Sept. 5, 1933. G. KNOPP 1,925,722

METHOD OF AND APPARATUS FOR TREATING PULP STOCK

Filed June 4, 1930 2 Sheets-Sheet 1

Fig. 2.

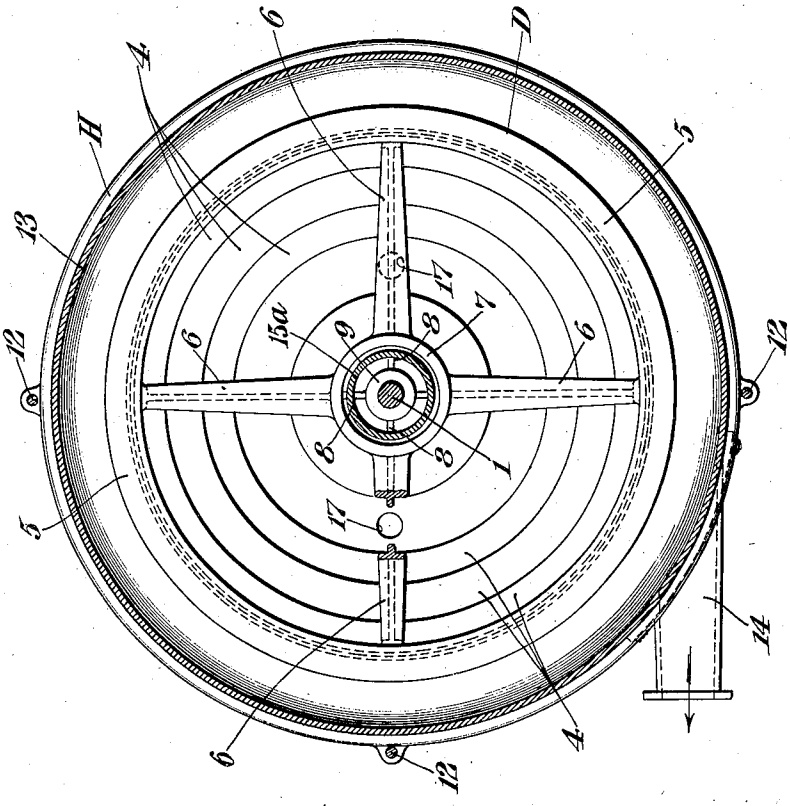
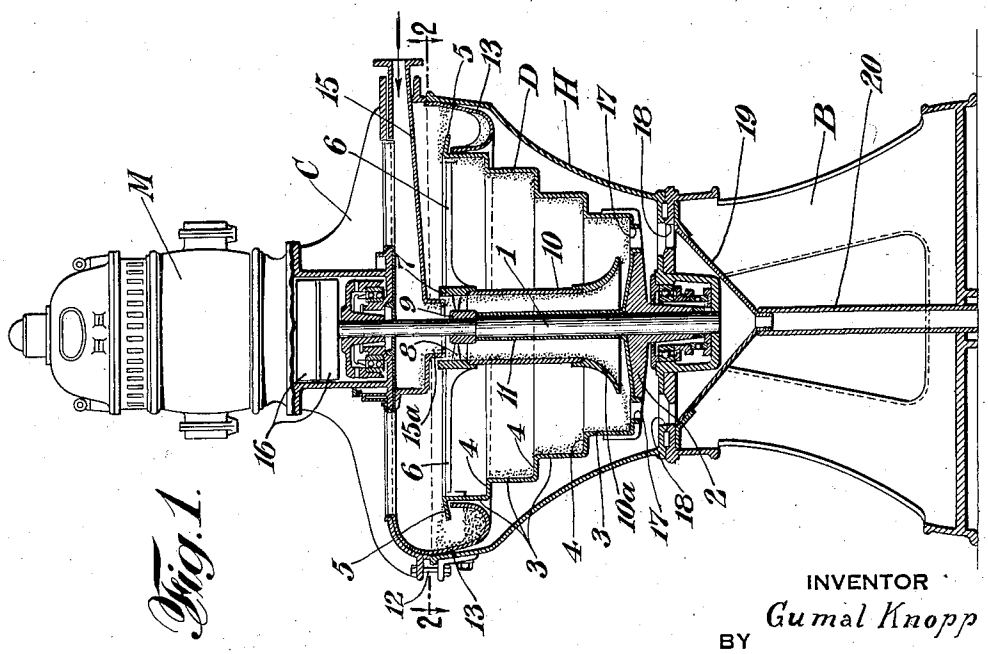


Fig. 1.



