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APPARATUS FOR THICKENING LIQUID SLURRY STOCKS

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Fig-2

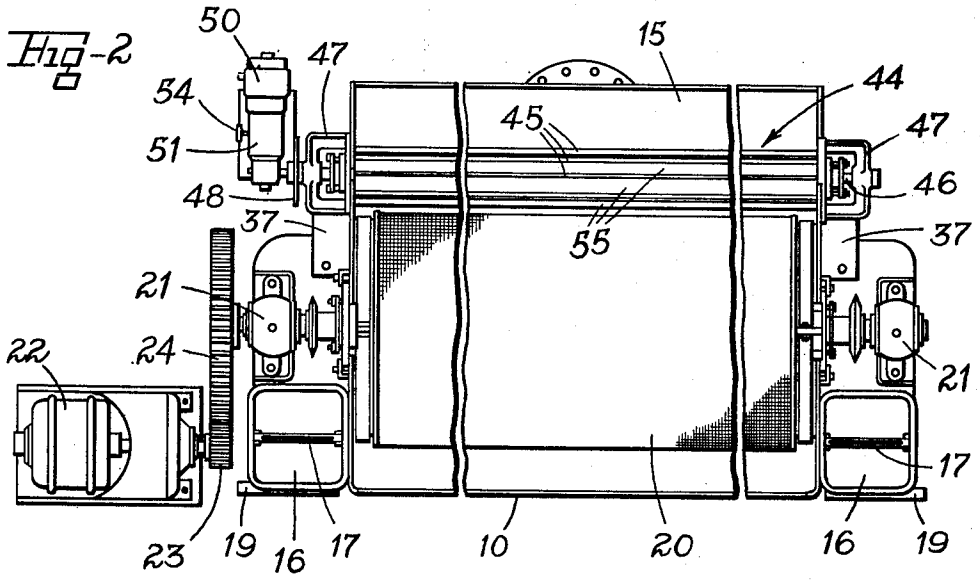


Fig-1

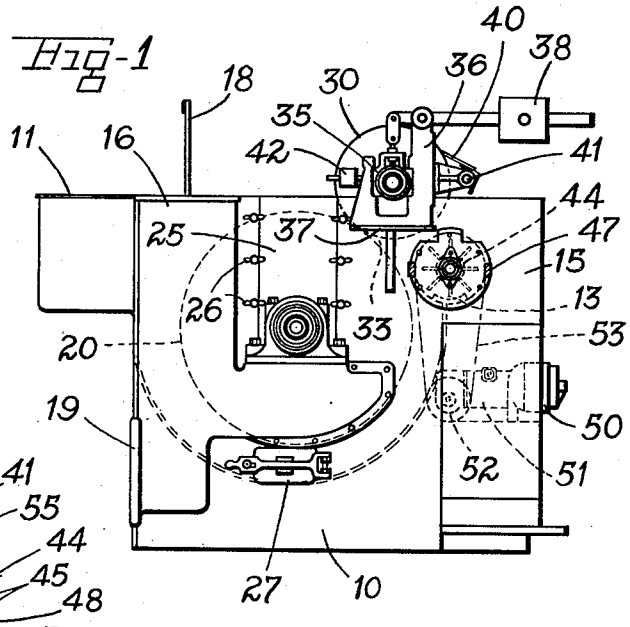
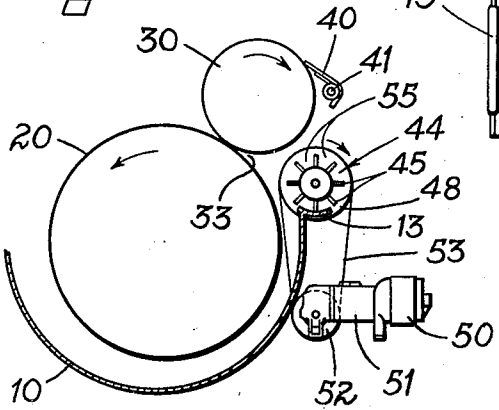


Fig-3



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APPARATUS FOR THICKENING LIQUID SLURRY STOCKS

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8 Claims. (Cl. 92—42)

1

This invention relates to apparatus for thickening paper making stock and other liquid slurry stocks.

