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PULPING-DEFIBERING APPARATUS

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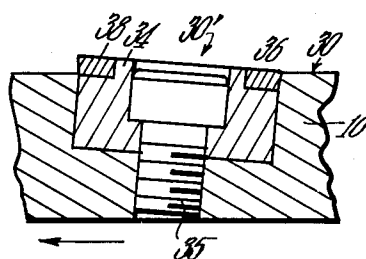
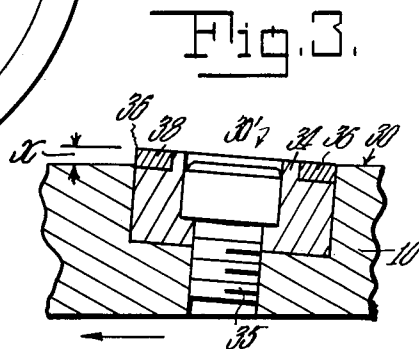
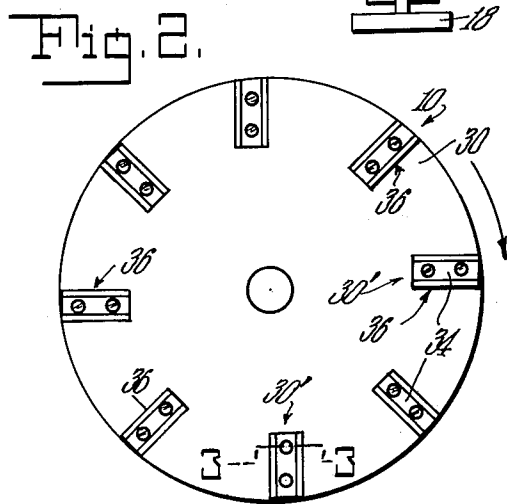
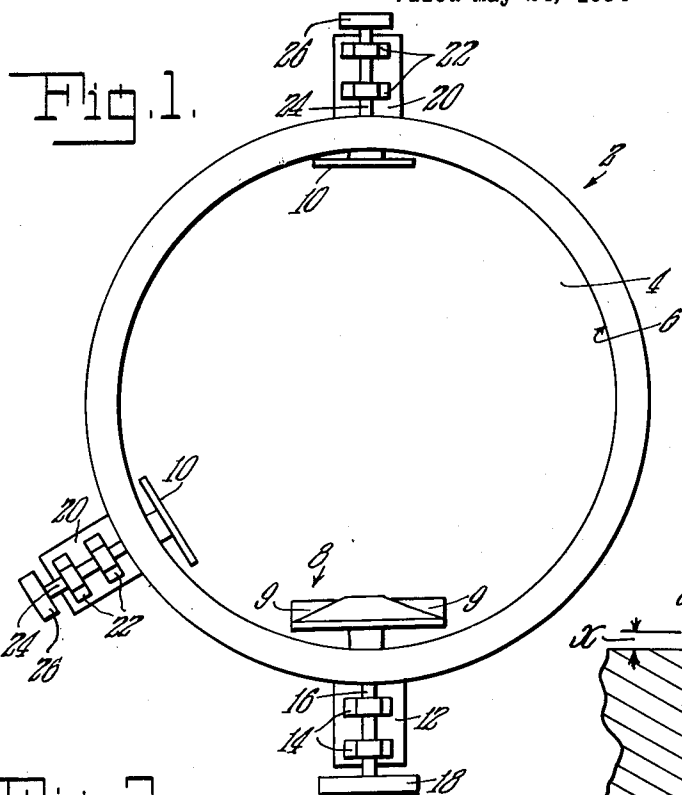
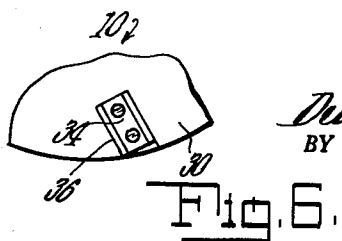
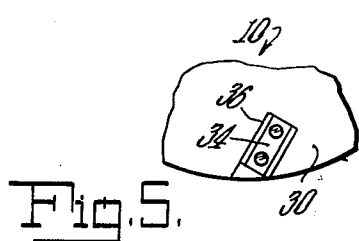


Fig. 4.