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Fig. 3.

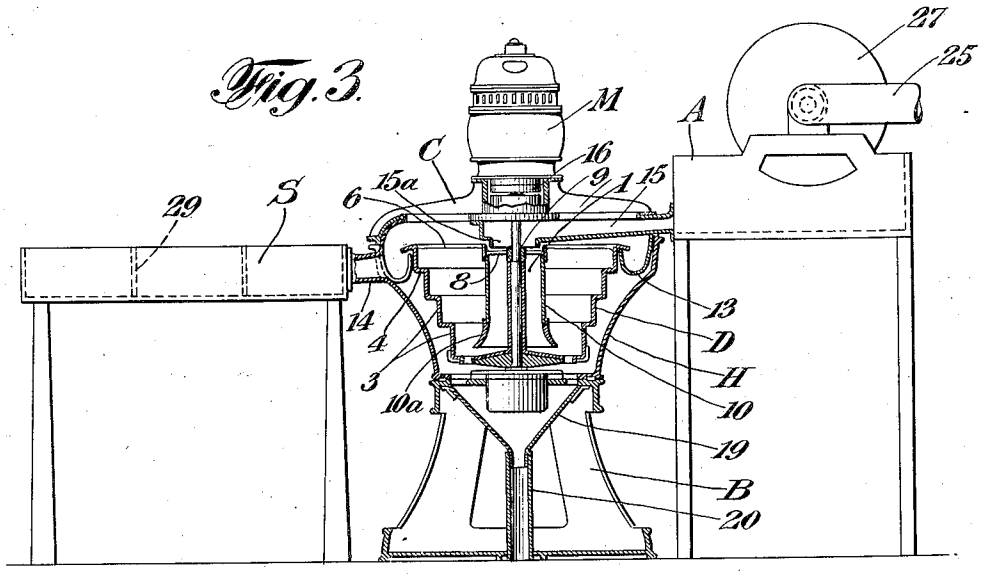
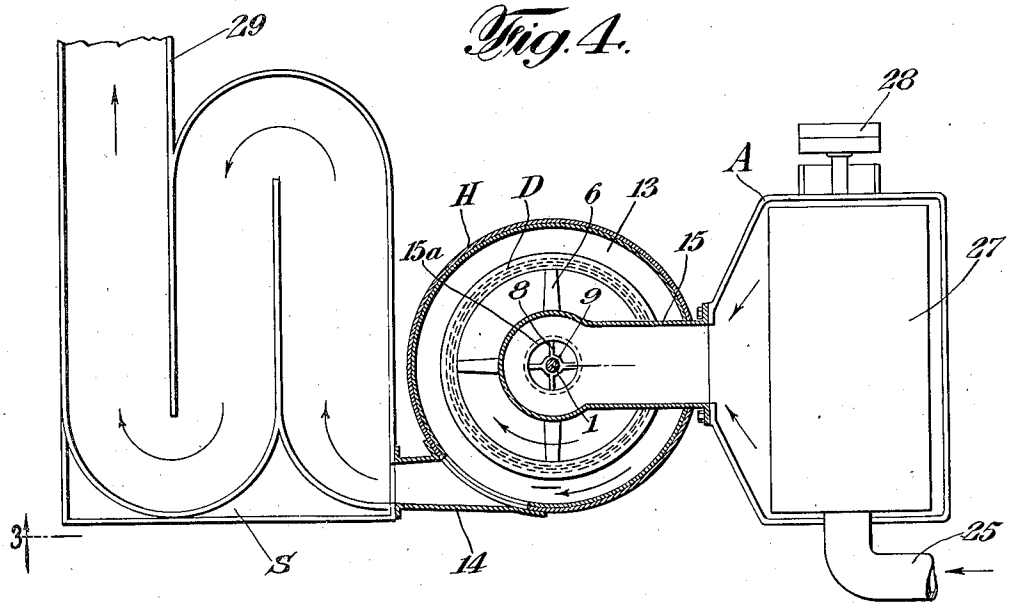


