June 20, 1944. H. D. WELLS 2,351,728

CONTINUOUS BEATER AND PULP SELECTOR

Filed Aug. 8, 1942

FIG. 1.

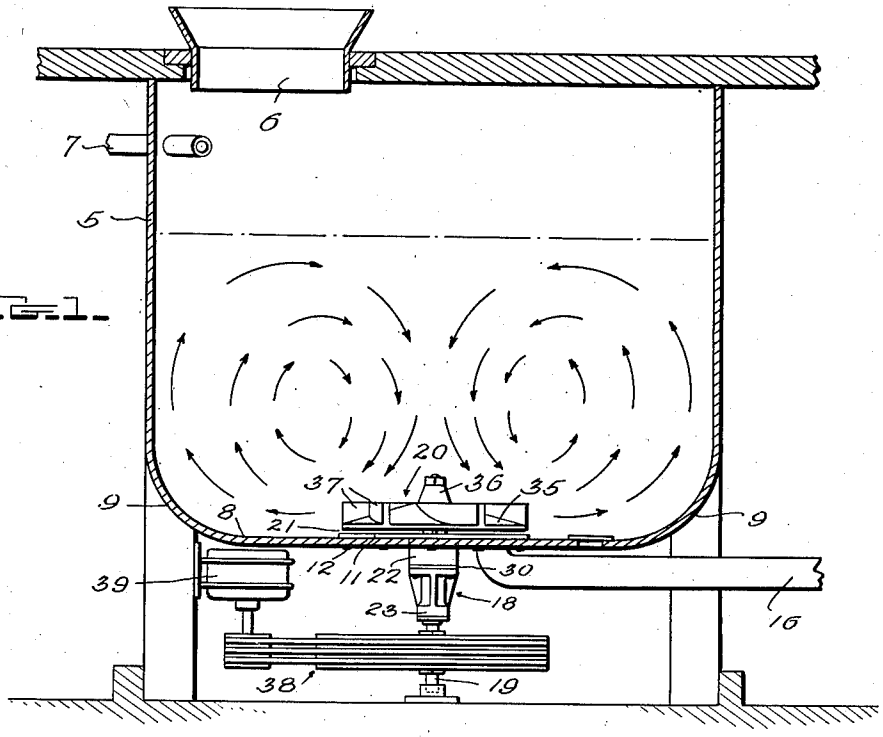


FIG. 2.

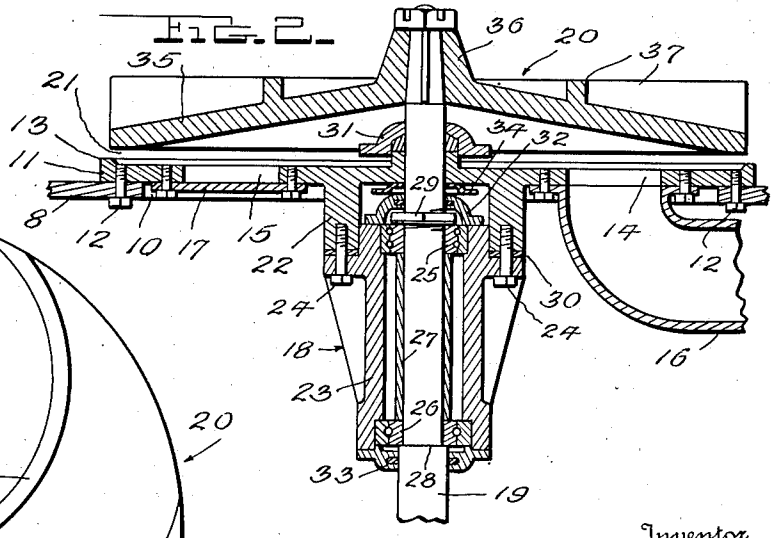
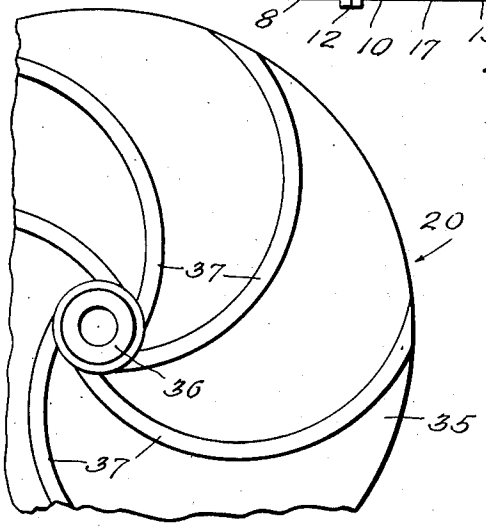


