roll end of the curved run of the wire, means for feeding pulp stock into said casing and rotary impeller means operating within the casing to whirl the stock around and against the circumferential wall of the casing.

4. Apparatus as set forth in claim 3, wherein the pulp stock is fed into said casing by said feeding means at a rate in excess of the rate at which the pulp stock is delivered through said slice outlet and wherein said casing is provided with overflow outlet means for the escape of excess stock.

5. Apparatus for forming an aqueous suspension of pulp stock into a sheet including an endless, slack, Fourdrinier wire running at high speed around a series of horizontal rolls including a breast roll and a couch roll between which the upper run of the wire travels in a curved path free of contact with frictional drag-impacting surfaces and with the concavely curved side of the wire facing upwardly, a substantially cylindrical casing having end covers and a tangential slice outlet through which pulp stock is delivered from said casing onto the breast roll end of the curved upper run of the wire, said casing being also provided, at least at one end thereof, with an end cover having a substantially central opening of predetermined diameter affording an overflow for the escape of excess pulp stock from said casing, means for feeding pulp stock into said casing at a rate in excess of the discharge capacity of said slice outlet, and impeller means operating within the casing to form the pulp stock fed into the casing into a whirling mass whirling around and against the circumferential wall of the casing and having a central core of air of a diameter controlled by the diameter of said overflow opening.

6. Apparatus as set forth in claim 5 including means for venting the headbox casing to atmosphere so that the central air core of the whirling mass of stock is substantially at atmospheric pressure.

7. Apparatus as set forth in claim 5 including means mounting said headbox for rotary adjustment about a horizontal axis to provide for easy adjustment of the position of the slice outlet in relation to the forming wire.

8. A paper machine headbox assembly including a substantially cylindrical casing having a tangential slice outlet, means for feeding paper-making stock into said casing and rotary impeller means operating within the casing to whirl the stock around and against the circumferential wall of the casing.

9. A headbox assembly as set forth in claim 8 in which the stock is fed into the headbox casing at a rate in excess of the rate at which the stock is discharged from said casing through the slice outlet and in which said casing is provided with overflow outlet means for the escape of excess stock.

10. A paper-machine headbox assembly including a substantially cylindrical casing having end covers and a tangential slice outlet, said casing being provided, at least at one end with a substantially central opening affording an overflow outlet, means for feeding paper-making stock into said casing and rotary impeller means operating within the casing to form the stock supplied to said casing into a whirling mass whirling around and against the circumferential wall of the casing and having a central core of air, the diameter of which is controlled by the diameter of the overflow outlet opening.

11. A headbox assembly as set forth in claim 8 in which the means for feeding the stock into said casing

includes a stationary, hollow, perforated manifold around which the impeller travels, said impeller extending substantially the full inside length of the casing.

12. A headbox assembly as set forth in claim 11 in which the manifold is provided with perforations which are staggered both longitudinally and circumferentially of the manifold.

13. A paper machine headbox assembly including a substantially cylindrical casing having end covers and a tangential slice outlet, means for feeding paper stock into said casing including a stationary, hollow, perforated manifold centrally located in the casing and extending substantially the full inside length of said casing, means for feeding stock axially into said manifold through at least one end of the manifold and rotary impeller means operating within said casing between the manifold and the circumferential wall of the casing and serving to form the stock supplied to said casing into a whirling mass whirling around and against the circumferential wall of the casing and a rotary scraper arranged within the manifold in scraping engagement with the inner circumferential wall surface of said manifold.

14. A paper machine headbox assembly including a substantially cylindrical casing having a tangential slice outlet, means for feeding paper stock into said casing including a stationary, hollow, perforated manifold centrally located in the casing and extending substantially the full inside length of said casing, means for feeding stock axially into said manifold through at least one end of the manifold and rotary impeller means operating within said casing between the manifold and the circumferential wall of the casing and serving to form the stock supplied to said casing into a whirling mass whirling around and against the circumferential wall of the casing and means arranged in said manifold for creating a variable area for the passage of pulp stock at constant axial velocity throughout the length of the manifold.

15. A paper machine headbox assembly including a substantially cylindrical casing having end covers and a tangential slice outlet, a stationary, hollow, perforated manifold centrally located in said casing and extending longitudinally thereof, means for feeding stock axially into said manifold through at least one end thereof, a rotatable scraper arranged within the manifold and extending substantially the full length thereof, said scraper including a body portion of substantially circular cross section and scraper blades extending from said body portion into scraping engagement with the inner circumferential wall of the manifold, the diameter of the body portion of the scraper being varied in such manner as to create a variable area for the passage of pulp stock at constant axial velocity throughout the length of the manifold, and rotary impeller means operating within the casing between the manifold and the circumferential

wall of the casing and serving to form the stock supplied to the casing through the perforations of the manifold into a whirling mass whirling around and against the circumferential wall of the casing.

16. A paper machine headbox assembly including a substantially cylindrical casing having a tangential slice outlet, means for feeding paper-making stock into said casing, an impeller, including a series of longitudinally extending impeller blades mounted in said casing for rotation about the longitudinal axis of the casing, and means for driving said impeller.

17. A headbox assembly as set forth in claim 16 in which the impeller blades are transversely curved.

18. A headbox assembly as set forth in claim 16 in which the impeller is provided with a cylindrical extension extending outwardly through an overflow opening provided at one end of the casing and in which the impeller driving means is connected to said cylindrical extension.

19. A paper machine headbox assembly including a substantially cylindrical headbox casing having end covers and a tangential slice outlet, a stationary, hollow, perforated manifold centrally located in said casing and extending longitudinally thereof, means for feeding stock axially into said manifold through at least one end thereof, and a rotary impeller operating within said casing and serving to form the stock supplied to said casing through said manifold into a whirling mass whirling around and against the circumferential wall of the casing, said impeller including a circular series of longitudinally extending impeller blades arranged to travel around the casing between the manifold and the circumferential wall of the casing.

20. A paper machine headbox assembly as set forth in claim 10 characterized in that the rate of supply of stock to said casing is regulated by the rate of overflow of stock through the overflow outlet opening.

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