Fig. 4.



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UNITED STATES PATENT OFFICE

1,925,722

METHOD OF AND APPARATUS FOR TREATING PULP STOCK

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Application June 4, 1930, Serial No. 459,215, and in Germany July 11, 1929

5 Claims. (Cl. 92—34)

My invention relates to a method of and apparatus for treating any suitable kind of pulp stock or other fibrous material destined to be utilized in the manufacture of paper, board, cardboard, or otherwise as may be desirable.

My invention, in one of its prominent phases, involves an arrangement for disintegrating or separating bundles of pulp stock into fibres or for greatly diminishing the size of such bundles of pulp stock.

My invention also relates to an arrangement or system for cleaning or treating suitable pulp stock to remove impurities therefrom.

Various other objects, advantages and characteristics of my invention will become apparent from the following description taken in connection with the accompanying drawings.

My invention resides in the method, system, apparatus, features of construction and combinations of parts of the character hereinafter described and claimed.

For an illustration of some of the forms my invention may take, reference is to be had to the accompanying drawings in which:

Figure 1 is a vertical sectional view, partly in elevation, of apparatus constructed in accordance with my invention.

Fig. 2 is a horizontal sectional view taken on the line 2—2 of Fig. 1 and looking in the direction of the arrows.

Fig. 3 is a vertical sectional view, partly in elevation, of a system for cleaning pulp stock.

Fig. 4 is a plan view of the system shown in Fig. 3.

Referring to Figs. 1 and 2, B represents a base of any suitable construction carrying a housing or shell H which is secured to said base B in any suitable or desired manner.

A shaft 1 disposed vertically and longitudinally of the housing H carries, adjacent its lower end, a member or hub 2, said shaft 1 and member 2 being secured together in any suitable manner for rotative movement together.

The member 2 supports a drum D of suitable corrosion-resisting metal which is secured thereto in any suitable manner for rotative movement therewith, the member 2, preferably, comprising an outer circular vertical wall or flange for the reception of said drum D. The drum D, preferably, is circular in cross-sectional configuration and, in accordance with my invention, is so formed as to define a plurality of steps, each of which is formed by the intersection of a vertical cylindrical wall portion 3 and a horizontal annular wall portion 4. As illustrated particularly in Fig. 1, the drum D is of minimum diameter at its bottom and maximum diameter at its top. This is in accordance with my invention as hereinafter particularly to be described.

The upper vertical wall of the drum D terminates in an outwardly and downwardly disposed flange or shelf 5 utilizable as hereinafter described.

In the form of my invention herein illustrated the drum D, at its top, carries a spider which comprises a suitable number of radial arms 6 suitably secured at their outer ends to the upper vertical drum wall 3, said arms 6, preferably, being formed integrally with an outer hub 7 connected by ribs 8 to an inner hub 9 coacting directly with the shaft 1.

The hub 7 carries a conduit 10 preferably concentrically disposed with respect to the shaft 1, said conduit 10, by preference, terminating in a flaring nozzle 10*a*, the lower surface of which is spaced from the lower wall of the drum D. If desired, there may be an upwardly extending sleeve 11 of suitable corrosion-resisting metal and closely embracing the shaft 1.

Carried by the housing H is a cap structure C, bolts 12, or an equivalent arrangement, being utilized to retain the cap C on said housing H.