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PULPING-DEFIBERING APPARATUS

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9 Claims. (Cl. 92—26)

This invention relates to improvements in apparatus for and method of pulping and defibering stock such as fibrous stock used for paper making.

The novel features of the invention are directed to the provision of separated and different rotatable high and low speed components which may be called an impeller and a defibering disc or discs adapted for independent functions in connection with stock in a tank but which in combination cooperate for roughly pulping and defibering stock for paper making. It may be said that the impeller and defibering disc are separate and that one is remotely located relative to the other whereby they operate independently for their respective functions.

The construction according to the invention is such that the low speed impeller functions to pump or circulate stock about a tank or vat and roughly pulp waste paper, baled pulp, frozen lumps and the like without appreciable defibering of the stock. The high speed defibering disc efficiently operates for its defibering function without an appreciable circulating action.

It has been discovered that very excellent results are obtained where the slow speed impeller has relatively few vanes of relatively large size and is rotated at a relatively low peripheral speed of approximately 2000 to 4000 feet per minute. The vanes or blades are scrolled something like a pump so that a large mass of stock is circulated without excessive power consumption. Greater speeds than mentioned would result in objectionable power consumption without contributing proportionately to effective work. The high speed defibering disc is rotated at a speed in excess thereof and may be rotated up to 12,000 feet per minute and more, if desired. High speed is desirable for the high speed defibering disc since by its structural features, a high rate and desired characteristics of defibering are obtained. Its high speed does not retard and, in fact, it promotes circulation slightly and is not regarded as power consuming beyond a desired limit due to its design for defibering stock rather than for pumping or circulating stock.

Insofar as the velocity of the high speed disc is concerned, the higher its speed the greater the defibering action. The limit of speed will be more or less determined by what is considered safe mechanical operation. In a general way, the defibering disc operates at a speed three to six times greater than does the impeller, the former being adapted for defibering rather than for stock circulation and therefore not power consuming while the latter is adapted for circulation rather than defibering and the low speed contributes to low power consumption.

As a special feature of the invention, the high speed disc is in the nature of a plate having blades adjacent the periphery thereof. These have sharp and hard leading defibering edges extending only slightly above the plane of the plate and disposed generally radially of the axis of rotation of said disc for picking up and striking the fibers of the stock and discharging it rather than for circulating said stock. The blades may be disposed otherwise depending upon the stock and results to be obtained but will

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be arranged to pick up and act on the fibers of the stock and discharge them.

All of the above objects I accomplish by means of such structure and relative arrangements of parts thereof, as will fully appear by a perusal of the description below and by various specific features which will be hereinafter set forth.

To the above cited and other ends and with the foregoing and various other novel features and advantages and other objects of my invention as will become more readily apparent as the description proceeds, my invention consists in certain novel features of construction and in the combination and arrangement of parts as will be hereinafter more particularly pointed out in the claims hereunto annexed and more fully described and referred to in connection with the accompanying drawings wherein:

Fig. 1 is a plan view of pulping-defibering apparatus embodying the novel features of the invention;

Fig. 2 is a plan view of the defibering disc of the apparatus shown in Fig. 1;

Fig. 3 is a sectional elevational view on the line 3—3 of Fig. 2;

Fig. 4 is a view similar to Fig. 3 showing a modified form of the invention; and

Figs. 5 and 6 are fragmentary plan views of the defibering disc to illustrate the relation of the defibering blades to the disc.

Referring now to the drawings more in detail, the invention will be fully described.

A tank or vat is represented by 2 in Fig. 1 and, as usual, it may have bottom and side walls 4 and 6. The tank may be of any size or shape other than that shown and provided with inlets or outlets well known in the art.

More or less diagrammatically an impeller is represented by 8 and defibering discs are represented by 10.

A bracket 12 is carried by the tank and provided with bearing means 14 for a shaft 16 to which the impeller 8 is secured. The shaft 16 may be rotated by belt means engaging a pulley 18 of said shaft 16.

