Sept. 13, 1932. T. O'CONNOR 1,877,030

ROTARY PULP SCREEN

Filed April 16, 1930

Fig. 1.

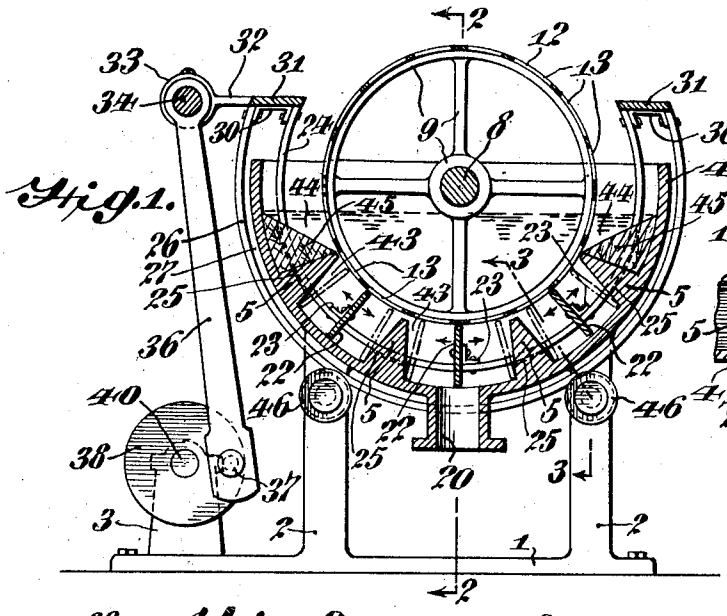


Fig. 3.

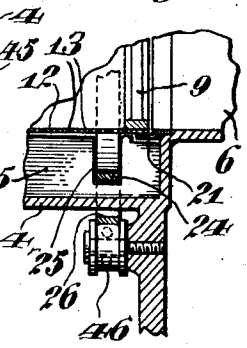


Fig. 2.

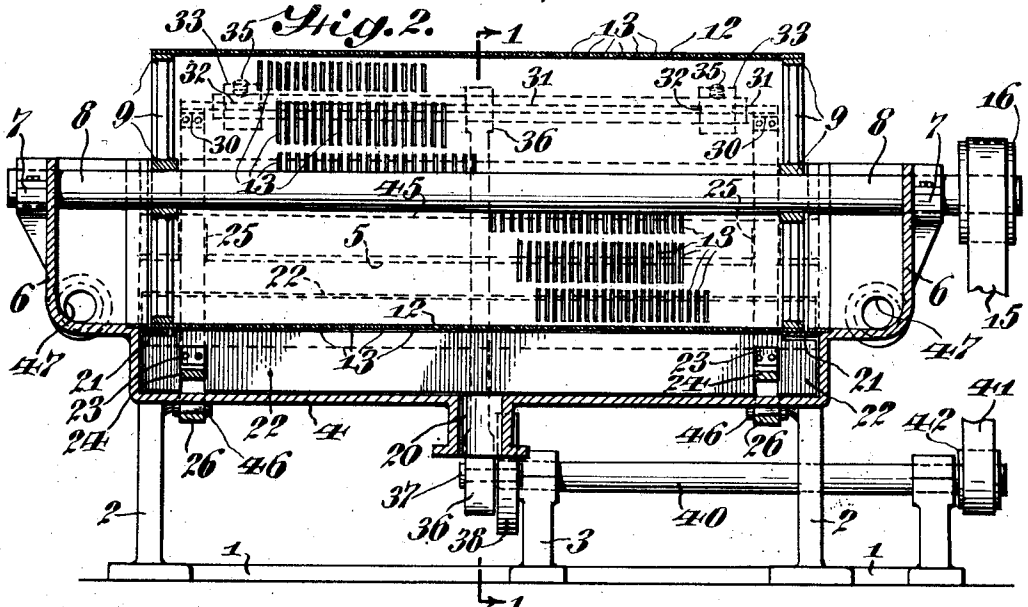
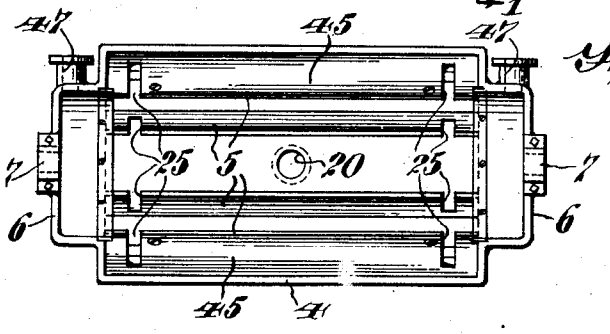


Fig. 4.