The cap C has secured thereto in any suitable manner an annular trough 13, the inner wall of which is disposed beneath the aforesaid flange or shelf 5 at the top of drum D. At a suitable level, an opening is formed in housing H, such opening being in communication with the trough C and being disposed in alinement with a tangential outlet conduit 14 bolted or otherwise suitably secured to the exterior surface of the housing H.

The cap member C is provided with an opening through which an inlet conduit 15 extends, said conduit 15 being suitably secured to the cap member C and having an outlet throat opening toward the aforesaid conduit 10.

The shaft 1 may be rotated in any suitable or desired manner. As herein illustrated although not necessarily, said shaft 1 is rotated by a suitable electrical motor M carried by the aforesaid cap member C, coupling members 16, 16 being utilized to connect the motor shaft to the shaft 1. Where the shaft 1 is supported in anti-friction bearing structures, as it usually is, one of such bearing structures may be disposed in and carried by the cap member C at the upper end of shaft 1 while another of such bearing structures may be disposed within a casing formed

as a part of the housing H and disposed at the lower end of said shaft 1.

Preferably, the lower wall of drum D and the aforesaid member 2 are provided with openings 17 and, similarly, the lower wall of housing H and the upper wall of base B are provided with openings 18. The latter open into a funnel-shaped member 19 having a discharge conduit leading to any suitable destination, not shown.

The operation of the apparatus shown in Figs. 1 and 2 is as follows:

The motor M is energized to such extent that the drum D rotates at suitable speed such, for example, as with a peripheral velocity of 100 ft. per second, or less.

A mixture of the pulp stock and water is then introduced into the conduit 15 and passes downwardly first between the rotating hubs 7 and 9, then through the rotating conduit 10 and emerges from the latter through the rotating nozzle 10*a*. From the latter, the aforesaid mixture, under the influence of centrifugal action, is thrown against the lowest vertical drum wall 3.

The pulp stock and water mixture should be introduced continuously and at a substantially regular rate through the conduit 15, the new supply thus being introduced as it is thrown against said lowest drum wall 3 causing the previously admitted mixture to mount higher and higher along the drum wall D. In so doing, the mixture ascends a vertical wall 3, then passes laterally immediately above a horizontal wall 4 and into engagement with the next upper vertical wall 3. From the uppermost vertical wall 3, the mixtures passes over the shelf 5 and enters the trough 13 from which it escapes by way of the discharge conduit 14.

The pulp stock and water mixture, as it thus ascends along the side wall structure of drum D, forms vertical layers along each of the vertical drum walls 5, such layers being of relatively small thickness and being determined, approximately, by the rate at which the mixture is supplied through the conduit 15.

Accordingly, the pulp stock and water mixture progressively ascend the drum vertical walls 3 and, as such mixture reaches the top of each, it is thrown into contact with the next higher vertical wall 3. By virtue of such action, there is a constant rubbing or grinding of the pulp mixture both within itself and against the aforesaid drum walls whereby any pulp stock or fibre bundles or masses are substantially or completely disintegrated. Moreover, as the pulp stock passes successively from zones of smaller diameter to zones of larger diameter, it is acted upon by centrifugal forces of increasing magnitude, due to the increases of diameter of the drum from zone to zone. The circumference of the drum also increases from zone to zone so that the thin stream of stock becomes wider and wider, and hence thinner and thinner as it reaches successive zones. Furthermore, in passing from zone to zone, the thin stream of stock is forced at high speed over the shoulders between the zones, namely, the surface defined by the junction of a vertical wall 3 with a horizontal wall 4. This action last named is highly advantageous because contributing largely to the aforesaid fibre bundle or mass disintegration.

Due to the centrifugal action described above, the aforesaid mixture does not escape from the drum D by way of the openings 17. However, when operation of the apparatus is discontinued, the material then in the drum escapes therefrom by way of said openings 17, and then passes to the funnel-shaped member 19 by way of the openings 18. From the member 19, the material passes to waste or other suitable destination by way of the conduit 20.

