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COAXIAL BREAKER CONVEYOR AND FEEDER

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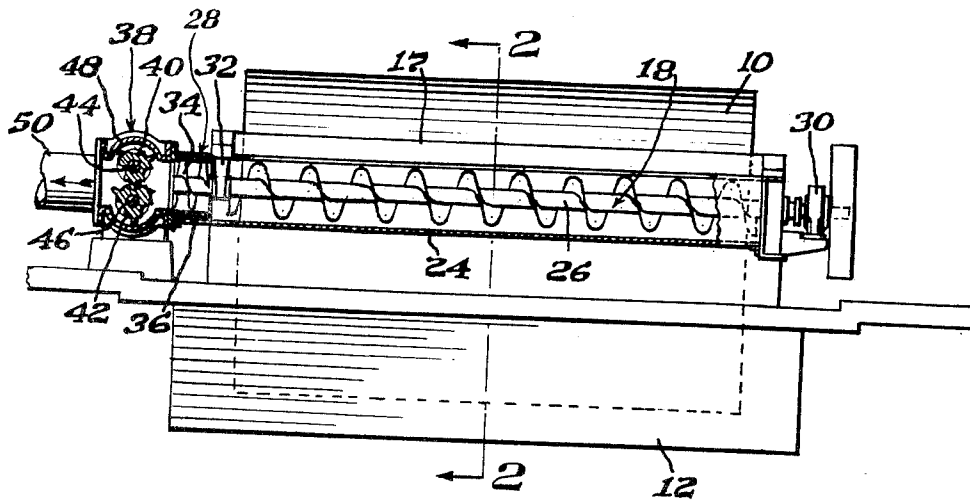
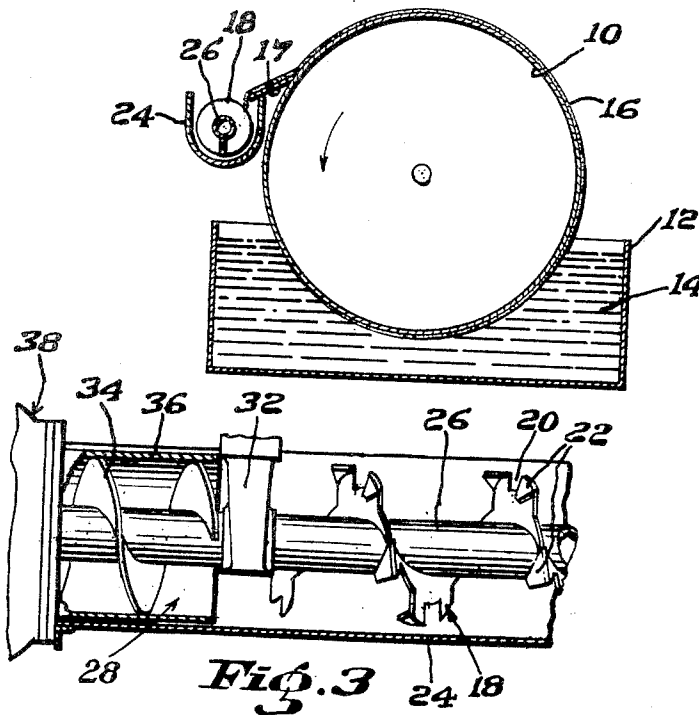


Fig. 1

Fig. 2



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COAXIAL BREAKER CONVEYOR AND FEEDER
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1 Claim. (Cl. 241-152)

This invention relates to apparatus for the transfer of paper pulp suspensions and the like and more particularly it relates to apparatus utilized in the transfer of such suspensions between a washing stage and a subsequent bleaching or storage stage in pulp manufacturing.

An increasingly acute problem in wood pulp manufacturing is the scarcity of fresh water supplies sufficiently clean and pure to be used for washing, diluting and transporting pulp stock, especially in the bleaching stages where a high degree of cleanliness is essential. The quantities of water used for washing have been reduced by advances in the art of rotary vacuum filtration, but further reductions in usage over present practice will be difficult to achieve. A much greater quantity of water is used simply for transporting pulp in slurry form from one operation to another. This is conventionally done using centrifugal pumps and stock slurries containing 3-6% by weight of pulp.