INVENTOR.

Thomas O'Connor

BY Cyrus N. Anderson

Attorney

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UNITED STATES PATENT OFFICE

THOMAS O'CONNOR, OF PHILADELPHIA, PENNSYLVANIA

ROTARY PULP SCREEN

Application filed April 16, 1930. Serial No. 444,687.

My invention relates to screens of the rotary type for the treatment of pulp, and it is adapted for the treatment either of what is known as ground wood pulp or chemical pulp. The screen as illustrated is of a character such that it is primarily adapted for use in the treatment or handling of pulp just previous to its delivery to a paper making machine. Although as indicated the screen as illustrated is adapted for use at the point stated in the process of treating the pulp employed in the manufacture of paper yet it should be understood that it may be adapted for use at an earlier stage in the preparation of the pulp.

The type of screen as illustrated and constituting one embodiment of my invention is used for the most part in connection with a paper making machine where a screen is required for the breaking up of fibre bundles and to keep foreign material from reaching the paper making machine. Screens employed at this point in the manufacture of paper are used for fine screening work. Their purpose or object broadly is to agitate the pulp, which should be thin, for the purpose of maintaining the finely comminuted fibres thoroughly distributed throughout the water by which they are conveyed through the pulp handling apparatus to the paper making machine.

The general object of my invention is to provide a rotary screen of the character hereinbefore indicated having novel means for effecting in a highly efficient manner the agitation of the pulp mass and for breaking up the fibre bundles or clots and also for breaking up into small particles all foreign material which may have reached the said screen. By thus breaking up and disintegrating lumps of any kind which may reach the screen I am enabled to prevent the same from reaching the paper making machine and thereby to prevent the formation of bad spots in the paper which may be produced upon such machine.

It may be noted that when the pulp has reached a screen of this character, which is employed for a final treatment or at least one of the final treatments of the pulp before it is run into the paper making machine, the hard lumps or particles have already been removed therefrom. As already indicated, the stock should be thin so that the finely comminuted fibres of the pulp may be thoroughly and evenly distributed therethrough.

It also is an object of my invention to provide a rotary screen having means for effecting a pressing or crushing action and also simultaneously tending to cause a forward movement of the stock through the screen.

A further object of the invention is to provide means whereby portions of the stock after having been once acted upon by the agitating means may return to position to be again acted upon by the said agitating means.

It also is an object of my invention to provide a screen adapted for fine screening work comprising an agitator having stationary and movable parts, the said stationary parts constituting abutments the operating surfaces of which are located in planes which occupy positions in non-parallel relation to the planes of the opposite sides of agitating blades which constitute parts of the movable member of the agitator, except when said agitating blades occupy positions midway between adjoining abutments.

Other objects and advantages of my invention will be pointed out in the detailed description thereof which follows or will be apparent therefrom.

In order that the invention may be readily understood and its practical advantages fully appreciated reference should be had to the accompanying drawing wherein I have illustrated a structure in a form which at present is preferred by me which embodies the invention. However, it will be understood that the invention may be embodied in other forms of construction than that shown and that changes in the details of construction may be made within the scope of the claims without departing from the invention or the principle thereof.

In the drawing:

Fig. 1 is a view in transverse section of a screen structure embodying my invention, the

said view being taken in the plane of the line 1—1 of Fig. 2;

Fig. 2 is a longitudinal section of such screen taken in the plane of the line 2—2 of Fig. 1;

Fig. 3 is a sectional view of a fragmentary portion of the structure taken on the angular line 3—3 of Fig. 1, the purpose of which is to show more clearly certain details of construction; and

Fig. 4 is a view in top plan of the stationary part of the trough-like portion or tank of the structure constituting the stationary part of the structure shown in Figs. 1 and 2.