Other brackets 20 carried by the tank having bearing means 22 for shafts 24 to which defibering discs 10 are secured and pulleys 26 on the shafts 24 may be connected to a source of power.

The bracket arrangement and pulleys are shown for purposes of disclosure and the impeller and defibering discs may be mounted for rotation in any desired manner and rotated by various means such as motors or the like. It is desired to rotatably support the impeller and defibering discs inside of the tank and rotate them at relatively low and high speeds according to the invention.

According to the invention, the impeller and defibering discs are separated from one another for their separate functions and there may be any number of defibering discs and if desired more than one impeller. While shown as associated with the side walls of the tank, the units may be associated with any of the walls of a tank which may be of various forms. Depending upon the character of the stock to be treated, the impeller and disc may be rotated on vertical or horizontal axes or one may be rotated on a vertical axis and the other on a horizontal axis in order that a certain stock may be roughly pulped and defibered to the desired extent.

The drives for the impeller or impellers and for the defibering disc or discs will be such as to independently rotate the impeller and disc or discs at their relatively low and high speeds as aforesaid.

The impeller will be such as to pump or circulate the stock about the tank. In the form of the invention shown, the impeller 8 is provided with axially extending blades or fins 9 which will be arranged to function to pump and circulate stock about the tank and to roughly pulp the stock for the defibering action. The speed of the im-

PELLER 8 will be such as to obtain suitable pumping circulation of stock but not sufficiently high to bring about excessive and objectionable consumption of power.

The defibering disc 10 has a forward substantially flat outer face 30 having a plurality of defibering elements indicated generally by 30' associated therewith.

Said elements are in the form of elongated bodies 34 secured in grooves in the face of the plate by screws 36 or other suitable means. The bodies 34 are provided on upper and opposite longitudinal sides thereof with elongated blades 38. These blades are formed from extremely hard material, such as tungsten carbide or the like, and are suitably secured to the bodies so as to present elongated defibering edges 36. The bodies are arranged relative to the face of the disc 10 so that the edges 36 thereof lead in the direction of rotation of the disc 10.

The bodies are also disposed in such a manner relative to the disc that the upper sides of the defibering elements decline rearwardly from the leading edges 36 to the face 30 of the disc and rearwardly in relation to the direction of rotation of the disc, see Figs. 3 and 4.

The elements are related to the face of the disc in such a way that the leading edges 36 are generally radial relative to the axis of rotation of the disc and are preferably in parallelism with the face 30 of the disc. In some cases, the leading edges may extend forwardly angularly relative to a plane extending through the axis of rotation of the disc as in Fig. 5 or they may extend rearwardly as in Fig. 6. That is, the inner ends of leading edges 36 may be disposed rearwardly of outer ends thereof or the inner ends may be disposed forwardly of the outer ends thereof relative to the direction of rotation of the disc while at the same time being generally radial relative to the axis of rotation of the disc.

The elements having two hard and sharp edges they may be reversed in the grooves of the disc provided therefor.

In all cases, the leading edges 36 will be disposed only slightly above the face of the disc for the defibering function rather than for a pumping or circulating function. As an example, the height or dimension X in Fig. 3 when from one thirty-second to three-eighths of an inch has given very desirable defibering action without bringing about appreciable power consuming pumping and circulating action.

Within the limits specified, there is sufficient longitudinal area below the edges 36 to adequately pick up fibers and bundles of fibers for the defibering action and to discharge stock. At the same time, there is a desired discharge of the fibers for the action of the defibering action of the sharp and hard edges.

As shown in Fig. 4, the leading edges are arranged to extend forwardly which in some cases has been found to be desirable. For the most efficient defibering action and to insure sharp leading edges the angle between the upper side and forward elongated side of the members 38 should be ninety degrees or less as indicated in Figs. 3 and 4. The edges 36 are preferably in parallelism with the plane of the face 30 of the disc.

It will be appreciated that the impeller which is operated at a relatively low speed will adequately function with a pumping or circulating function and simultaneously operate to roughly pulp the stock. While there may be some defibering action, it is not as essential as circulating the stock to the desired degree. The rotation of the impeller will be at such a low speed as to result in consumption within tolerable limits while functioning for circulating stock.

