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APPARATUS FOR SEPARATING SOLIDS FROM A LIQUID SUSPENSION

Filed Sept. 16, 1953

2 Sheets-Sheet 1

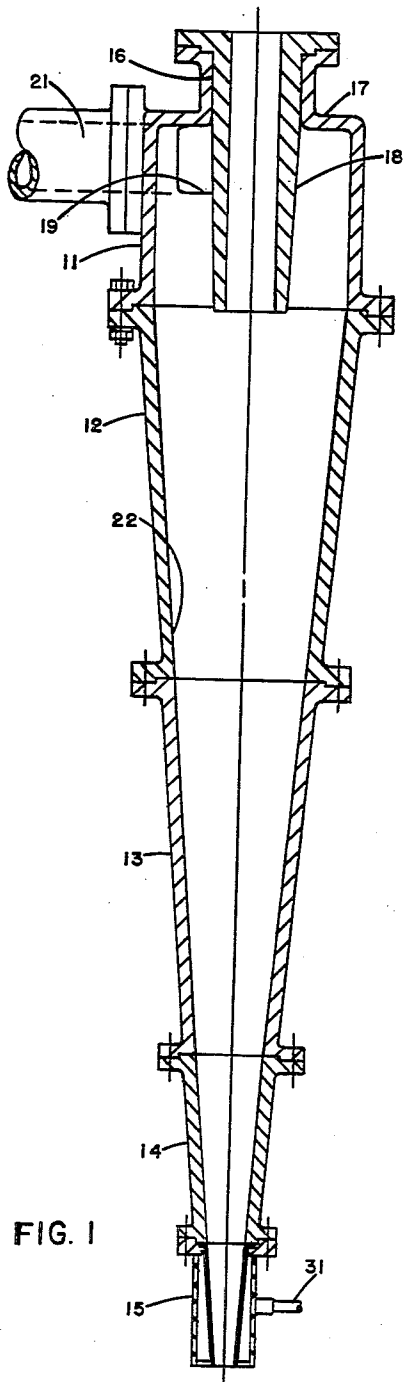


FIG. 1

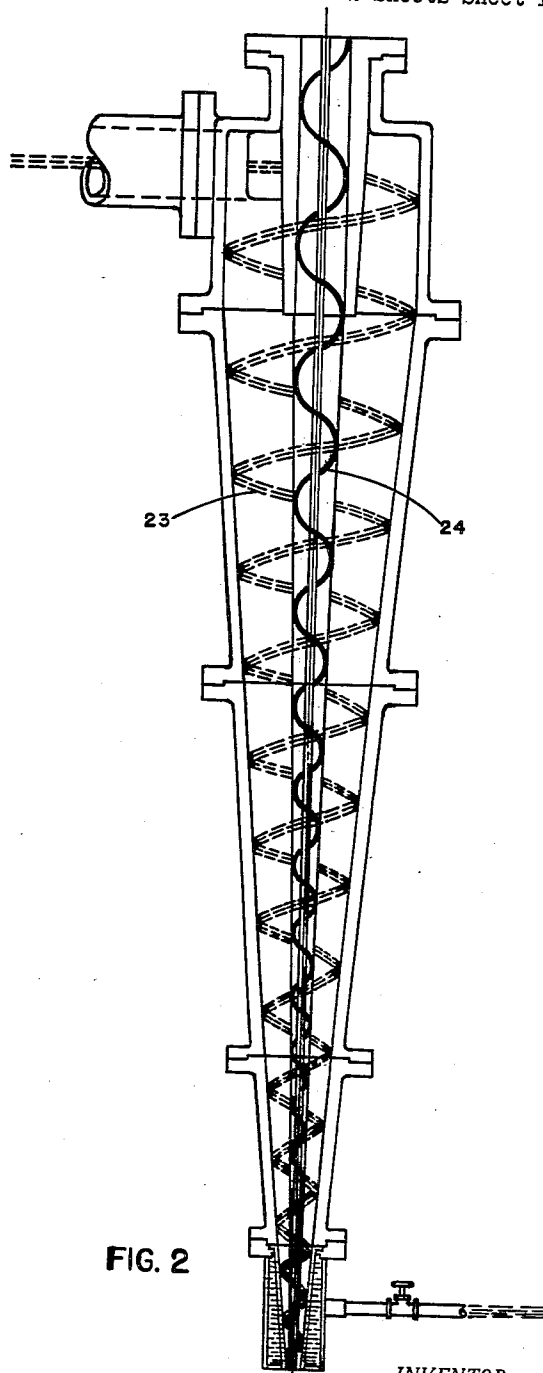


FIG. 2

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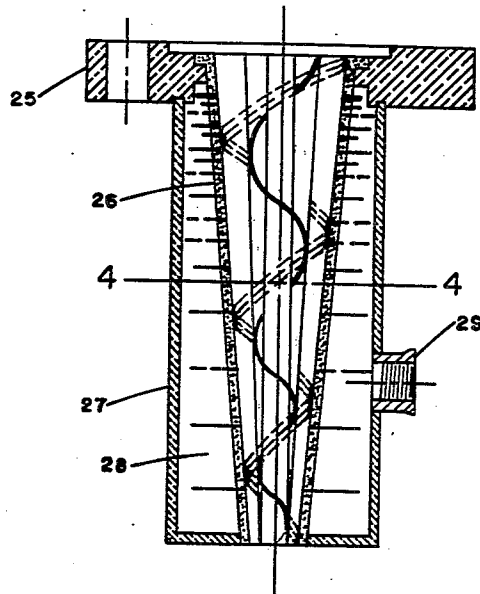


FIG. 3

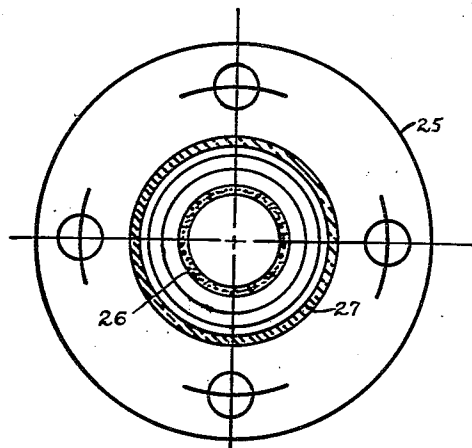


FIG. 4

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2,809,567

APPARATUS FOR SEPARATING SOLIDS FROM A LIQUID SUSPENSION

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4 Claims. (Cl. 92—28)

This invention relates to separating methods and apparatus, and more particularly to pulp separation wherein desirable wood fibers are removed from a liquid pulp suspension in a cone type separator.

The object of the invention is to simplify the construction as well as the means and mode of operation of cleaners, whereby such cleaners may not only be economically manufactured, but will be more efficient and satisfactory in use, adaptable to a wide range of applications, while having relatively few parts and be unlikely to get out of repair.

A further object of the invention is to improve the efficiency of cleaners of the described kind, to the end that desirable wood fibers, heretofore discharged without separation, may be separated.

A further object of the invention is to utilize a principle of water injection in pulp cleaners of the kind described, for purposes of supplemental or better fiber separation.

Still another object of the invention is to modify pulp cleaners of the kind described by embodying therein a means of water injection, applicable to both new and existing devices.

A still further object of the invention is to substitute in pulp cleaners of the kind described a generally new tip whereby water under pressure may be injected into the flowing liquid pulp material for a radial squeezing or compression thereof.

A further object of the invention is to provide a cleaner possessing the advantageous structural features, the inherent meritorious characteristics and the mode of operation herein mentioned.

With the above primary and other incidental objects in view as will more fully appear in the specification, the invention intended to be protected by Letters Patent consists of the features of construction, the parts and combinations thereof, and the mode of operation, as herein-after described or illustrated in the accompanying drawings, or their equivalents.

Referring to the accompanying drawing, wherein is shown one, but obviously not necessarily the only form of embodiment of the invention,

Fig. 1 is a view in longitudinal section, partly diagrammatic, of a separator in accordance with the illustrated embodiment of the invention;

Fig. 2 is a view like Fig. 1, with lines superimposed thereon indicating flow paths in the device;

Fig. 3 is a detail, enlarged view, in longitudinal section, of the separator tip; and

Fig. 4 is a view in cross section, taken substantially along the line 4—4 of Fig. 3.

Like parts are indicated by similar characters of reference throughout the several views.