In the drawing I have shown at 1 a base having upright posts 2 and 3 thereon. Upon the upper ends of the posts 2 a stationary tank or trough member 4 is mounted the upper side of which is open as shown. The said trough-like member is provided upon its inner side with a plurality of upwardly tapered or wedge-shaped projections 5 which extend lengthwise thereof. These projections are of a length equal to the inner side of the main body portion of the tank or trough 4. The opposite ends of the trough are provided with outwardly extending projections 6 the upper edges of the walls of which are provided with bearings 7 within which are journaled the opposite ends of a shaft 8 upon which are mounted skeleton wheels 9 having outer rims which fit in the opposite ends of a hollow screening drum 12. This drum is provided in known manner with extremely narrow slots 13 of considerable length as indicated in Fig. 1 of the drawing. These slots in the construction shown extend around the drum or concentrically with respect to the axis of the shaft 8. The drum is rotatably driven by means of power applied through a driving belt 15 to a wheel 16 mounted upon the shaft 8. The pulp or stock to be screened is delivered to the trough or tank 4 through a port 20 provided, in the construction as illustrated, in the bottom thereof. The joints between the opposite ends of the screen 12 and the opposite end walls of the trough or tank are closed by known means as indicated at 21 so that the stock which enters the trough or tank through the port 20 must enter the drum through the screening perforations 13 provided therein.

As previously stated, the opposite sides of the projections 5 are tapered and it may be noted that the planes of the sides are not located in planes which are radial with respect to the axis of the rotary drum 12. The purpose of this arrangement or relationship of the planes of the opposite surfaces of the projections 5 will be referred to and explained hereinafter.

For the purpose of agitating the stock within the tank or trough 4 I have provided agitating blades or panels which consist of plates 22 of lengths substantially equal to the distance between the inner sides of the opposite end walls of the trough or tank 4. These plates are connected at their opposite ends to angle brackets 23 which are secured at intervals to the circular bars 24 which are located upon the inner side of the trough or tank 4 in spaced relation thereto as shown. These bars 24 extend through notches or slots 25 provided in adjoining relation to the opposite ends of the upwardly tapered projections 5. Curved bars 26 similar to the bars 24 are located outside of the trough or tank 4 near the opposite ends thereof, as best shown in Fig. 2 of the drawing. The bars 26 are spaced from the said trough or tank as indicated at 27. The opposite upper ends of the bars of each couple of bars 24 and 26 are connected together by means of inverted U-shape members 30. The couples of bars 24 and 26 are connected together by means of plates 31 which are mounted upon the upper ends of said bars and which extend lengthwise of the structure between the two couples as shown in dash lines in Fig. 2 of the drawing. One of the plates 31 is provided at its opposite ends with outwardly or laterally extending arms 32 having at their outer ends bearings 33 within which the opposite ends of a rod or bar 34 are located and within which they are secured by binding screws 35. The upper end of a connecting rod 36 is loosely connected with the rod or bar 34. At its opposite lower end the connecting rod 36 is connected to a crank pin 37 carried upon the rotatable wheel 38. The wheel 38 is mounted upon a shaft 40 supported in bearings provided in the upper ends of the posts 3. The shaft is driven by power applied through a belt 41 to a wheel 42 mounted upon the said shaft. The source of power for driving the belts 15 and 41 has not been shown but any suitable power for that purpose may be employed.

It may be noted that the shafts 8 and 40 are driven at different speeds. The shaft 8 may be driven at a speed of approximately ten revolutions per minute, while the shaft 40 may be driven at a speed of approximately fifty revolutions per minute, but the revolutions of these shafts may be adjusted to such speeds as in practice may be found to be most desirable and by which the most efficient results may be obtained.

It will be noted that the plates 22 are located in planes which are radial with respect to the axis of the shaft 8 and of the drum 12 mounted on said shaft. As pointed out previously, the surfaces of the tapered sides of the projections 5 are not radial with respect to the axis of the said shaft. It follows from this relationship between the plates 22 and the cooperating surfaces of the projections 5 that when a plate 22 moves into position such that its outer or lower edge contacts with a side of anyone of the

projections 5 it makes an acute angle therewith as indicated by the dotted lines at 43. The movement of the plates 22 toward the projections 5 not only operates to crush and disintegrate the lumps or clots which may be present in the stock but also tends to cause a flowing movement of the stock toward the rotating drum 12. Such movement tends to cause the passage of the stock through the elongated narrow perforations or slots therein. These slots are very narrow and prevent the passage into the drum and thence to the paper machine of fibres which are of larger size than should be permitted to enter into the formation of the paper sheets.

