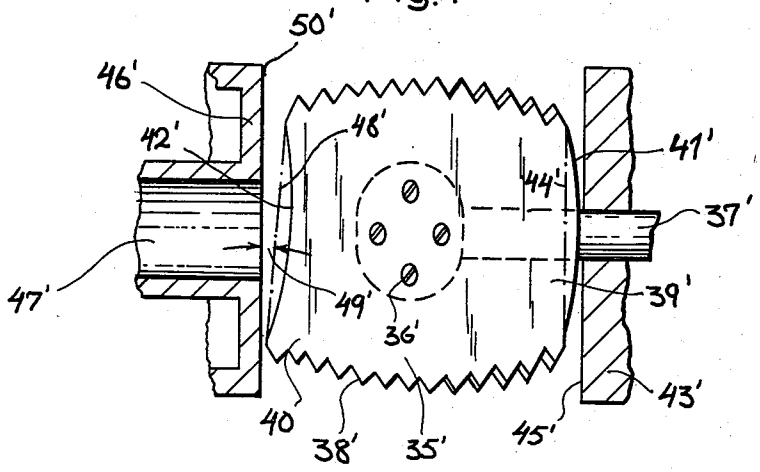
Dec. 10, 1963 G. NEIDL 3,113,734

APPARATUS FOR COMMINUTING FIBROUS MATERIAL

Filed Dec. 13, 1960 2 Sheets-Sheet 1

Fig. 1



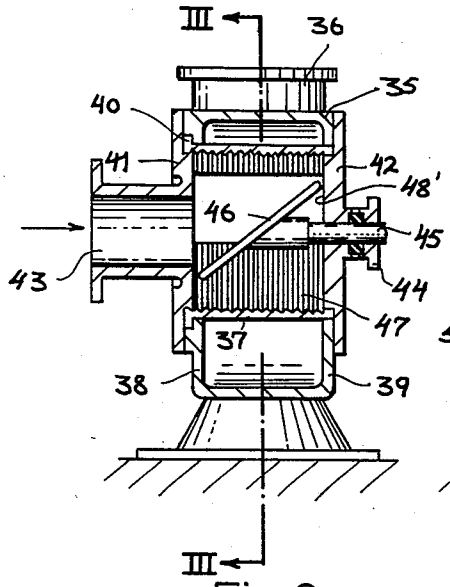


Fig. 2

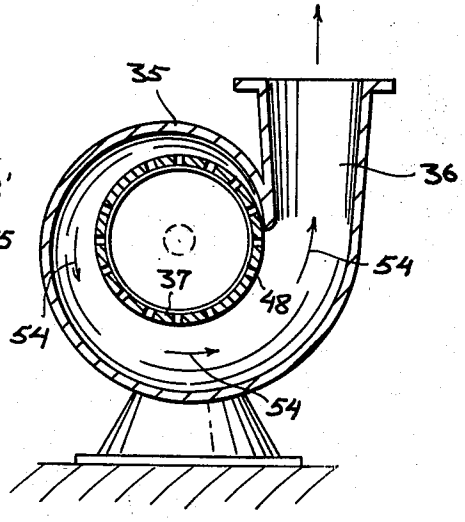


Fig. 3

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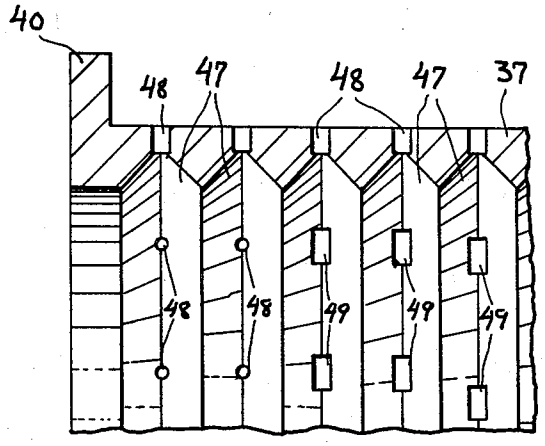


