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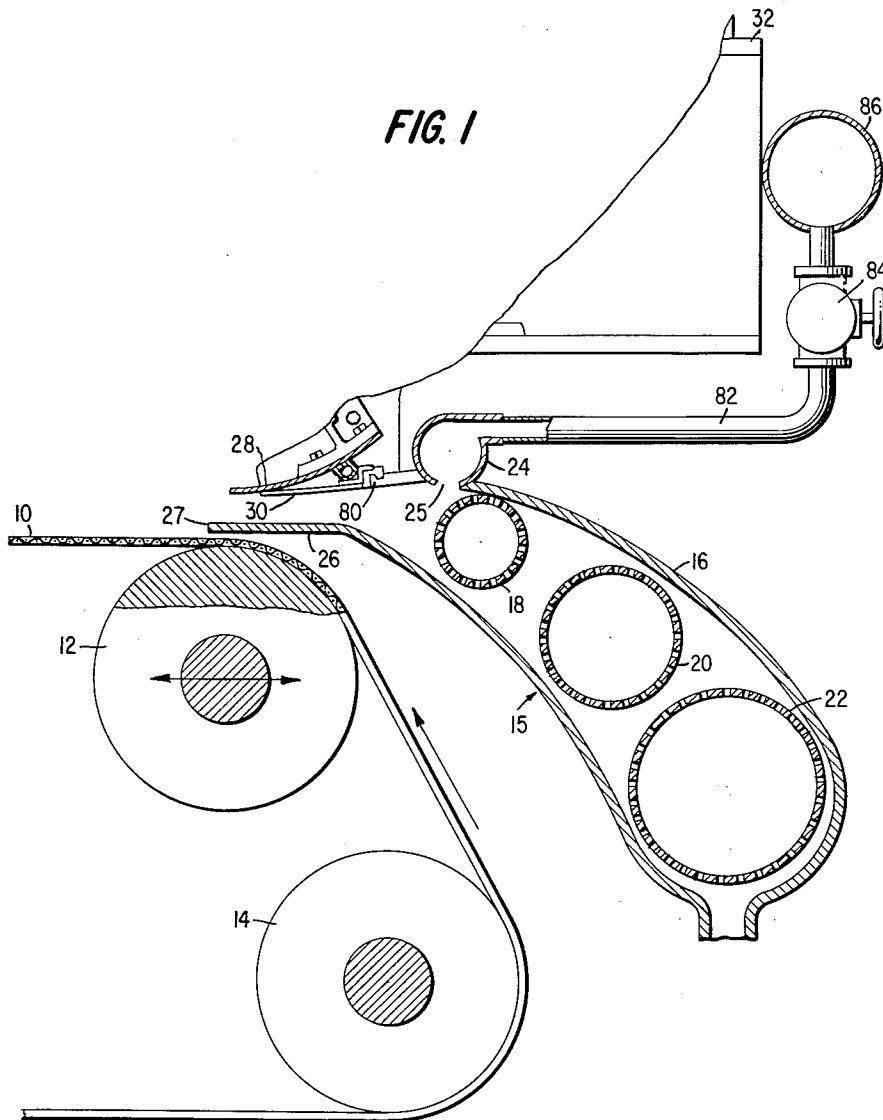
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MECHANISM FOR REMOVAL OF AIR FROM PAPER-MAKING MACHINE FEED STOCK