As previously described, the stock enters the trough or tank 4 through the port 20 and in order that it may pass into the compartments on the opposite side of the projections 5 adjoining the said port the upper edges of said projections are located or spaced a substantial distance, say about one inch, from the drum 12. The upper or top edges of the outermost of the projections 5 are located nearer to the drum 12 than are the edges of the two inner of said projections. The space between the upper edges of the outermost projections and the drum may, for example, be approximately one-quarter of an inch. This is for the purpose of permitting the stock to flow from the two outermost compartments provided by the projections 5 into the spaces indicated at 44 above the upper sides of the blocks 45 which are mounted in the angles between the outer sides of the outside projections 5 and the adjoining portion of the wall or body of the trough or tank 4. In other words, some portion of the stock may flow back and forth between the spaces 44 and the two outside compartments formed by the projections 5.

In the operation of the device the rotation of the crank pin 37 with the wheel 38 causes reciprocatory movement of the connecting rod 36 to effect an oscillatory movement of the frame comprising the two couples of bars, each couple comprising bars 24 and 26, which frame constitutes a support for the agitating blades or plates 22. The distance of the crank pin 37 from its axis of rotation is such that the distance through which the frame comprising the couples of bars 24 and 26 is moved is not greater than will be permitted by the trough 4.

In order to facilitate the oscillatory movements of the frame, supporting rollers 46 are provided upon the upright posts or standards 2 upon which the outermost of the curved bars 26 of each couple of bars forming a part of the frame structure are supported. As the frame is oscillated as previously described the rollers 46 rotate upon the supports therefor so that the oscillatory movements of the frame are facilitated or are more easily effected.

The stock which enters through the port 20 into the tank 4 passes from the latter into the hollow rotary screen 12 and flows out through the opposite ends of the lower portions of the latter into the hollow projecting portions 6 and escapes from the latter through the outlet ports 47, and by means of pipes (not shown) having connection with the said ports is conducted to its destination.

It will be seen that by my invention I have provided a novel construction of screen of the rotary type which while extremely simple is of a character such as to render it highly efficient in operation.

Although I have described in detail the mechanism of the apparatus embodying the invention it will be understood that the invention may be embodied in a machine of different construction provided only that it shall operate in accordance with the principle of my invention as disclosed herein. Furthermore, the machine or apparatus embodying my invention may be employed for the treating or handling of any other material similar to pulp for which it may be or may be found to be adapted.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. A screening apparatus comprising in combination a tank having projections therein which extend lengthwise thereof and which project inwardly, the said projections being spaced from each other to form compartments, agitating means located within the said compartments, and means for causing oscillatory movements of the said agitating means in the said compartments back and forth between the said projections.

2. A screening apparatus of the character described, comprising in combination an open topped trough-shaped tank having projections therein which extend lengthwise thereof, the said projections being spaced from each other to provide intervening compartments, plates located within the said compartments, the said plates being located in planes which are radial with respect to the axis of the said tank, means for supporting the opposite ends of said plates, and means for causing oscillatory movements of the said supporting means to cause back and forth movements of the said plates between the said projections.

3. A screening apparatus comprising in combination an open topped tank of trough-shape, said tank having projections upon its inner side which extend lengthwise thereof, said projections being tapered, the surfaces of said projections extending in directions forming angles with planes which are radial with respect to the axis of the said tank, agitating plates located in the said tank between the said projections, the said plates occupying planes which extend radially of the

axis of the said tank, means for supporting said plates, and means for causing oscillatory movement of the said supporting means to effect back and forth movement of the said plates between adjoining projections.

4. In a screen structure of rotary type the combination of a rotatable screen, a tank of trough-shape having an open top within which the said screen is mounted, the said screen being spaced from the inner side of said tank, projections located in the said tank and extending lengthwise thereof, the said projections being of inwardly tapered shape in cross section and being spaced from each other, agitating plates extending lengthwise of the said tank and being located respectively in the spaces between adjoining projections, the said plates being located in planes radial of the axis of the said rotatable screen, a support for the said plates, and means for causing oscillatory movements of the said support to effect oscillatory movements of the said plates between adjoining projections, the said plates when moved into juxta-position with respect to the surfaces of adjoining projections forming acute angles therewith, the openings of said angles extending inwardly toward the said rotatable screen.