The invention has particular relation to stock thickeners of the type which include a cylinder mold rotating in a vat of dilute stock and a couch roll or other device for removing the thickened pulp from the cylinder mold and discharging it to the discharge trough of the vat. The vat may also be provided with an overflow outlet to the discharge trough for direct discharge of dilute stock, so that the thickened product of the thickener is a mixture of the thick pulp from the cylinder mold and the more dilute stock discharged at the overflow. The present invention is directed particularly to the provision of simple and effective means for varying and regulating the consistency of the thickened stock produced with this type of stock thickener by simultaneous adjustment of the consistency of the thickened pulp removed from the cylinder mold and the rate of discharge of the more dilute stock from the overflow to give the desired final consistency in the resulting mixture.

This desired result is obtained in accordance with the invention by mounting a driven transfer roll on the thickener adjacent the overflow and in spaced relation with the cylinder mold. This transfer roll is longitudinally fluted or otherwise formed with a plurality of angularly spaced compartments in its surface, and it is supported in close relation with the top of the overflow in such manner as to have running clearance therewith while substantially preventing flow of stock between itself and the overflow. Direct discharge from the vat to the discharge trough thus takes place over the transfer roll, and the rate of such discharge depends on the rate of rotation of the transfer roll, with the compartments in its surface acting to pick up stock within the vat and carry it above the overflow to the discharge trough.

In the operation of a stock thickener with this transfer roll, when the transfer roll is rotated in such direction that adjacent surfaces thereof and of the cylinder mold travel in the same direction, it acts to urge the pulp in the vat towards the surface portion of the cylinder mold which is rising above the level in the vat so that the pulp tends to cling to the cylinder mold instead of slipping back away from it, thus delivering more pulp at higher consistency to the cylinder mold than when the transfer roll is not present, and this has the further desirable result of materially increasing the capacity of the thickener under given operating speeds. In addition, the transfer roll is provided with a variable speed drive for effecting ready adjustment of its speed of rotation to vary the rate of discharge of the more dilute stock from the overflow to the discharge outlet. Since this in turn determines the relative proportions of thickened pulp and more dilute stock delivered to the discharge trough, it provides ready adjustment to give the desired consistency in the resulting thickened mixture.

2

It is accordingly one of the principal objects of the invention to provide a simple variable control over the consistency of the thickened stock delivered from a stock thickener, and particularly to provide such a control which is adjustable to give a desired high consistency in the pulp received by the couch roll and desired relative proportions of this thick pulp and the more dilute stock discharged at the overflow of the vat.

Another object is to provide a stock thickener having a transfer roll mounted in position to control the rate of discharge from the overflow of the thickener vat and equipped with a variable speed drive for effecting desired adjustment of the speed of rotation of the roll in accordance with the desired proportions of thick pulp and more dilute stock delivered to the discharge trough of the thickener.

Other objects and advantages of the invention will be apparent from the following description, the accompanying drawings and the appended claims.

In the drawings—

Fig. 1 is a somewhat diagrammatic side or end elevational view of a stock thickener embodying a transfer roll in accordance with the invention;

Fig. 2 is a top view of the thickener with the couch roll and doctor removed for simplicity of illustration; and

Fig. 3 is a fragmentary diagrammatic view illustrating the operation of the transfer roll.