Fig. 4

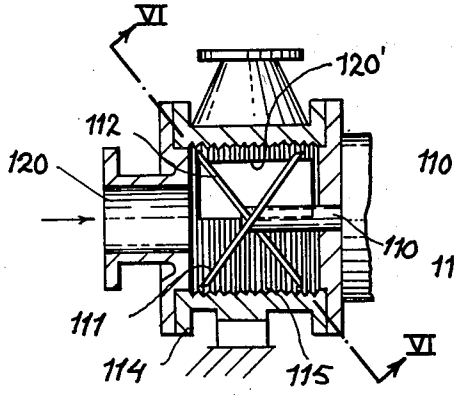


Fig. 5

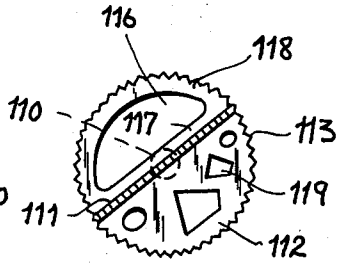


Fig. 6

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3,113,734

APPARATUS FOR COMMINUTING FIBROUS MATERIAL

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Filed Dec. 13, 1960, Ser. No. 75,536
Claims priority, application Germany Dec. 29, 1959
3 Claims. (Cl. 241—74)

This invention relates to improvements in and to further developments of the method claimed in my copending application Ser. No. 859,887, now Patent No. 3,067,960, of producing a fibre material, and to improved apparatus for performing said method.

According to said application the raw materials from which the fibre product is made, together with the liquid required for suspending, dispersing and digesting the same, are introduced into a tank, and by pumping said mixture by a swashplate impeller pump whilst simultaneously disintegrating the same, the mixture is continuously circulated through tank and pump until the mixed and dispersed material has been reduced to the desired fineness of fibre.

For producing the fibre material a rotary pump may for instance be used of a kind fitted with an impeller in the form of a circular or elliptic disc provided along its periphery with teeth, serrations, projections or indentations, which in axial section engage conformable grooves in the inside walls of the pump casing. Segment-like portions are cut off the shorter sides of the disc-shaped impeller in such manner that the cut edges are inclined or concave or convex or curved in some other way in relation to the adjacent inside faces of the cover plates of the casing.

This conformation of the edges submits the feed to a wedging action when the impeller rotates, engendering a tearing, pulping and grinding effect.

It may be advisable to provide a first pump with a coarse reducing effect followed by pumps which have a finer action. If this is done, the final product emerging from the last of the pumps can be obtained in a form which is free from nebs, i.e. from nodules and lumps, and the process will occupy minimum time, as is required for the production of a paper which is free from flaws. Synthetic fibres may be added to the fibre pulp.

Moreover, it may be advisable to make use of pumps which in the interior of their pump casings are fitted with a screen in the opening facing the delivery branch, said screen substantially widening in the downward direction, and the entry into the pressure branch being likewise widened by a bulging formation of the casing wall at this point. This raises the delivery volume and improves the disintegrating effect.

Moreover the bulge may be formed by a volute-like casing extending around the entire periphery of the pump and the perforated screening insert may take the form of a hollow cylindrical liner provided with holes around its entire circumference and arranged to leave space around the entire periphery of the perforated liner.

The casing of the rotary pump may have the shape of a hollow body of revolution with a disc-shaped impeller mounted at an angle of tilt on a shaft which passes concentrically through the casing.

The casing in the form of a hollow body of revolution, of ellipsoidal or spheroidal shape is widened in the manuer of a volute, a shape which greatly improves the efficiency of the pump.

If two discs are provided one may be solid and the other provided with perforations.

The invention will now be described in greater detail by reference to embodiments shown in the accompanying drawings in which:

FIGURE 1 is a partial axial section of a pump casing;

FIGURE 2 is an axial section of a rotary pump with a circularly grooved inserted liner and a volute-shaped casing;

FIGURE 3 is a radial section of a pump similar to that shown in FIGURE 2 the section corresponding to one taken on the line III—III;

FIGURE 4 is a partial axial section of the annularly grooved liner;

FIGURE 5 is an axial section of a rotary pump containing two crossed impeller discs; and

FIGURE 6 is a fragmentary view and a part section of the impeller, taken on the line VI—VI in FIGURE 5.

In the swashplate impeller pump shown in FIGURE 1, the impeller **35'** is a disc affixed by screws **36'** to a pump shaft **37'** and provided with peripheral teeth **38'** which engage corresponding grooves inside the pump casing (**47** in FIGURE 2). Segments are cut off the shorter sides **39'**, **40'** of the impeller **35'** along arcs **41'**, **42'**. The arc **41'** facing the side of the pump which is closed by cover **43'** is convex, the chord across the arc **41'** as indicated by a dot-dash line being parallel with the inside face **45'** of the cover plate **43'**. The cut edge **42'** on the opposite side **40'** of the impeller disc **35'** is concave with the concavity facing a cover **46'** which is integral with the entry branch **47'**. The chord **48'** across this concave curve **42'**, likewise shown in dot-dash lines, forms an acute angle with the inside face **50'** of the pump cover plate **46'**.