FIG. 3.



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CONTINUOUS BEATER AND PULP SELECTOR

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7 Claims. (Cl. 92—23)

The invention relates to improvements in beaters and selectors for use in the preparation of pulp for paper-making purposes.

A tank is provided within which waste papers, broke or the like, are beaten and circulated in an appropriate pulping liquid by means of a rotary pulper and circulator. In machines of this nature, there is usually a continuous discharge of the prepared pulp as it reaches a predetermined state of fineness, discharge screens being provided to hold back the pulp until it has reached said state. It is the principal object of the present invention, however, to provide a new and improved construction which does not require any such perforated or foraminous screens, due to the fact that the rotary beater and circulator is cooperable with a wall of the tank in providing a restricted passage through which the prepared pulp may flow to the main outlet as it reaches the desired state of fineness.

Another object of the invention is to provide a novel structure in which the beater and circulator is adjustable with respect to the aforesaid wall so as to vary the size of the aforesaid restricted passage in accordance with the extent to which the pulp is to be reduced before discharge.

A still further object is to provide a simple and inexpensive, yet a highly efficient and desirable construction.

With the foregoing in view, the invention resides in the novel subject matter hereinafter described and claimed, description being accomplished by reference to the accompanying drawing.

Fig. 1 is a vertical sectional view partly in elevation.

Fig. 2 is an enlarged vertical sectional view through the beater and circulator and related portions of the machine.

Fig. 3 is a fragmentary top view of the beater and circulator.

In the drawing above briefly described, the numeral 5 denotes a beating and circulating tank having a feed opening 6 for pulp bales, waste papers, broke or the like, said tank also having a liquid inlet 7. The bottom wall of the tank is denoted at 8 and the peripheral portion of said bottom wall preferably curves upwardly at 9 to the side wall of the tank which is of cylindrical form. In the present disclosure, the central portion of the bottom wall 8 is formed with an opening 10 which is covered by a plate 11, said plate being secured to said bottom wall 8 by screws or the like 12. This plate is preferably of circular outline and provided at its peripheral edge with a continuous ridge 13. Openings 14 and 15 are formed through the plate 11, and one or both of these openings may serve as outlet means for the pulp selected for discharge. In the present showing, only the opening 14 is an outlet opening and it communicates with a selected pulp discharge pipe 16. The other opening 15 is closed by a suitable cover 17 and may constitute a clean-out opening.

A vertical shaft bearing 18 is disposed below the plate 11 and is rigidly carried thereby. Rotatably mounted in this bearing 18 is a vertical shaft 19 which extends to a point above the plate 11, and secured to the upper end of said shaft there is a beater and circulator 20. This beater and circulator covers the opening 14 and prevents the tank contents from directly discharging through said opening, said beater and circulator, however, being upwardly spaced from the plate 11 a sufficient distance to provide a restricted passage 21 through which the pulp must pass before it can discharge through said opening 14. It will thus be seen that the size of the restricted passage 21 will control the state of fineness to which the pulp will be reduced before discharge. Therefore, by varying the size of this passage 21, the pulp may be reduced to any desired state of fineness. In order to so vary the size of the passage 21, the beater and circulator 20 is adjusted toward or from the plate 11, as the case may be, and obviously this may be accomplished in any suitable way. The construction described below is preferred.

