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Seifert

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[54] PULPING APPARATUS

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[52] **U.S. Cl.** **259/44,** 241/46.17, 259/8

[51] **Int. Cl.** **B01f 15/02,** B01f 7/16

[58] **Field of Search**.....241/46.11, 46.17, 46.08; 259/8, 43, 44, 96; 162/261; 259/23, 24

[56] **References Cited**

UNITED STATES PATENTS

3,592,444	7/1971	Arvanitakis	259/44 X
2,557,174	6/1951	Cowles	259/96 X
3,595,488	7/1971	Blakley et al.	241/46.08 X
3,043,526	7/1962	Cowles	241/46.17

FOREIGN PATENTS OR APPLICATIONS

1,038,974	8/1966	Great Britain	259/96
822,143	10/1959	Great Britain	241/46.11
1,122,660	5/1956	France	241/46.08

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[57] **ABSTRACT**

A waste treatment tub having a cylindrical side wall, a perforated bottom wall and a rotor mounted on the bottom wall is provided with a baffle which extends across the tub in chord relationship to the circle defined by the cylindrical side wall. The chord-like baffle shifts the center of the vortex formed by the rotor to a position non-coincident with the axis of rotation of the rotor to improve cutting efficiency and also causes undisintegrated material to be flung inwardly, from whence it can be carried through the treating zone. When the rotor is of the type which is provided with pivotally mounted hammers or flails, the flow pattern which results from the use of the chord-like baffle reduces vibrations which may be caused by material collecting on the vanes of the rotor and the hammers or flails.