Referring to the drawing, which illustrates a preferred embodiment of the invention, the thickener is shown as of the Decker type and includes a vat 10 provided with an inlet flow trough 11 for the dilute stock and an overflow outlet lip 13 to the discharge trough 15 for the thickened stock. The white water outlet troughs 16 at either end of the vat are provided with adjustable overflow gates 17 having adjusting bars 18, and their lower ends are fitted at 19 for attachment to suitable conduit pipes. The cylinder mold 20 is mounted for rotation in the vat by means of bearings 21 and is driven by the motor 22 through a pinion 23 and large gear 24. The cylinder mold is pro-

vided with packing boxes 25 at either end secured in position by a plurality of clamps 26, and a clean out door 27 is provided at the end of the vat.

The couch roll 30 is mounted above the cylinder mold and in driven contact therewith to form a nip 33 adjacent and above the level of the overflow outlet lip 13. The bearings 35 for the couch roll are supported in stands 36 on shelf-like brackets 37 and are provided with adjustable counterweights 38 for regulating the pressure at the nip 33. The doctor blade 40 is pivoted at 41 above the discharge trough 15 and is provided with counterweights 42 for maintaining its upper edge in proper contact with the surface of the couch roll to receive the thickened pulp from the couch roll and discharge it to the trough 15.

The transfer roll 44 is mounted for rotation above the overflow outlet lip 13, and it includes a plurality of angularly spaced and radially arranged fins or ribs 45 providing a generally fluted construction. The shaft 46 of the transfer roll is journaled in brackets 47 at either end of the vat and carries a sprocket or pulley 48, and a variable speed drive is provided for transfer roll 44 which is independent of the drive for the cylinder mold. As shown, a motor 50 provided with a variable speed transmission 51 is mounted adjacent one end of the vat, and the driving pulley or sprocket 52 of the transmission 51 is connected through a chain or belt 53 with the sprocket or pulley 48 on the shaft of the transfer roll. The adjusting handle for the variable speed transmission 51 is indicated at 54.

The transfer roll 44 is mounted in such position that the outer edges of the fins 45 have running clearance with the overflow outlet lip 13, which is curved substantially concentrically with the rotational axis of the transfer roll but is of sufficiently greater angular extent than the angular spacing between the outer edges of adjacent fins 45 to assure that at least one fin will be in running contact therewith at all times. The ribs 45 and outlet lip 13 thus cooperate to effect substantial sealing against direct flow of stock from the vat to the discharge trough 15 between the transfer roll and lip 13. In addition, adjacent fins on roll 44 cooperate to form a plurality of sector shaped compartments 55 in the surface of roll 44 which act when the roll is rotated to pick up the dilute stock within the vat and to carry it over lip 13 to the discharge trough.

In the operation of the thickener with the cylinder mold 20 rotating in counterclockwise direction as viewed in Fig. 3, the surface of the cylinder mold picks up the fiber in the stock within the vat as the water drains through the perforate surface of the mold, and thus thickened pulp is transferred to the couch roll 30 and thence by way of the doctor 40 to the discharge trough 15. When the transfer roll 44 is rotated in clockwise direction in Fig. 3, it exerts two effects on the operation of the thickener. In the first place, since the adjacent surfaces of the cylinder mold and the transfer mold are both traveling upwardly, the fins 45 have an impeller like action and urge the pulp in the surrounding stock upwardly and towards the cylinder mold, thus effectively keeping the nip 33 filled with stock. As a result, instead of there being a tendency for the pulp to slip back from the rising surface of the cylinder mold, it is effectively forced into the nip 33, thus substantially increasing the volume of pulp delivered to the couch roll. At the same time, since the transfer roll 44 tends to feed a more uniform quantity of partially dewatered stock throughout the entire length of couch roll 30, the pressure is uniformly applied, which results in a uniform consistency of the stock removed from the couch roll by the doctor 40.

In addition to this effect of the transfer roll on the volume and consistency of the pulp delivered to the couch roll, the transfer roll controls the rate of direct discharge of the dilute stock to the discharge trough. Since the transfer roll and lip 13 cooperate as described to prevent direct flow of stock therebetween, the discharge of the more dilute stock takes place as a result of successive filling and emptying of compartments 55. The rate of such discharge will accordingly depend upon the rate of rotation of the transfer roll. Also, since the consistency of the mixture of stock received in the discharge trough depends upon the relative proportions of the thick pulp from the couch roll and the more dilute stock from the vat itself, the consistency of this mixture is readily controlled by suitable adjustment of the rate of rotation of the transfer roll in accordance with the desired proportions of the thick and more dilute stock as delivered to the discharge trough.