Pulp stock destined for paper manufacture is desirably treated in accordance with my invention and, as a result, the formation of the resulting paper is improved as is the strength thereof. Moreover, bleaching of the pulp stock is better effected after the same has been subjected to the action of the drum D.

The apparatus illustrated in Figs. 1 and 2 somewhat resembles the centrifugal separator disclosed in Thomassen U. S. Letters Patent No. 1,599,502, granted Sept. 14, 1926. With a construction such as disclosed in that patent, the pulp stock is purified because of impurity-entrapment by the rings 10. The latter, or an equivalent thereof, are not utilized in accordance with my invention and, as a result, the impurities largely pass along with the pulp mixture. However, since the rings 10 of said patent, or equivalent, are not utilized, the desirable result of my invention is attained as described above.

Referring to the form of my invention illustrated in Figs. 3 and 4, the mixture of the pulp stock and water is shown as traversing a channel 25 and entering a knotter or screen A of a character well known to the art, the latter comprising the usual rotatable drum 27 driven in any suitable manner, as by the pulley 28.

From the knotter or screen A, the aforesaid mixture is passed to and through the conduit 15 of the apparatus shown in Figs. 1 and 2 which functions as hereinbefore described to substantially or completely disintegrate any fibre bundles.

Eventually, the pulp stock and water mixture passes, by way of the conduit 14, into any suitable cleaning device S which may be a conventional riffler or sand trap. In the latter, grains of sand and other impurities are separated from the aforesaid mixture, the purified pulp stock passing along a channel 29 to any suitable destination.

A pulp stock treating system of the character shown in Figs. 3 and 4 involves, as stated, a drum D especially designed to effect separation and disintegration of the fibre bundles. By virtue of this action, foreign substances are readily separated from the pulp stock in the cleaning device S.

An arrangement of the character illustrated in Figs. 3 and 4 is especially desirable and suitable for treating cellulose or wood pulp. However, it shall be understood that the invention of Figs. 3 and 4 is not to be limited to treatment of pulp stock of the character just described.

It shall also be understood that the apparatus shown in Figs. 1 and 2 is by no means at all to be limited to association with a system such as shown in Figs. 3 and 4 although said system does illustrate one important application for the apparatus of Figs. 1 and 2.

While the invention has been described with respect to certain particular preferred examples which give satisfactory results, it will be understood by those skilled in the art after understanding the invention, that various changes and modifications may be made without departing from the spirit and scope of the invention and it is intended therefore in the appended claims to cover all such changes and modifications.

What I claim as new and desire to be secured by Letters Patent is:

1. In the art of treating pulp stock, the method which comprises supplying a mixture of pulp stock and water to a rotating chamber having an inner surface defining a series of steps, the pulp stock and substantially all impurities therein passing in a thin stream along and rubbing against the walls of said steps and around the corners thereof whereby any bundles of pulp stock are subjected to a bundle-disintegrating action.

2. In the art of treating pulp stock, the method which comprises passing a mixture of pulp stock and water to a knotter or screen, subjecting the screened pulp stock to a bundle-disintegrating action, and thereafter removing from the stock impurities released by disintegration of fiber bundles in the stock.

3. In the art of treating pulp stock, the method which comprises passing a mixture of pulp stock and water in a thin stream over alternate cylindrical and annular wall segments of a rotating chamber whereby any bundles of pulp stock are subjected to a bundle-disintegrating action, and thereafter passing the mixture of pulp stock and water to an impurity-removing device.

4. In the art of treating pulp stock, the method which comprises flowing the stock rapidly in a thin stream over a hard surface, subjecting the thin stream to strong centrifugal force to rub the stock therein against said hard surface.

5. In the art of treating pulp stock, the method which comprises flowing the stock rapidly in a thin stream over a hard surface, subjecting the thin stream to strong centrifugal force to rub the stock therein against said hard surface, and progressively increasing the thinness of said stream and the magnitude of the centrifugal force acting thereon.

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