2 Claims, 3 Drawing Figures

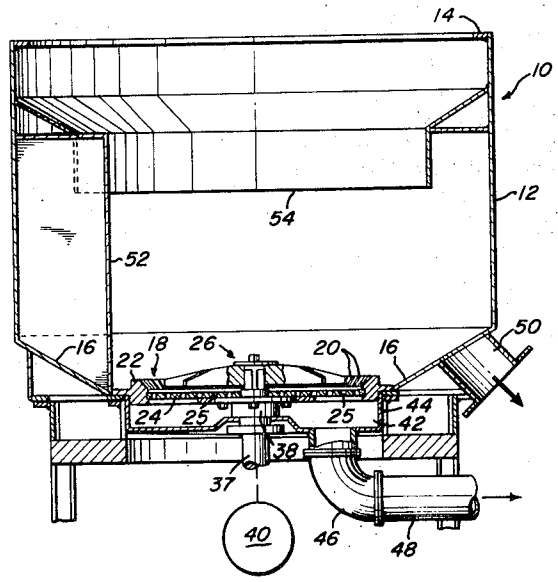


FIG-1

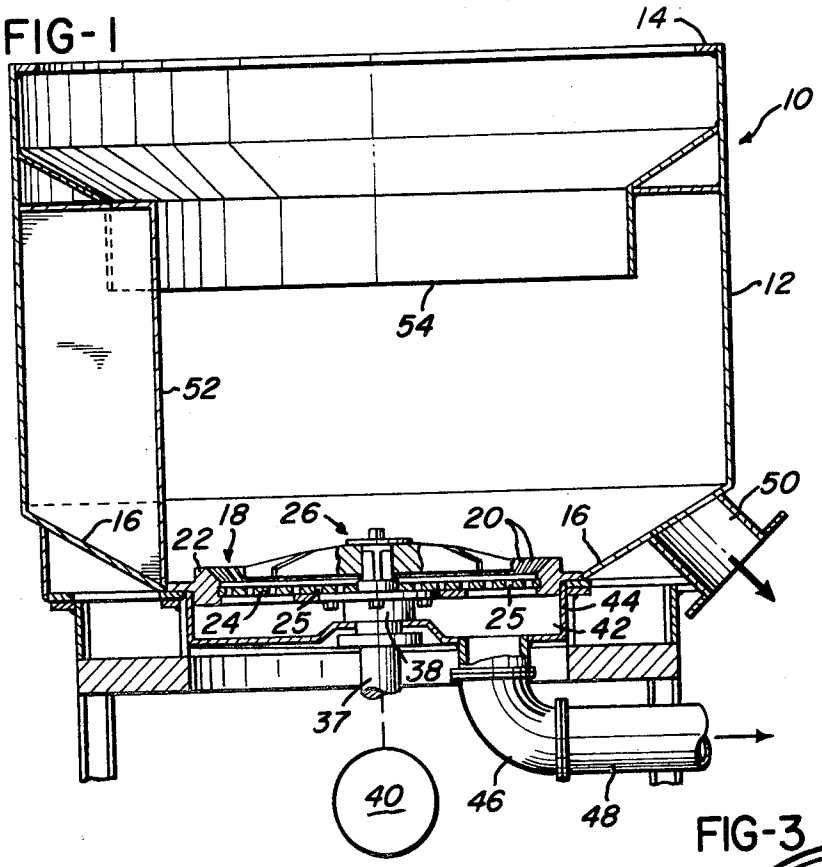


FIG-3

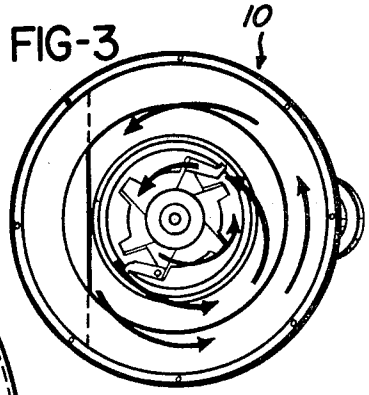
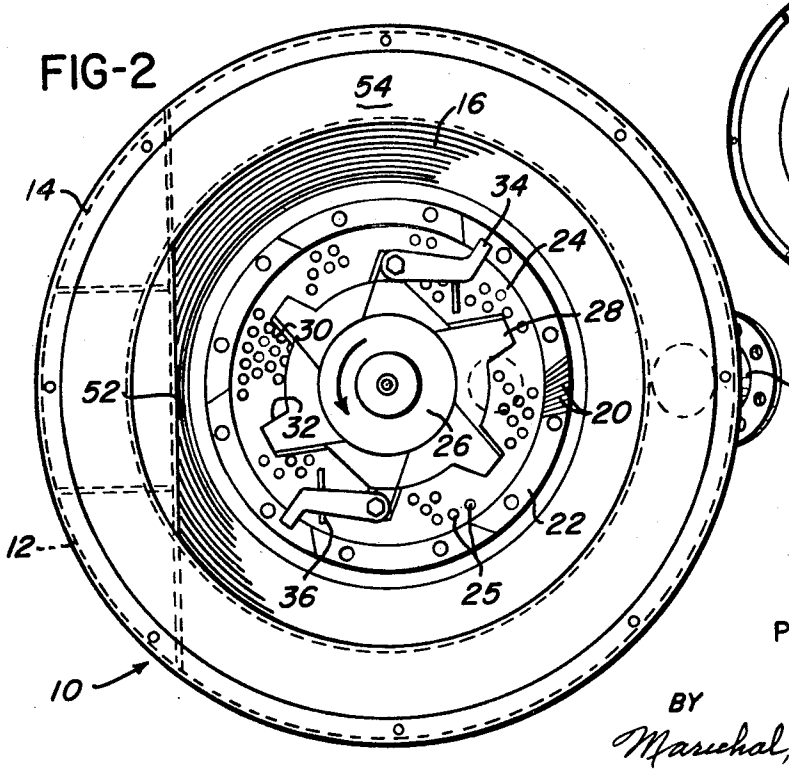


FIG-2



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PULPING APPARATUS

BACKGROUND OF THE INVENTION

Pulping apparatus which incorporates a rotor rotatably mounted on a perforated bedplate extending across the bottom of the pulper tub has gained widespread acceptance in the paper industry for repulping broke, wastepaper, etc. In apparatus of this type the rotational movement of the rotor causes the paper placed in the tub together with water to be subjected to both mechanical and hydraulic shear forces as the mixture of water and paper is circulated in a vortical pattern outwardly and upwardly along the wall of the treatment vessel and then downwardly toward the center of the vessel and the rotor. The hydraulic shear forces are generated by the violent vortical flow patterns set up by the rotor, whereas the surfaces of the rotor itself are primarily responsible for the mechanical shear forces. Pulping apparatus of this general type is shown in detail in the U.S. Pat. to Vokes, No. 3,073,535.

