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METHOD AND MEANS FOR EQUALIZING QUALITY FLUCTUATIONS IN MANUFACTURE OF FIBRE MASS

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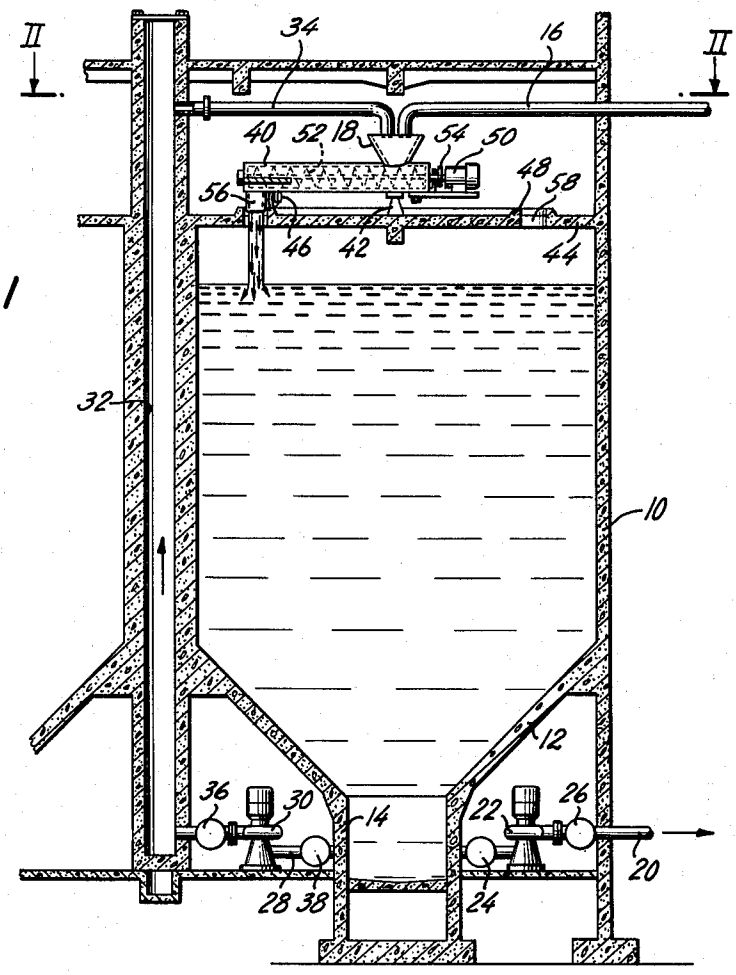
FIG. 1



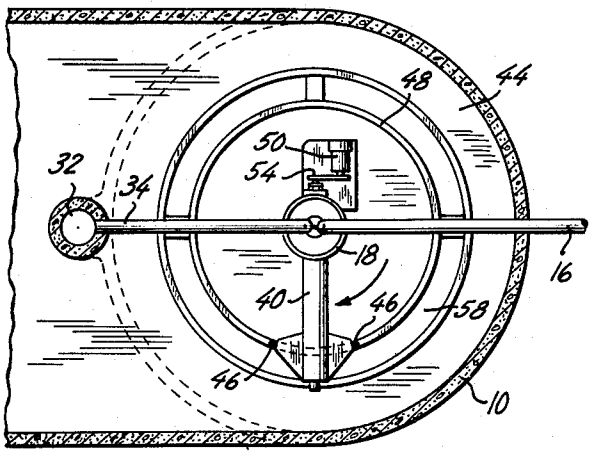


FIG. 2

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METHOD AND MEANS FOR EQUALIZING QUALITY FLUCTUATIONS IN MANUFACTURE OF FIBRE MASS

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10 Claims. (Cl. 259—4)

During manufacture of groundwood pulp or other pulps, quality fluctuations caused by surface properties of the grinder stones are apt to occur. The stones should be burred in a way to suit the stone quality and the type of pulp to be manufactured. This burring is made at intervals determined by the hardness of the stone, a sand stone or cement stone having to be burred more frequently than a ceramic stone. Immediately after a burring a rather coarse pulp is obtained, but with the wear of the stone surface the fineness of the pulp increases and at the end of the interval a very fine groundwood pulp is produced. Concomitantly the rate of production drops and the risk of burning increases. Pulp quality variations therefore become more pronounced when the number of grinders is small in an installation even if the burrings are spaced to give the best possible distribution of burring intervals.