The housing of the shaft bearing 18 is composed of an upper section 22 integral with the plate 11, and a lower section 23 which is secured to said section 22 by screws or the like 24. Upper and lower ball bearings 25 and 26, for the shaft 19, are mounted in the lower housing section 23 and are spaced apart by a sleeve 27. The inner ring or race of the lower bearing 26 is disposed upon a shoulder 28 on the shaft 19, and a nut 29 on said shaft abuts the inner ring or race of the upper bearing 25. It will thus be seen that vertical adjustment of the bearing housing section 23 will effect similar adjustment of the shaft 19, whereby the vertical dimension of the pulp outlet passage 21 may be varied. I have illustrated a shim or spacer 30 between the two sections 22 and 23 of the bearing housing. By removing this shim or spacer, an upward adjustment of the lower housing section 23 may be effected, or by adding a shim or

substituting a shim of greater thickness, a downward adjustment may be effected.

Where the shaft 19 passes through the plate 11, I provide a suitable stuffing box 31. Seals 32 and 33 are also provided around the shaft at the upper and lower ends of the housing section 23.

The part 34, shown in Fig. 2, is simply a "water flinger."

The beater and circulator 20 preferably comprises a squat conical disk 35 having an upstanding hub 36 in which the shaft 19 is secured, the top of said disk 35 being provided with spirally directed vanes 37 for not only beating the pulp but for circulating it as indicated by the arrows in Fig. 1. Should any accumulation occur under the disk 35, it may be removed through the opening 15, or loosened by inserting a suitable tool through said opening, so that it may discharge through the opening 14.

It will be observed that the rotor 20 with its vanes 37 causes the circulation of the stock and thus produces a defibering or refining action on the pulp, and that the circulation is radially outward from the restricted passage 21 which is in effect a single slot screen. The larger pieces of pulp are thus carried away from passage or slot 21 to be further reduced by the circulation and the beating action of rotor or beater 20 and its vanes 37. However, the velocity of the circulation indicated by the arrows in Fig. 1 is greater than the velocity of the stock discharging through the outlet pipe 16 and hence, the pulp that has been sufficiently refined to pass through the passage 21 will be carried out continuously. The passage or slot 21 together with the circulation thus forms a centrifugal classifier or selector. The width of the slot may be quickly and easily varied by changing the thickness of the shim or shims 30 to provide the fineness of pulp desired to make the quality of paper for a specified order. It is a great and novel advantage for the paper manufacturer to be able to quickly change in a few minutes the width of the restricted passage to get the fineness of pulp necessary to make the right quality of paper.

It will be further noted that the plate 11 is of slightly greater diameter than the rotor or beater 20 and that the width of the raised ridge 13 is such that it extends slightly under the peripheral edge of the beater. The ridge thus forms a relief ring so that any pieces of pulp that are large enough to just enter the passage or slot 21 will not bind or build up by gathering additional pieces and act as a brake, but will freely pass through the passage or slot to the discharge. That structure, together with the fact that one wall of the passage or slot 21 is constantly moving, makes it unnecessary to use wipers or scrapers, and the machine has been found to be non-clogging and highly efficient in operation.

I have illustrated a multiple V-belt drive 38 connecting the shaft 19 with an electric motor 39 but other appropriate driving means could of course be employed. When a vertical adjustment of the shaft 19 is carried out to vertically adjust the beater and circulator 20 as required, either the motor 39 may be bodily adjusted vertically, or a pulley of the drive belt may be adjusted so that the belts will still operate in planes truly at right angles to the shaft axis.

From the foregoing taken in connection with the accompanying drawing, it will be seen that novel and advantageous provision has been made for carrying out the objects of the invention, and while preferred details have been disclosed, variations may of course be made. Moreover, it is not essential that the beater and circulator and associated elements coact with the bottom wall of the tank, for they could well be positioned to cooperate with a vertical wall.