More recently, pulping apparatus of this general type has been adapted for use in treating solid waste materials. For example, apparatus shown in application Ser. No. 861,778, filed Sept. 29, 1969, now Blakley et al. U.S. Pat. No. 3,595,488, treats a mixture of solid waste materials and a liquid such as water or the like and disintegrates the relatively fragile portions of the solid waste to a particle size small enough to be extracted with some of the liquid in the tub in slurry form through the perforations in the perforated bedplate. Relatively infrangible portions of the solid waste, such as metal castings, pipes and the like, are withdrawn from the tub separately from the slurry of relatively frangible portions.

Whereas the rotor shown in the apparatus of U.S. Pat. No. 3,073,535 depends primarily upon the rotor surfaces for mechanical shearing action, the rotor disclosed in the above noted copending application is further provided with pivotally mounted hammers or flails attached to the outwardly projecting vanes of the rotor which cooperate with a discontinuous attrition surface to provide additional shearing action.

SUMMARY OF THE INVENTION

The present invention represents an improvement over pulping apparatus of the type described above. In pulping apparatus according to the present invention, a baffle extends across the tub from one portion of the side wall to another portion thereof and substantially parallel to the axis of rotation of the rotor. Thus, if the side wall of the pulper tub or vessel is substantially cylindrical in cross-sectional configuration, the baffle in cross-sectional configuration constitutes a chord to the circle defined by the cylindrical side wall on the pulper tub, and the baffle in effect forms that portion of the wall of the tub connecting the ends of the cylindrically curved portion.

This chord-like baffle has the effect of moving the center of the vortex created by the rotor to a position noncoincident with the axis of rotation of the rotor. This produces a much more violent circulation of the material being processed by the apparatus and provides more efficient disintegration of the material. Thus, knots or balls of undisintegrated material are flung inwards, from whence they can be carried through the pulper cutting zone by its normal action, and there is minimum tendency for solid material to collect in the center of the vortex as can occur with a vortex centered on the rotor axis.

As a result, these knots and balls are disintegrated to a much higher degree than in a pulper tub not having the chord-like baffle. Additionally, the baffle induces a flow pattern which reduces vibrations caused by the material being processed hanging on the vanes or the pivotally mounted hammers or flails.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an elevational view, partly in section, showing the apparatus of the present invention;

FIG. 2 is a plan view of the structure of FIG. 1; and

FIG. 3 is a somewhat diagrammatic plan view, similar to FIG. 2, but showing the flow pattern induced in a tub provided with the baffle of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

As seen in FIG. 1, the apparatus of the present invention includes a treatment vessel or tub **10** having an upstanding, circular, cylindrical side wall **12**. The upper end of the side wall **12** is turned inwardly to form an overhanging top lip **14** while the lower end of the side wall **12** is directed inwardly at an angle to provide a substantially frusto-conical portion **16**. A bottom wall, referenced in its entirely by numeral **18** extends across the bottom of the portion **16** of the side wall and is comprised of a series of trapezoidally shaped bars **20** which are angularly disposed with respect to the radius of the circle defined by the side wall **12** and are spaced apart to define a discontinuous attrition surface **22**, all as explained in greater detail in the above noted copending application.