Filed Jan. 23, 1958

2 Sheets-Sheet 1



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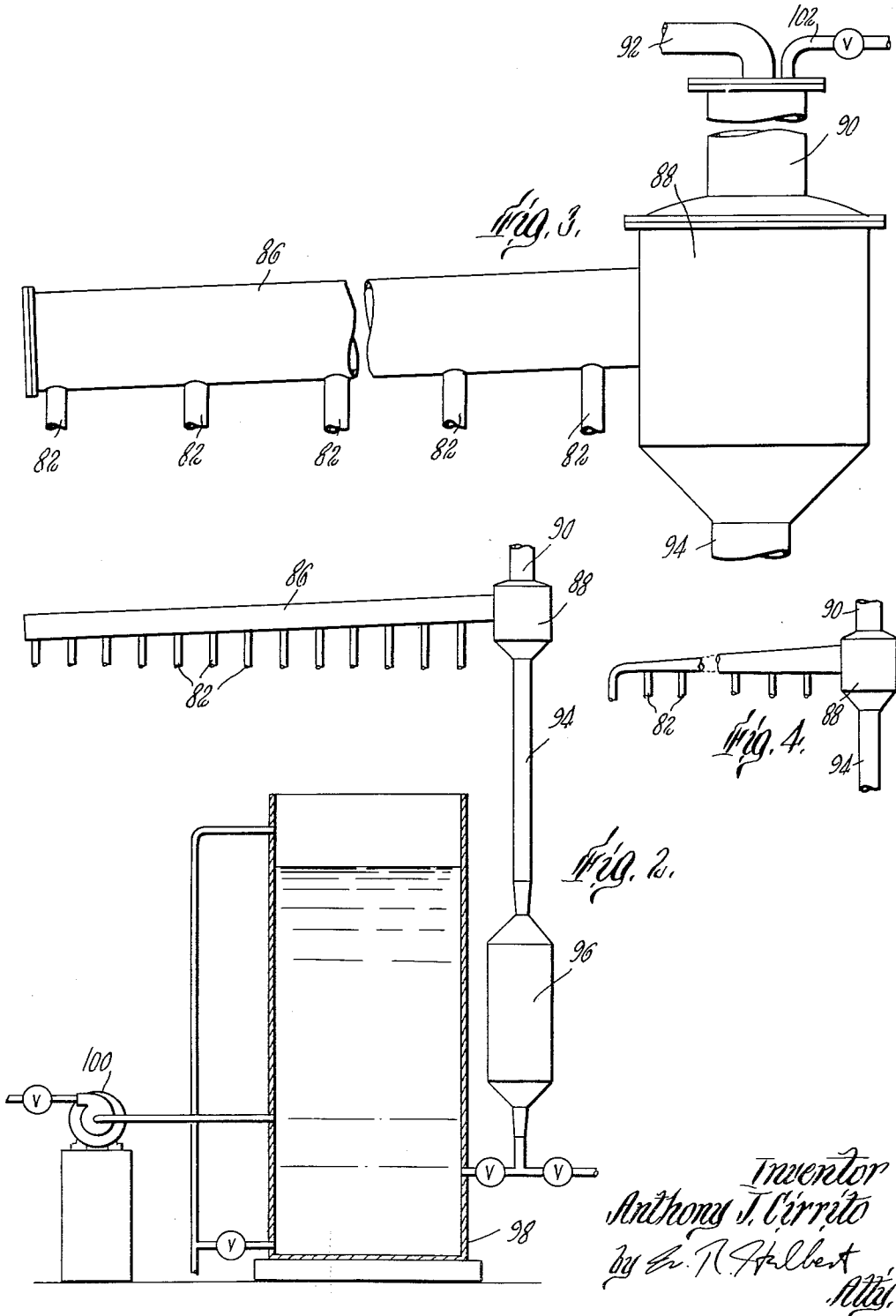
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MECHANISM FOR REMOVAL OF AIR FROM PAPER-MAKING MACHINE FEED STOCK

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8 Claims. (Cl. 162—337)

This invention relates to paper-making machines, and more particularly to apparatus for removal of air at stock inlets thereof.

One object is to make possible pressure- or velocity-type flow channel stock inlets which run full of stock and free of air pockets.

Another object is to produce such results even at low slice flow velocities, of the order of one hundred feet per minute, for example, in a pressure-type inlet.

Another object is to provide for delivery of a uniform and air-free sheet of stock at the slice, and to eliminate stagnant areas at which air bubbles might collect adjacent slice attachments or hinges and the approaches thereto.