The defibering disc is rotated at a much higher speed and constructed as it is, its function is for a defibering action rather than for stock circulation. The defibering edges projecting only slightly above and in parallelism with the face of the disc and being relatively hard and sharp they function for the most efficient defibering action without appreciable circulating effect. The power consumption of the defibering disc is very low and the

defibering elements being inclined as they are, objectionable eddy currents and turbulence set up in the stock by the high speed rotation of the disc are eliminated.

It will be noted that the leading edges or blades 36 of the defibering elements are formed from very hard material such as "Carboloy" or suitable tungsten cemented alloy as distinguished from various grades of carbon or so-called stainless steel. This is very important for the reason the material being defibered is usually corrosive and particularly so where the material is hard to defiber or is of the so-called wet strength material where heat and acid are involved. Under the conditions and the high speed operation, ordinary steels and stainless steels very quickly lose their operating characteristics whereas the leading edges of the type mentioned are characterized by very great corrosion resistance and edge retention ability.

The invention may be embodied in other specific forms without departing from the essential characteristics thereof. Hence, the present embodiments are therefore to be considered in all respects merely as being illustrative and not as being restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all modifications and variations as fall within the meaning and purview and range of equivalency of the appended claims are therefore intended to be embraced therein.

What it is desired to claim and secure by Letters Patent of the United States is:

1. Stock pulping-defibering apparatus comprising in combination, a tank having bottom and side walls, an impeller and a defibering disc separate therefrom remotely mounted in separated relation in said tank for low and high speed rotation respectively, said impeller formed for circulating stock about said tank and relative to said defibering disc, said defibering disc including a forward face having peripherally spaced elongated defibering elements provided with longitudinal hard and sharp forward defibering edges leading in the direction of rotation of said disc and disposed generally radial to the axis of rotation of said disc.

2. Stock pulping-defibering apparatus set forth in claim 1 wherein said defibering edges extend slightly above and in parallelism with the face of said disc.

3. Stock pulping-defibering apparatus set forth in claim 1 wherein said defibering elements decline transversely from said defibering edges rearwardly relative to the direction of rotation of said disc to the face thereof.

4. A high speed defibering device comprising in combination, a circular rotatable disc having an outer forward substantially flat face, a plurality of separate defibering elements spaced peripherally of said disc, said elements including elongated bodies having sharp defibering leading forward edges disposed generally radially of the axis of rotation of said disc and forwardly in the direction of rotation of said disc, said edges being disposed slightly above the face of said disc and upper sides of said bodies being disposed to decline rearwardly relative to said direction from said defibering edges to the face of said disc.

5. A high speed defibering disc set forth in claim 4 wherein said leading edges of the elements are disposed substantially parallel to the face of said disc.

6. A high speed defibering disc set forth in claim 4 wherein said defibering edges are formed from elongated members of relatively hard metal associated with said bodies.

7. Stock pulping-defibering apparatus comprising in combination, a stock tank, a mass turbulence creating rotor mounted within said tank for low speed rotation for circulating stock about said tank without an appreciable defibering action a defibering disc mounted within said tank remote from said rotor for high speed rotation for defibering stock without an appreciable circulating action.

8. Stock pulping-defibering apparatus comprising, a

tank, an impeller mounted within said tank for low speed rotation for circulating stock, a defibering disc mounted within said tank remote from said impeller for high speed rotation for defibering stock, said defibering disc including a forward face having peripherally spaced defibering elements provided with forward defibering edges leading in the direction of rotation of said defibering disc and disposed generally radial to the axis of rotation of said defibering disc. 5

9. A high speed defibering device comprising, a circular rotatable disc having an outer forward substantially flat face, a plurality of separate defibering elements spaced peripherally of said disc, said defibering elements including elongated bodies having sharp defibering forward leading edges and disposed slightly above the face 15

of said disc disposed generally radial of the axis of rotation of said disc and forwardly in the direction of rotation thereof.

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