The bottom wall **18** also includes a perforated bedplate **24** having a series of holes **25** defined therethrough of some preselected, usually uniform, size and spacing. Rotatably mounted just above the bedplate **24** is a rotor **26** having outwardly projecting vanes or arms **28**, each of which has a leading edge **30** and a trailing edge **32**. Hammers or flails **34** are pivotally mounted on opposing vanes or arms and are beveled on their outer, under surfaces complementarily to the opposing surfaces of the bars **20**. Additionally, the bedplate **24** can be provided with angularly disposed bars **36** fixed to its upper surface and adapted to cooperate with oppositely extending bars, not shown, mounted on the lower surface of the motor **26**.

A shaft **37** extends downwardly from the rotor and is received in a bearing **38** mounted in a lower portion of the treatment vessel and driven by a motor **40** for rotation in the direction shown by the arrow in FIG. **2** of the drawings. Immediately beneath the perforated bedplate **24** a chamber **42** is defined by the downwardly and inwardly extending wall **44**. An opening from the chamber **42** is connected to the elbow connection **46**, which in turn is connected to a pipe **48** leading downstream to further treatment stations. Similarly, the interior of the treatment vessel **10** is provided with an outlet **50** for a purpose to be presently described, the outlet **50** being located, as shown in FIG. **2**, at a position between the periphery of the rotor **26** and the curved portion of wall **12**.

With the apparatus thus described solid material such as wastepaper, broke, solid waste material or the like, and a liquid medium such as water, are dumped into the treatment vessel **10** where the solid materials are subjected to a violent hydraulic and mechanical shear forces. Relatively frangible portions of the solid materials are disintegrated until they are reduced in particle size to a dimension small enough to pass through the perforations in the bedplate **24**, after which they are extracted with a portion of the liquid medium in slurry form into the chamber **42**. Relatively infrangible portions of the solids are extracted, either continuously or periodically, through the outlet **50** for further treatment.

In apparatus of this general type, the rotational action of the rotor **26** will cause the liquids and solids contained in the tub to be flung outwardly along the side walls then upwardly and inwardly toward the center of the tub where they fall by gravity back toward the center of rotation of the rotor **26**. In treatment apparatus according to the present invention, the substantially symmetrical vortex thus created is modified by the introduction into the treatment vessel of a baffle **52** which is mounted in the tub and extends upwardly from the lower portion of the frusto-conical section **16** of the side wall to an inwardly projecting brow **54** which is annularly disposed within the vessel **10**. The baffle **52** thus forms in effect a planar portion of the inner side wall of the tub extending along the chord connecting the ends of the remaining portion of the circularly curved side wall **12**, and the arc subtended by this chord is of substantial angular extent, shown as approximately 100°.

Thus, with the apparatus of the present invention, rather than the substantially symmetrical flow pattern found in prior art pulping apparatus, the flow pattern is modified, substantially as shown in FIG. **3** of the drawings. As thus modified, the vortex created through the action of the rotor is shifted, to the right as seen in FIG. **3**, to a point where the center of the vortex is noncoincident with the center of rotation of the rotor **26**. This causes knots or balls of undisintegrated material to be flung inwards, from whence they can be carried through the pulper cutting zone by normal action and disintegrated to a higher degree. Additionally, the resulting flow pattern reduces vibrations in the treatment vessel caused by solid materials hanging on the vanes or pivotally mounted hammers and flails. As a result, much more efficient disintegrating action is obtained and the active life of the apparatus itself is appreciably lengthened.

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. Apparatus for pulping liquid suspensions, comprising a tub having a substantially vertical side wall including a circularly curved portion of less than 360° and a substantially planar portion connecting the ends of said circularly curved portion, a rotor mounted in the bottom of said tub for rotation on an axis substantially concentric with the center of said circularly curved wall portion, means for driving said rotor to create a vortex in a liquid suspension within said tub, and the extent of the arc subtended by said planar wall portion being sufficient to cause the center of said vortex to shift from said rotor axis away from said planar wall portion.

2. Pulping apparatus as defined in claim **1** further comprising means defining a discharge outlet for relatively infrangible solids located in the bottom of said tub at a position between said rotor and said circularly curved wall portion.

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