In particular, it is an object of the invention to bleed off from the top of the inlet an air-rich layer of feed stock, thereafter separating out the air and recycling the white water.

It is a further object to minimize cross-currents at the slot through which the air-rich layer is led off and in the receiver into which said slot enters by providing a multiplicity of conduits from said receiver to a vacuum or other relatively reduced pressure source.

Other objects, features and advantages will appear from the following description of a preferred embodiment, taken together with the attached drawings of said preferred embodiment, in which:

FIG. 1 is a side elevation, partially in section, showing the new apparatus mounted on and in combination with a stock inlet of the velocity type with slice attachment thereto;

FIG. 2 is an end elevation partially broken away;

FIG. 3 shows a portion of the view shown in FIG. 2, on an enlarged scale; and

FIG. 4 is a schematic view similar to FIG. 3 but on a reduced scale of an alternative construction in accordance with the invention.

Referring now in greater detail to the drawings, there is shown in FIG. 1 a typical Fourdrinier wire 10 trained about conventional rolls 12 and 14. A pressure- or velocity-type inlet 15 defined by casing 16 is arranged to discharge stock onto the wire 10 over an apron 26 having a lip 27, and has mounted therein perforated rolls 18, 20 and 22, for purposes well known to the art. The upper wall of the inlet includes a member 30 and slice 28 forming no part of the present invention. Secured in the upper wall of the inlet 16 and extending therethrough is a generally cylindrical primary receiver 24 extending transversely across the entire width of the stock inlet 16, and provided across the bottom thereof with a slot 25 through which the top of the inlet 16 is in communication with the interior of the receiver 24. The primary receiver 24 and slot 25 are mounted adjacent the slice attachment 30, the slot 25 being toward said attachment 30 from the perforated roll 18, and being separated from the former only by a smooth surface not adapted to permit any fluid stagnation forward of the slot 25. Extending tangentially rearwardly from the top of the primary receiver 24 are a multiplicity of small pipes 32, which may be, for example, one-inch pipes spaced 9 inches apart, where the primary receiver 24 has an inside diameter of approximately 3 inches. In order to minimize cross-flow, the ratio of distance between the centerlines of the small

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pipes extending from the primary receiver should preferably not be more than three times the inside diameter of said primary receiver. Included in each line 32 may be a valve 34 as an aid to controlling the pressure drop. All the lines 32 extend into the bottom of a second receiver 36, of diameter greater than the first receiver, for example 8 inches, mounted thereabove on fixed mounting 32 and also transversely of the paper-making machine. The second receiver 36 is preferably slanted upwardly toward a separator or collector 38 to encourage foam rising toward that end and eliminate possibility of stagnation at the opposing end. The diameter and physical characteristics of the second receiver are preferably chosen so that in operation the pressure drop across each of the pipes 32 is approximately six or more times the pressure drop across the entire width of the second receiver. Another method of insuring equal flows in each of the small pipes is to taper the second receiver as shown in FIG. 4 such that its area at the large end approximates the sum of the areas of the pipes 32. Mounted above the collector 38 is a dome 90 from the top of which extends a pressure-control line 92, through which pressure (either vacuum or superatmospheric) may be imposed on the system (the only requirement being that the pressure be less than that in the inlet 16). The collector 38 functions together with the dome 90 to act as a separator of the air and stock, stock falling through the drop leg 94 and air being pulled off, under vacuum conditions, through the pipe 92. The drop leg 94 terminates at the entrance of a magnetic flow meter 96 through which the white water enters the tank 98 from which it is recycled through pump 100. Also entering the top of the dome 90 is a shower line 102 for adding the liquid to rinse the system and minimize foam build-up.

It will be understood that, according to the invention, the air rich stock is drawn off by differential of pressure depending upon fluid pressure existing in the stock inlet. If the latter is very substantially above atmospheric pressure, the lower pressure in the control line 92 may well be also above that of the atmosphere in order to achieve the desired flow. The use of the word "vacuum" in this connection is, therefore, purely relative.