In a typical example of operating conditions with this thickener as described and with the cylinder mold 36 inches in diameter and the couch roll 6 inches in diameter, if the entering stock is of a consistency of the order of 3½ to 4% and the cylinder mold is rotated at 25 R. P. M. and the transfer roll is rotated at 1 R. P. M., the pulp received by the couch roll for discharge to the trough 15 will be of a consistency of about 13%. At the same time, the pulp discharged by way of the transfer roll will be of approximately 6% consistency, and with the above dimensions and operating conditions, the mixture of the thick and more dilute stock will average about 8% in consistency. If the rate of rotation of the transfer roll is increased, there may be a slight increase in the quantity of the thick pulp, but there will be a considerably greater increase in the proportion of more dilute stock delivered to the discharge trough, and the average consistency of the resulting mixture will be correspondingly less.

It will accordingly be seen that the present invention provides for simple and effective control of the consistency of the thickened stock delivered by a stock thickener as well as providing for increasing the capacity of the thickener without otherwise changing its dimensions or operating characteristics. Since with the transfer roll operating as described at a low rate of rotation, both the volume and the consistency of the pulp picked up by the cylinder mold are increased, a substantially greater volume of stock can be treated under given operating speeds than when a stationary overflow gate to the discharge trough is employed. At the same time, the final consistency of the mixture of thickened and more dilute stock delivered by the thickener is readily adjusted as described by suitable regulation of the rate of rotation of the transfer roll independently of the other conditions.

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

What is claimed is:

1. In the apparatus for regulating the con-

sistency of the thickened stock delivered by a stock thickener including a vat adapted to be filled with dilute stock to be thickened and having a discharge trough and an overflow outlet for said dilute stock to said trough, a cylinder mold mounted for rotation within said vat and means for receiving and discharging the thickened stock from said cylinder mold to said trough, the improvement comprising the combination of a transfer roll mounted between said cylinder mold and said outlet in spaced relation with the surface of said cylinder mold and in the path of flow of stock over said overflow outlet, means maintaining said transfer roll in running clearance with said overflow outlet substantially preventing flow of stock therebetween, generally straight vanes extending lengthwise of said transfer roll and substantially parallel with the axis thereof to form a plurality of circumferentially separated compartments around said transfer roll, means for rotating said transfer roll to cause said compartments to be successively filled with dilute stock within said vat and to carry said stock over said overflow outlet to said trough, and means for varying the speed of rotation of said transfer roll to regulate the rate of discharge of said stock from said overflow outlet.

2. In the apparatus for regulating the consistency of the thickened stock delivered by a stock thickener including a vat adapted to be filled with dilute stock to be thickened and having a discharge trough and an overflow outlet for said dilute stock to said trough, a cylinder mold mounted for rotation within said vat and means for receiving and discharging the thickened stock from said cylinder mold to said trough, the improvement comprising the combination of a transfer roll mounted for rotation above said overflow outlet in the path of flow of stock over said outlet and in spaced relation with said cylinder mold, means maintaining said transfer roll in running clearance with said overflow outlet substantially preventing flow of stock therebetween, generally straight vanes extending lengthwise of said transfer roll and substantially parallel with the axis thereof to form a plurality of circumferentially separated compartments around said transfer roll, means for causing said cylinder mold to rotate in such direction that the portion thereof adjacent said transfer roll moves upwardly, means for rotating said transfer roll in the opposite direction from said cylinder mold to urge the stock in the space between said rolls towards said cylinder mold for increasing the volume of solid material picked up by said cylinder mold and also to cause said compartments to be successively filled with dilute stock within said vat and to carry said stock over said overflow outlet to said trough, and means for varying the speed of rotation of said transfer roll to regulate the rate of discharge of said stock from said overflow outlet.