In the embodiments shown in FIGURES 2 and 3 the rotary pump has a volute-shaped casing **35** with a spiral or tangential delivery branch **36**. A hollow cylindrical liner **37** is inserted in pump casing **35** and held in position between the two side walls **38**, **39** of the casing. In the embodiment of FIGURE 2, outlet opening **48'**, extending the full length of the liner, is provided while individual outlet apertures **48** are provided in the liner of FIGURE 3. For securing the liner **37** inside the casing one end of the liner is formed with a radial flange **40** which engages a corresponding annular recess in the cooperating side wall **38** of casing **35**. The side walls **38** and **39** of casing **35** are provided with openings which equal the diameter of the liner **37** in size, said openings being closed by flanged cover plates **41**, **42** of which one **41** is formed with the entry branch **43**, whereas the other flanged cover **42** carries the bearings **44** and a stuffing box for the pump shaft **45** which extends into the interior of liner **37** and upon which the slanting impeller **46** is overhung. The inside face of liner **37** may be provided with circumferential grooves **47** for engagement of teeth cut into the periphery of the impeller disc **46**.

It will be seen by reference to FIGURES 3 and 4 that the outlet apertures or channels **48** and **49**, respectively, provided at the bottom of the circumferential grooves **47**, have a circular, square, rectangular, or some other cross section.

In the embodiment shown in FIGURE 5 the pump shaft **110** carries two impeller discs **111**, **112** which interpenetrate at an angle and are overhung on the end of said shaft in such manner that teeth **113** on the peripheries of the two rotating discs with or without clearance engage parallel annular grooves **115** cut into the inside peripheral surface of pump casing **114**.

One **112** of the two discs is provided with perforations. These may take the form of semicircular lunettes **116** as shown in FIGURE 6 at the top, leaving only a central diametral rib **117** and an outer ring portion **118**, or, as illustrated in the lower half of the drawing, they may consist of a plurality of elliptical, square, or otherwise shaped holes **119** in the disc.

These perforations serve the purpose of restricting the primary pumping effect to the unperforated disc **111**, whereas the other disc **112** is chiefly intended to assist the

disintegrating effect of disc 111 by the cooperation of its teeth with the circumferential grooves in the casing.

The pump casing has an inlet opening 120 as well as an outlet opening 120' similar to that illustrated at 48' in FIGURE 2.

I claim:

1. Apparatus for comminuting fibrous material suspended in a liquid vehicle, comprising a housing having a pump chamber provided with an axis, inlet means for admitting a suspension of said material into said chamber and outlet means spirally widening outwardly from said axis for removing said suspension from said chamber; an impeller disc having a serrated periphery extending within said chamber in inclined intersecting relationship to said axis, said chamber having an annularly grooved wall portion centered on said axis and complementarily receiving the teeth of the serrated periphery of said disc; and means for rotating said disc about said axis with the periphery of said disc sweeping a surface of revolution centered on said axis and closely juxtaposed with said wall portion of said chamber whereby said disc displaces said suspension from inlet means through said outlet means and spirally therealong.

2. Apparatus for comminuting fibrous material suspended in a liquid vehicle, comprising a housing having a generally cylindrical partition forming a pump chamber provided with an axis, inlet means for admitting a suspension of said material into said chamber and outlet means spirally widening outwardly from said partition, said partition being provided with aperture means communicating between said outlet means and said chamber; an impeller disc having a serrated periphery extending within said chamber in inclined intersecting relationship to the axis of said partition, said partition having an inner wall portion centered on said axis and provided with axially spaced annular grooves complementarily receiving the teeth of the serrated periphery of said disc; and means for rotating said disc about said axis with the periphery of said disc sweeping a surface of revolution centered on said axis and closely juxtaposed with said wall portion of said chamber whereby said disc displaces said suspension from said inlet means to said outlet means and spirally therealong.

3. Apparatus for comminuting fibrous material suspended in a liquid vehicle, comprising a housing having a generally cylindrical partition forming a pump chamber,

inlet means for admitting a suspension of said material into said chamber, said partition being provided with a plurality of angularly spaced throughgoing apertures, and outlet means communicating with said apertures while widening spirally outwardly from said partition for removing said suspension from said chamber; an impeller disc having a serrated periphery extending within said chamber in inclined intersecting relationship to the axis of said partition, said chamber having an inner wall portion centered on said axis and provided with axially spaced annular grooves, complementarily receiving the teeth of the serrated periphery of said disc; and means for rotating said disc about said axis with the periphery of said disc sweeping a surface of revolution centered on said axis and closely juxtaposed with said wall portion of said chamber whereby said disc displaces said suspension from said inlet means to said outlet means and spirally therealong.

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