In operation, the upper layer of stock flowing through the inlet 15, in which is known to accumulate the major portion of entrapped air or foam, is drawn up through the slot 25 extending across the entire inlet into the first receiver 24, from which it is in turn withdrawn from a multiplicity of smaller pipes 32 extending from the top of the first receiver, and adapted to be independently throttled to control at a constant figure the pressure differential across the entire first receiver, to minimize or eliminate cross-currents therein. The mixture of stock and foam is drawn through the pipes into the bottom of the larger second receiver 36, and passes upwardly and transversely therealong into the collector 38, air and liquid being separated therein and in the dome 90, the liquid then being recirculated and the air being removed through the line 92.

It will be apparent that this invention provides the art with apparatus adapted to remove the free air from stock flowing through inlets to paper-making machines adjacent the slice attachment so as to prevent accumulation of foam thereat and periodic discharge of foam therefrom, to the detriment of the paper structure, this being accomplished at the same time without inducing cross-currents and while maintaining a constant pressure differential across the entire width of the slot through which the air, as a part of the air-rich upper layer of stock, is withdrawn.

The invention makes possible, for example, achievement with a streamlined pressure-type inlet of slice velocities as low as one hundred feet per minute, whereas here-

tofore it has been necessary to operate a large reservoir type of head box with a vacuum dome in order to achieve these very low velocities.

In addition to the preferred embodiment described herein, other arrangements and variations within the spirit of the invention and the scope of the appended claims will occur to those skilled in the art. The slice attachment, for example, might be a hinged rather than a rigid attachment as in the embodiment above described.

I claim:

1. In combination with a paper-making machine having an enclosed stock inlet including a slice attachment, a first receiver secured in the upper wall of said stock inlet across the entire width thereof in advance of and adjacent said slice attachment, said first receiver being provided across the width thereof with a slot through which said first receiver communicates with the interior of said stock inlet, a second receiver mounted above said first receiver, a multiplicity of conduits of diameter smaller than the diameter of said receivers extending therebetween, and means for imposing within the second receiver a predetermined pressure and for receiving therefrom liquid and gases withdrawn therethrough.

2. The combination of claim 1 in which said second receiver is slanted upwardly toward and terminates at one end in a collector, the opposing end being sealed off.

3. The combination of claim 1 in which each of said conduits extends from the top of the first receiver into the bottom of said second receiver, and in which the pressure drop across the width of said second receiver is less than one-sixth the pressure drop across one of said conduits in operation.

4. The combination of claim 1 in which said conduits are spaced apart a distance not greater than three times the inside diameter of the first conduit.

5. The combination of claim 1 in which each of said conduits has mounted therein a valve as an aid to controlling the pressure drop therein.

6. The combination of claim 1 in which said first receiver and said slot are adjacent said slice attachment.

7. The combination of claim 1 wherein the second receiver is tapered with its cross section increasing toward the discharge end and the cross-sectional area at this

extremity approximating the sum of the areas of the multiple conduits while its area at the other extremity equals that of one of the multiple conduits.

8. In a paper making machine having an enclosed stock inlet including a slice attachment, the combination of a slot in advance of and adjacent the web forming region in the upper wall of said stock inlet across the entire width thereof, disposed to receive a shallow, even depth machine-wide layer of stock from the uppermost portion of the main stock stream flowing through said inlet, a machine-wide transition zone defined adjacent said slot, and in receiving communication with said main stream through said slot, a series of evenly spaced pipes disposed along said transition zone, each in communication therewith at a point spaced from said slot and generally in flow alignment with said slot, said transition zone being adapted to direct said machine-wide layer of stock into said pipes and a receiver means communicating with the opposite end of each pipe, adapted to impose a pressure drop condition on each pipe relative to said stock inlet suitable to maintain balanced flow in said pipes whereby an even depth shallow layer of stock can be removed from said main stream without disturbance of the stock flow conditions at the web forming region.

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