In order to eliminate as far as possible these fluctuations the capacity of the storage tanks is increased. Thus horizontal chests are often used that are characterized in that the pulp is circulated between two parallel connected channels by a propeller pump which pumps the stock from the end of one channel to the high lever of the adjacent channel and then flows by gravity along the two connected channels back to the pump. Chests of this type are built with capacities up to 200–400 m.^{3}. It is often difficult to obtain homogeneous blending of the pulp suspension from one end of the connected channels to the other since the entering pulp has a tendency to move along without mixing with the pulp it is added to. Horizontal or vertical agitators have been added in order to crease turbulence but with little success depending on the large volumes in circulation. At pulp consistencies above 3–4% the agitation becomes entirely unsatisfactory. Certain pulp qualities (for example groundwood pulp and board pulp) have a tendency to float up to the surface especially if produced from dry wood. Thus the pulp suspension will have a higher consistency at the surface. When the level drops in the chest this stock accumulated at the surface will show up as lumps in the pulp pumped out.

Pulp quality fluctuations can also be caused by the wood quality. This applies to chemical and semichemical pulps as well as groundwood pulp. The fluctuations may be caused by the use of different species of wood or by variations in quality of a certain species.

This invention will eliminate the drawbacks inherent in earlier chest designs and makes possible a thorough equalization of pulp produced under the conditions described above. According to this invention pulp suspension is carried through a pipe to the top of a tower and from the bottom of this tower through another pipe to the pulp consumer. The invention is characterized by the recirculation of part of the pulp taken out from the bottom of the tower up to the tower top where it is mixed with incoming stock. The mixing of incoming and recirculated stock takes place in a special feeding and distribution device before the stock enters the tower. This feeding device ensures distribution of the stock along the periphery of the tower where it is deposited in an helical stream. According to the invention incoming and recirculated stock are carefully mixed already before the pulp is pumped to the pulp consumer. The towers can be given volumes of 200–1000 m.^{3} or even more.

Below the invention will be described with reference to the drawing enclosed.

FIG. 1 shows a vertical section of a tower built according to this invention and FIG. 2 a section along the line II—II in FIG. 1.

10 is the cylindrical wall of the tower which at the bottom joins a cone **12** at the bottom of which there is a small cylindrical well **14**. The pulp suspension is added through the pipe **16** which empties into a central hopper **18** right above the tower. The blended pulp is extracted from the pump well **14** of the tower and pumped by a pump **22** through a pipe **20** to the pulp consumer which might be a newsprint mill or a pulp machine. The pipe **20** may be equipped with valves **24** and **26**. From the pump well **14** another pump **30** transports the pulp through the pipe **28** to a vertical channel **32** which runs along the side of the tower up to the top of it where a pipe **34** connects it to the hopper **18**. The pipe **28** can be supplied with valves **36** and **38**.

The pipes **28**, **32** and **34** carry pulp from the bottom of the tower back to the hopper **18** where it is mixed with incoming pulp from pipe **16**. The mixing apparatus **40** contains a rotating horizontal screw and rotates itself in a horizontal plane around a pivot **42** placed on a concrete floor **44**. The outlet end of the apparatus is supported by two wheels **46** which travel on a concrete rim **48** elevated above the floor **44**. The apparatus is rotated by the motor **50** at a velocity which may amount to one revolution per hour and is generally lower than ten revolutions per hour.

The mixing apparatus has the shape of a radially positioned cylindrical drum containing a screw feeder **52** driven by a motor **50** through a gear box **54**. The apparatus mixes incoming and recirculated stock and feeds the mixture to the outlet **56** in the bottom of the drum at the periphery of the tower. Below this outlet there is an annular slot **58** in the floor **44** through which the pulp suspension falls down into the tower. When this jet of stock hits the surface, the stock flows out radially towards the periphery as well as towards the center of the tower as indicated by arrows in the figure. The distance between the slot and the tower wall is chosen so as to ensure the best possible distribution of stock across the surface of the tower. It was found advantageous to make the area inside the ring of disposited stock equal to the area of the annular space between this ring and the tower wall. The stock level in the tower **10** will drop as stock leaves through pipes **20** and **28**. The level is however maintained by continuous addition of stock in a helical stream through the inlet opening **56**. The degree of mixing is controlled by altering the flow of recirculated stock from the pump well **14** to the hopper **18**. The usually constant flow of stock through pipe **20** to the pulp consumer shall equal the flow of incoming stock through pipe **16**. A level controller (not shown) may be used to maintain the stock level within a devised range by actuating the valve **24**.