Thus, in conventional washer systems the stock is removed from the washer by means such as a doctor or a screw type conveyor, and is fed by gravity to an intermediate storage location. The pulp is then diluted to pumping consistency by the addition of water and is transported to a bleaching tower or a distant part of the pulp mill. The use of such an intermediate system between the washer stage and the next stage has certain defects, among these being: the necessity to pump the stock to a greater height, the addition of water with the subsequent necessity to remove it, the problem of introducing impurities through the use of improperly controlled water, and the increasing difficulty of pumping stock as lines become longer and have more twists and turns.

A great reduction in the usage of water for transport has been achieved by the use of pumps of special design which will transport pulp stock in the range of 12-15% by weight of pulp. These are particularly useful in conjunction with washing steps in the pulp preparation process because rotary vacuum filters conventionally discharge the pulp in just this range of consistency. An example will serve to illustrate the quantities of water involved: In a typical mill producing, say, 300 tons of dry pulp per day, the water required to dilute stock from 12% consistency as discharged from a washer to 6% consistency as can be conventionally transported is approximately 600,000 gallons/day.

Pumps of the type referred to have the disadvantage, however, that the pulp stock does not fill the suction chamber of the pump as would a fluid, but tends to plug or arch over the suction pipe either preventing the pumping action altogether, or reducing its efficiency markedly. A method which has been used with limited success to overcome this difficulty has been to place the pump at the bottom of a high vertical pipe so that the velocity of the stock falling down the pipe will assist in feeding the pump. Rotary mechanical feeders of several types have also been used, but these are expensive constructions in relation to the function they serve and require additional motors and transmission machinery.

Accordingly, it is an object of the invention to provide apparatus whereby the stock from the washer may be transmitted substantially directly from the washer to the bleaching tower.

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Another object of the invention is to provide a more efficient bleaching stage.

A further object of the invention is to provide a pulp transport system between the washer and a subsequent apparatus which does not require the addition of water.

The preferred embodiment of the invention consists of a washer in which the stock, removed therefrom by a doctor blade, is transported axially by a single rotor, notched flight conveyor which serves to break up and shred the mat of pulp as it is taken off the washer. A feeder of the rotary type is mounted on the same shaft as an extension of the conveyor. This feeder accepts the pulp from the conveyor and delivers it to a thick stock pump which is capable of pumping pulp having consistencies in the range of 10 to 15% and greater. This system provides for the transportation of pulp without an intermediate storage step; it requires no addition of dilution water for pumping purposes and thereby avoids quality control problems which accompany the addition of water; and the transport distance may be substantially reduced, thereby increasing efficiency.

Other objects, features and advantages will become apparent as the following description of the preferred embodiment progresses, in conjunction with the drawing, in which:

FIG. 1 is a side view of the system according to the preferred embodiment and shows in combination a washer, a notched flight conveyor and a feeder and a thick stock pump, according to the principles of the invention;

FIG. 2 is an end view of the washer; and

FIG. 3 is a view in partial section of a portion of the conveyor and the pump feeder.

With reference to FIGS. 1 and 2, the washer apparatus consists of a large cylinder which is suspended over a vat 12 such that it is partially submerged in a pulp solution 14. Conventionally, such washers are wire covered metal cylinders from 8 to 12 feet in diameter and from 8 to 16 feet in face length, and are provided with means for applying vacuum to the pulp mat 16 which forms on the wire surface. Reduced pressure is provided on the interior of the cylinder 10 such that a certain portion of the liquid is extracted from the pulp through the wire covered wall of the cylinder. The pulp then is removed from the cylinder by a doctor 17 and is deposited into a screw conveyor apparatus 18. The washing cylinder and the conveyor may be driven from a common source through suitable gearing or belt drives. Preferably, the conveyor 18 is of the notched type as shown in detail in FIG. 3. The edge portions of the screw flight provided with notches or serrations 20 and with off-set portions or tabs 22 such that the pulp, in the form of a sheet or mat as it is removed from the cylinder 10, is broken up so that it is more easily transported. The screw rotates with a substantial clearance from the trough 24 such that binding and stalling conditions due to the high consistency of the pulp stock as it is removed from the washer are minimized.