Referring to the drawings, as shown in Figs. 1, 3 and 4 a cyclone separator in accordance with the illustrated embodiment of the invention comprises a plurality of aligned housing elements 11, 12, 13 and 14 and a tip 15. The interior of the separator is open through the tip 15.

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At the opposite end of the separator the element 11 is formed with a closure wall 16, which has, however, a central opening 17 in which is installed a short tube 18. The tube 18 projects through and beyond the wall 16 to the interior of the separator and is aligned with the axis thereof, the tube further being spaced from the sides of the element 11.

Also in the element 11 is a tangential opening 19 communicating with a pipe 21 conducting a liquid suspension containing fibers for separation. The several elements 11, 12, 13, 14 and the tip 15 have mating internal surfaces defining a smooth wall 22 which progressively decreases in diameter from the element 11 toward the tip 15.

The operation of the instant separator is essentially the same as that of Sampson et al. Patent No. 2,377,524, issued June 5, 1945. Thus, and as indicated in Fig. 2, the liquid suspension is conducted to the separator by way of pipe 21 and is discharged by way of opening 19 tangentially upon the wall 22. Under the urging of the following liquid, and perhaps also as a result of gravity influence, the liquid suspension moves toward the tip 15, moving in a helical path along the wall 22 as represented by the broken line helix 23. Flowing through the open ended tip 15, the suspension material leaves the separator for discharge to waste or for further separation in similar separators.

The forces generated in flow of the liquid suspension are productive of a phenomenon manifested by a free vortex rising centrally of the separator and inducing a counterflow of material as represented by the heavy sinuous line 24. Relatively light particles descending in the path 23 are entrained in the counterflow 24 and are conducted thereby out of the separator by way of the tube 18.

Referring particularly to Figs. 3 and 4, the tip 15 in accordance with illustrated embodiment of the invention is a fabricated device which includes a ring 25 bolted to the element 14, a conical member 26 defining the tip proper, and a jacket 27 supported from the ring 25 and in surrounding, spaced apart relation to the member 26. The jacket 27 and member 26 define a chamber 28 communicating through an opening 29 and a pipe 31 with a source of fresh water under pressure. The member 26 is of a porous material, through which water from chamber 28 is substantially evenly dissipated under pressure of the water supply in pipe 31.

Water under pressure is continuously supplied the space 28, in the operation of the separator. Forced through the member 26, this water applies a radially compressive force to the liquid suspension in path 23, tending to force it into the path 24 of the ascending vortex. Fibrous particles which might otherwise be lost thus are separated therefrom. Undesirable particles, having terminal velocities higher than the fibers pass through the wall of fresh water which is created substantially throughout the entire extent of member 26, and continue outward to the tip opening where they are discharged.

From the above description it will be apparent that there is thus provided a device of the character described possessing the particular features of advantage before enumerated as desirable, but which obviously is susceptible of modification in its form, proportions, detail construction and arrangement of parts without departing from the principle involved or sacrificing any of its advantages.

While in order to comply with the statute the invention has been described in language more or less specific as to structural features, it is to be understood that the invention is not limited to the specific features shown, but that the means and construction herein disclosed comprise but one of several modes of putting the invention into effect.

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Having thus described my invention, I claim:

1. An apparatus for separating solids from a liquid suspension, including a cone shaped separator having a liquid suspension inlet near the large end of the separator arranged for tangential discharge so that the liquid suspension flows in a helical path along the wall of the separator towards the small end thereof, said flow inducing a concentric counterflow entraining solids, said separator being made of substantially impermeable material, a tip on said separator constituting an extension thereof of substantial longitudinal extent and made of porous material, and means for supplying said tip with fresh water under pressure thereby displacing a part of the liquid suspension towards the axis of the separator.

2. Apparatus according to claim 1, characterized in that said last named means includes a jacket in surrounding spaced apart relation to said tip.

3. Apparatus for separating solids from a liquid suspension including a cone shaped separator, a liquid suspension inlet near the large end of the separator arranged for tangential discharge so that the liquid suspension flows in a helical path along the wall of the separator toward

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the small end thereof, said flow inducing a concentric counterflow entraining solids, a section of said separator of substantial longitudinal extent being made of a porous material, a jacket surrounding said section, and means for supplying fresh water under pressure to said jacket to displace liquid suspension into the path of said counterflow.

4. Apparatus according to claim 3, characterized in that said porous section is located at and defines the tip of said separator.

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