The speed of rotation of the mixing apparatus can be varied to suit the time scale of the pulp quality fluctuations of incoming stock.

The invention is of course not limited to the design described, which can be varied widely within the general framework of the conception. Thus the pumps **22** and **30** may be replaced by one pump which both circulates and pumps stock to the pulp consumer.

What I claim is:

1. In a method for storing and mixing a paper pulp slurry in a storage chest preparatory to utilization of said

pulp slurry in the manufacture of paper and paper board, which method is adopted to render more uniform the contents of said storage chest and minimize non-uniformities of pulp slurries introduced thereinto, the steps which comprise introducing said pulp slurry into said chest adjacent the top thereof above the surface of pulp slurry already in said chest and as a stream moving over said surface of slurry for enhancing admixture of newly introduced slurry with slurry already in said chest, withdrawing from adjacent the bottom of said chest portions of pulp slurry therein for admixing re-circulation with other portions of pulp slurry in said chest, admixing and combining said withdrawn portions of said pulp slurry with at least a portion of said slurry being initially introduced into said chest and as a part of said moving stream of slurry introduced at the top of said chest, and separately withdrawing from said chest portions of said admixed slurry for said paper and paper board manufacture.

2. A method as recited in claim 1 in which said moving stream of slurry has imparted thereto a helical movement over the static level of stored pulp slurry in said chest.

3. The method as recited in claim 1 in which portions of said pulp slurry are withdrawn from said chest for said paper making process and adjacent the bottom of said chest where said enhanced uniformity of mixing of said entering and re-circulated pulp slurry with pulp slurry stored in said chest is most complete.

4. A method as recited in claim 1 in which said moving stream of pulp slurry is introduced at the top of said chest from a rotating inlet point defining during rotation thereof a circle on the level of pulp slurry in said chest, which circle has an area approximately equal to one-half the cross-sectional area of said chest.

5. In storage chest apparatus for storage of a pulp slurry for the manufacture of paper and paper board, comprising in combination a generally cylindrical and vertical storage container for said slurry, means for introducing said slurry as a generally helical stream at the top of said chest for enhanced mixing of introduced slurry with slurry already in said chest, outlet means for withdrawing slurry from said chest adjacent the bottom thereof for introduction to said manufacture of paper and paper board, a re-circulating outlet also adjacent the bottom of said chest, and pump means for re-circulating pulp slurry withdrawn through said re-circulating outlet back into the stream of pulp being introduced into said chest, and means for admixing said re-circulated pulp slurry and said pulp being introduced into said chest prior to the actual introduction of said stream to pulp already in said chest for admixture therewith.

6. Apparatus as recited in claim 5 in which said means for introducing pulp slurry includes an elongated conveyor having an effective length substantially less than the radius of said storage chest.

7. Apparatus as recited in claim 5 in which said means for introducing said pulp stream includes a rotating arm rotatable about the axis of said storage chest effecting communal flow of said pulp into said chest as said helical stream.

8. Apparatus as recited in claim 7 in which said rotating arm also includes conveyor means for conveying pulp horizontally therethrough and opposed pulp inlet and pulp outlet in spaced relationship along said arm, and in which said arm and said conveyor receive both new pulp and pulp re-circulated from said chest for admixture prior to introduction into said chest.

9. Apparatus as recited in claim 5 which also includes a pulp outlet adjacent the bottom of said chest for withdrawing admixed pulp therefrom and independently of re-circulation of pulp in said chest.

10. Apparatus as recited in claim 5 which also includes means for re-circulating pulp in said chest and for admixing said re-circulated pulp with newly entering pulp prior to introduction thereof into said chest.

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