3. In the apparatus for regulating the consistency of the thickened stock delivered by a stock thickener including a vat adapted to be filled with dilute stock to be thickened and having a discharge trough and an overflow outlet for said dilute stock to said trough, a cylinder mold mounted for rotation within said vat and means for receiving and discharging the thickened stock from said cylinder mold to said trough, the improvement comprising the combination of a transfer roll having generally straight vanes extending lengthwise and substantially parallel with the axis thereof to form a plurality of circumferentially separated compartments around said transfer roll, means supporting said transfer roll for rotation about an axis located above the level of said overflow outlet and in the path of flow of stock over said overflow outlet, a curved lip on said outlet arranged in substantially concentric relation with the axis of said transfer roll and in running clearance with the surface of said transfer roll, said lip being of substantially the same angular extent as the mouth of each said compartment for substantially preventing flow of stock between said transfer roll and said lip, means for rotating said transfer roll to cause said compartments to be successively filled with stock within said vat and to carry said stock over said lip for discharge into said trough, and means for varying the speed of rotation of said transfer roll to regulate the rate of discharge of said stock over said lip.

4. In the apparatus for regulating the consistency of the thickened stock delivered by a stock thickener including a vat adapted to be filled with dilute stock to be thickened and having a discharge trough and an overflow outlet for said dilute stock to said trough, a cylinder mold mounted for rotation within said vat and means for receiving and discharging the thickened stock from said cylinder mold to said trough, the improvement comprising the combination of a transfer roll mounted for rotation about an axis between said cylinder mold and said outlet in the path of flow of stock over said outlet and in spaced relation with the surface of said cylinder mold, a plurality of generally straight vanes arranged generally longitudinally on and substantially parallel with the axis of said transfer roll and in angularly spaced relation around said roll to form a plurality of circumferentially separated compartments around said roll, a curved lip on said overflow outlet arranged in substantially concentric relation with the axis of said transfer roll and in running clearance with the outer edges of said vanes, said lip being of sufficiently greater angular extent than the angular spacing between the outer edges of adjacent said vanes to effect substantial sealing against flow of stock between said projections and said lip, means for rotating said transfer roll to cause said compartments to be successively filled with dilute stock within said vat and to carry said stock over said overflow outlet to said trough, and means for varying the speed of rotation of said transfer roll to regulate the rate of discharge of said stock from said overflow outlet.

5. In the apparatus for regulating the consistency of the thickened stock delivered by a stock thickener including a vat adapted to be filled with dilute stock to be thickened and having a discharge trough and an overflow outlet for said dilute stock to said trough, a cylinder mold mounted for rotation within said vat and a couch roll supported in driven contact with said cylinder mold to form a nip therewith adjacent and above the level of said overflow outlet and adapted to receive thickened stock from said cylinder mold for discharge to said discharge trough, the improvement comprising the combination of a transfer roll mounted between said nip and said overflow outlet in spaced relation with the surfaces of said cylinder mold and said couch roll and in the path of flow of stock over said overflow outlet, means maintaining said transfer roll in running clearance with said overflow outlet substantially preventing flow of stock between the surfaces thereof, generally straight vanes extending lengthwise of said transfer roll and substan-

tially parallel with the axis thereof to form a plurality of circumferentially separated compartments around said transfer roll, means for rotating said transfer roll to cause said compartments to be successively filled with stock within said vat and to carry said stock over said overflow outlet for discharge into said trough, and means for varying the speed of rotation of said transfer roll to regulate the rate of discharge of said stock from said overflow outlet.