I claim:

1. A pulp beater and selector comprising a beating and circulating tank, one wall of said tank having a selected pulp outlet, a circular beater-and-circulator in said tank and rotatably mounted on an axis perpendicular to said wall, said beater-and-circulator covering said selected pulp outlet and forming the sole means for barring direct discharge of the tank contents therethrough, said beater-and-circulator being spaced sufficiently inward from said wall to leave a restricted annular screening passage between the bottom edge of said beater-and-circulator and the underlying portion of said wall through which properly reduced pulp may flow to said outlet, and means for driving said beater-and-circulator.

2. A structure as specified in claim 1; together with means for adjusting said beater-and-circulator with respect to said wall to vary the screening action of said annular restricted passage.

3. A pulp beater and selector comprising a beating and circulating tank having an opening in one wall, a plate secured against the inner side of one wall of said tank over said opening and having a selected pulp outlet, said plate having an annular inwardly projecting ridge on its inner face, a rigidly mounted shaft bearing at the outer side of said plate, a shaft rotatably mounted in said bearing and extending inwardly from said plate, a circular beater-and-circulator centrally secured to the inner end of said shaft and covering said selected pulp outlet to form the sole means for preventing direct discharge of the tank contents therethrough, said beater-and-circulator having its periphery overlying said ridge and being sufficiently close to provide space only for properly reduced pulp to flow between said ridge and said beater-and-circulator to said selected pulp outlet, and means for driving said beater-and-circulator.

4. A structure as specified in claim 3; together with means for adjusting said shaft bearing with respect to said plate to vary the distance between said beater-and-circulator and the ridge on said plate according to the extent to which the pulp is to be reduced before discharge.

5. A pulp beater and selector comprising a beating and circulating tank having an opening in the center of its bottom, a circular plate secured against the inner side of said bottom over said opening and having a selected pulp outlet, said plate having a central aperture and an upstanding annular ridge on its upper face adjacent its edge, a vertical shaft extending through the aperture in said plate, a bearing for said shaft, a sectional housing for said bearing having an upper section carried by the underside of said plate and a lower section to support said bearing, a circular beater-and-circulator centrally secured to the upper end of said shaft and covering said selected pulp outlet to form the sole means for preventing direct discharge of the tank contents therethrough, said beater-and-circulator having its periphery overlying said ridge and being sufficiently close to provide space only for properly reduced pulp to flow between the ridge and the beater-and-circulator to said selected pulp outlet, means for vertically adjust-

ing the lower section of said housing to vary the space between the beater-and-circulator and said ridge, and means for rotating said shaft.

6. A pulp beater and selector comprising a beating and circulating tank, one wall of said tank having a selected pulp outlet, a plate secured to said wall and having a flat circular portion surrounding said outlet, a rotatable shaft perpendicular to said wall and positioned concentric with said flat circular portion of the plate, a circular beater-and-circulator in said tank fixed to said shaft and covering said selected pulp outlet to form the sole means for barring direct discharge of the tank contents therethrough, said beater-and-circulator having its periphery spaced sufficiently inward from said flat circular portion of the plate to leave a restricted annular screening passage between the bottom edge of said beater-and-circulator and the underlying flat circular portion of the plate through which properly reduced pulp may flow to said outlet, means for driving said shaft, and means for adjusting said beater-and-circulator with respect to the flat circular portion of said plate to vary the screening action of said restricted annular passage.

7. A pulp beater and selector comprising a beating and circulating tank, one wall of said tank having an opening, a plate secured upon the inner surface of said wall over its opening, said plate having a flat circular portion adjacent its edge and also having within said edge a selected pulp outlet, a shaft perpendicular to said one wall and extending centrally through said plate, a hollow cone-shaped beater-and-circulator fixed to said shaft and positioned to overlie said plate with its periphery spaced from the flat circular portion of the plate to provide therebetween a restricted annular screening passage through which properly reduced pulp may flow to said outlet, means on the outer side of said plate for supporting said shaft, means for adjusting said supporting means to vary the space between the periphery of said beater-and-circulator and the flat circular portion of said plate according to the extent to which the pulp is to be reduced before discharge.

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