5. In a screen structure of rotary type, the combination of a rotatable screen, a tank of trough shape and of open top within which the said screen is located, projections mounted upon the inner side of the said tank which extend lengthwise of the said tank and which are spaced from each other, the side surfaces of the said projections being located in planes which are angularly related to planes radial to the axis of rotation of the said screen, agitating plates located in the spaces between the said projections, said plates being located in planes radial with respect to the axis of said screen, a supporting means for the said plates, and means for causing movements of said supporting means to cause each of the plates to oscillate in the space in which it is located between the opposing sides of adjoining projections.

6. In a screen of rotary type for treating pulp and like substances, the combination of a rotatable screen, a tank of trough-shape in which the said screen is located, projections mounted upon the inner side of the said tank and extending lengthwise thereof, the said projections being spaced from each other to form compartments extending lengthwise of the said tank, the inner edges of the intermediate projections being located greater distances from said rotatable screen than are the inner edges of the outermost of said projections, and means for agitating the material within the said tank, the said agitating means being located in the spaces between adjoining projections.

7. In a screen structure of rotary type the combination of a rotatable screen, a tank of trough-shape within which the said screen is located, agitating means located between the said screen and the said tank, and means located outside of said screen and within said tank with which the said agitating means coacts to exert a squeezing action upon portions of the material passing through the said screen structure.

8. In a screen structure of rotary type the combination of a screen, a tank of trough-shaped within which the said screen is mounted, projections mounted upon the inner side of said tank and extending longitudinally thereof and being spaced from each other, and means cooperating with the said projections for agitating the material in its passage to the said screen and for exerting a squeezing action on portions of the said material.

9. In a screen structure of rotary type the combination of a screen, a tank, agitating means located between the said tank and screen, and means located between said tank and screen with which said agitating means coacts to exert a squeezing action on the material in said tank and force the same through said screen.

10. In a screen structure of rotary type the combination of a screen, a tank of trough-shape within which the said screen is located, the inner side of the said tank being spaced from the said screen, a frame the opposite ends of which comprise respectively two curved bars one of which is located on the inner side of the said tank and the other of which is located upon the outer side thereof, means for securing the opposite ends of the bars of each couple of bars together, means for connecting and uniting the said two couples of bars together, plates supported at their opposite ends upon the inner bars of the said couples and being located between the said screen and the said tank, and means for causing oscillatory movement of the said frame to effect oscillatory movements of the said plates to agitate the material in the tank underneath the said screen.

11. In a screen structure of rotary type the combination of a rotatable screen, a tank of trough-shape within which the said screen is located, a frame comprising two couples of curved bars one of which couples is located in adjoining relation to one end of the said tank and the other couple in adjoining relation to the other end thereof, one bar of each couple being located on the inner side of and in spaced relation to the said tank and the other bar of each couple being located on the outside of and in spaced relation to the said tank, means for connecting and uniting the two couples of bars, rotatable means upon which the outside bar of each couple of bars is supported, plates mounted at their opposite ends upon the inner of the bars of the said couples of bars, said plates being located between the

said tank and the said screen and in planes extending radially of the axis of said screen, and means for causing oscillatory movements of the said frame to effect corresponding movements of the said plates.

12. In a screen structure of rotary type the combination of a rotary screen, a tank in which the said screen is located, oscillating means located between said tank and screen for agitating material in its passage through the said screen structure, the said means including a plurality of members in spaced relation to each other, and spaced devices located between the said tank and screen with which the said members coact.

13. In a screen structure of rotary type for the treatment of pulp or other like material the combination of a rotary screen, a tank within which the said screen is located, the said screen being spaced from said tank, and means located between the said screen and tank for acting upon the said pulp or other material in its passage through the said screen structure, the said means including relatively movable members which coact with each other to exert a squeezing action upon the material in said tank and force the same through said screen.

In testimony that I claim the foregoing as my invention, I have hereunto signed my name this 15th day of April, A. D., 1930.

THOMAS O'CONNOR.