6. In the apparatus for regulating the consistency of the thickened stock delivered by a stock thickener including a vat adapted to be filled with stock to be thickened and having a discharge trough and an overflow outlet to said trough, a cylinder mold mounted for rotation within said vat and a couch roll supported in driven contact with said cylinder mold to form a nip therewith adjacent and above the level of said outlet and adapted to receive thickened stock from said cylinder mold for discharge to said trough, the improvement comprising the combination of a transfer roll mounted between said nip and said overflow outlet in spaced relation with the surfaces of said cylinder mold and said couch roll and in the path of flow of stock over said overflow outlet, generally straight vanes extending lengthwise of said transfer roll and substantially parallel with the axis thereof to form a plurality of circumferentially separated compartments around said transfer roll, means maintaining said transfer roll with said vanes in running clearance with said overflow outlet substantially preventing flow of stock between the surfaces thereof, means for rotating said transfer roll in the direction to cause the stock in said vat to flow into the space between said rolls and said cylinder mold for increasing the consistency of the thickened stock received by said couch roll, and means for varying the speed of rotation of said transfer roll to regulate the rate of discharge of stock over said transfer roll to said discharge trough.

7. In the apparatus for regulating the consistency of the thickened stock delivered by a stock thickener including a vat adapted to be filled with stock to be thickened and having a discharge trough and an overflow outlet to said trough, a cylinder mold mounted for rotation within said vat and a couch roll supported in driven contact with said cylinder mold to form a nip therewith adjacent and above the level of said outlet and adapted to receive thickened stock from said cylinder mold for discharge to said trough, the improvement comprising the combination of a transfer roll mounted for rotation above said overflow outlet in the path of flow of stock over said overflow outlet, means maintaining said transfer roll in running clearance with said overflow substantially preventing flow of stock between said transfer roll and said overflow outlet, generally straight vanes extending generally longitudinally on and substantially parallel with the axis of said transfer roll and in angularly spaced relation around said roll to form a plurality of circumferentially separated compartments around said roll, means for rotating said transfer roll in the same direction as said couch roll to cause said vanes thereon to urge the stock within said vat towards said mix for increasing the consistency of the thickened stock received by said couch roll and also to cause said compartments to carry stock from within said vat across said overflow outlet to said discharge trough, and means for varying the speed of rotation of said transfer roll in accordance with the desired relative proportions of the thickened stock discharged to said trough from said couch roll and the more dilute stock discharged to said trough over said transfer roll.

8. In the apparatus for regulating the consistency of the thickened stock delivered by a stock thickener including a vat adapted to be filled with stock to be thickened and having a discharge trough and an overflow outlet to said trough, a cylinder mold mounted for rotation within said vat and a couch roll supported in driven contact with said cylinder mold to form a nip therewith adjacent and above the level of said outlet and adapted to receive thickened stock from said cylinder mold for discharge to said trough, the improvement comprising the combination of a transfer roll having generally straight vanes extending lengthwise and substantially parallel with the axis thereof to form a plurality of circumferentially separated compartments around the surface thereof, means supporting said transfer roll for rotation about an axis between said nip and said overflow outlet in spaced relation with the surfaces of said cylinder mold and said couch roll and in the path of flow of stock over said overflow outlet, a curved lip on said overflow outlet arranged in substantially concentric relation with the axis of said transfer roll and in running clearance with said vanes on said transfer roll, said lip being of substantially the same angular extent as the mouth of each said compartment for substantially preventing flow of stock between said transfer roll and said lip, means for rotating said transfer roll to cause said compartments to be successively filled with stock within said vat and to carry said stock over said lip for discharge into said trough, and means for varying the speed of rotation of said transfer roll to regulate the rate of discharge of said stock over said lip.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
449,251	Decker et al.	Mar. 31, 1891
1,493,537	Haug	May 13, 1924
1,627,882	Berry	May 10, 1927
1,820,854	White	Aug. 25, 1931
1,869,148	Holcomb	July 26, 1932
2,005,839	Edge	June 25, 1935
2,164,142	Moore	June 27, 1939

FOREIGN PATENTS

Number	Country	Date
16,009	Great Britain	1906