Conventionally, at this point the thick stock would be fed to a hole in the trough 24 and deposited by gravity into a storage chest. It would then be diluted by the addition of water to a consistency suitable for conventional interstage. Pumping apparatus and then pumped up to a subsequent apparatus such as a bleaching tower. The system of the invention eliminates this gravity transport step, which subsequently requires substantial additional power to lift the pulp up past the level of the washer and conveyor, the pulp from the conveyor 18 being transported to a rotary feeder 28 which is preferably mounted on the end of the conveyor shaft 26.

As shown in FIG. 1, the conveyor shaft 26 is sup-

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ported by bearings 30 and 32 adjacent the ends of the washing cylinder 10. At the right end of the cylinder a conventional pedestal bearing 30 is utilized and the bearing 32 at the left end is of the hanger type.

The hanger type bearing construction is preferred as the interference with the flow of pulp past a bearing of this type is minimal. This bearing must be designed, however, to withstand the substantial radial and axial pressure that are exerted on it due to the cantilever construction and the nature of the high consistency stock.

The left end of the shaft 26 is cantilevered beyond the hanger bearing 32 and a feeder 28, which consists of a screw flight conveyor 34, and a channel portion 36. The screw conveyor 34 mates closely with the interior of the channel 36 such that pulp is force fed into a thick stock pump 38.

The thick stock pump should be suitable for handling pulp having consistencies in the range of 10 to 15%, as deposited in the conveyor 18. The pump illustrated is the type disclosed by Cook in U.S. Patent No. 2,460,278. Other types of pumps capable of handling pulp consistencies of this magnitude are, of course, also suitable. This particular pump has two rotary pistons or rotors 40, 42 which are mounted on shafts 44 and 46, respectively, such that they are suitably supported within the casing 48. The shafts and associated rotors counter-rotate and through the cooperation of their vanes, move the pulp stock through the pump and out into the discharge pipe 50 under a pressure sufficient to transport the stock to the next operation stage.

It is thus seen that the invention provides an apparatus whereby stock may be transmitted directly from the washing stage to the next succeeding stage, such as a bleaching stage, without the use of an intermediate storage stage and without the addition of water thereto. Because of this direct path the efficiency of the operation can be increased as the length of the path is decreased. In addition, certain undesirable conditions which result from static condition stock in storage are eliminated.

Certain modifications of the preferred embodiment will be obvious to those skilled in the art and it

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is not intended that this invention be limited to the preferred embodiment or to details thereof, and departures therefrom may be made within the spirit and scope of the invention as defined by the following claim.

I claim:

A thick stock transport system for transporting stock having consistencies of 10% to 15% from a rotary filter in a paper pulp manufacturing process which comprises, in combination, an elongated trough, means for feeding into said trough stock having a consistency of 10% to 15%, a shaft extending the length of said trough, a helically arranged notched flight screw element mounted on said shaft for breaking and feeding said thick stock along the trough, a feed screw cylindrical throughout its length on an extension of said shaft at the end thereof in the direction of feeding of said stock and forming a continuation of said notched flight screw element, a tube enclosing said feed screw, bearing means supporting said shaft and said screw including a hanging bearing positioned between said feed screw and said notched flight screw element, and a thick stock pump of the type having a pair of rotors with interengaging shearing elements rotatable about spaced axes with the axis of said feed screw being generally perpendicular to the axes of said rotors and positioned generally centrally thereof, said pump being connected with said tube to receive stock directly from the end of said feed screw into said pump in the direction of rotation of said rotors and to discharge said stock.

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