Dec. 25, 1928. 1,696,354

A. J. HAUG

PULP SCREENING MACHINE

Filed May 17, 1927 2 Sheets-Sheet 1

Fig. 1.

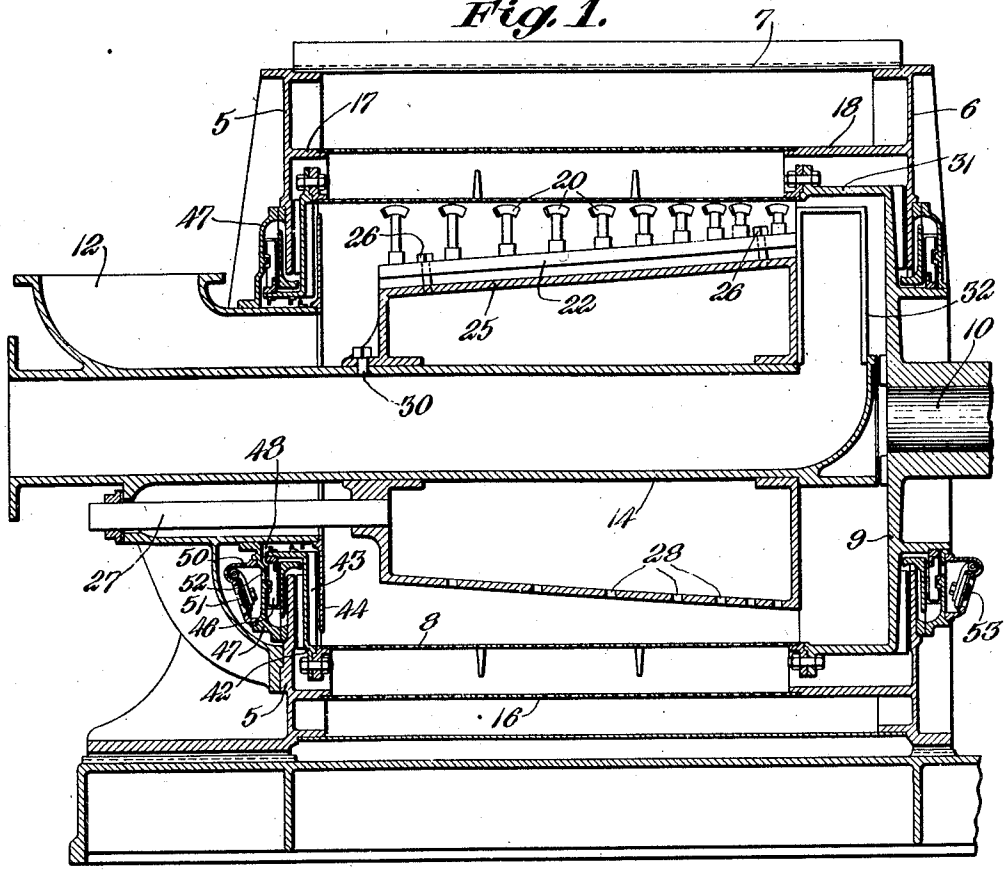


Fig. 2.

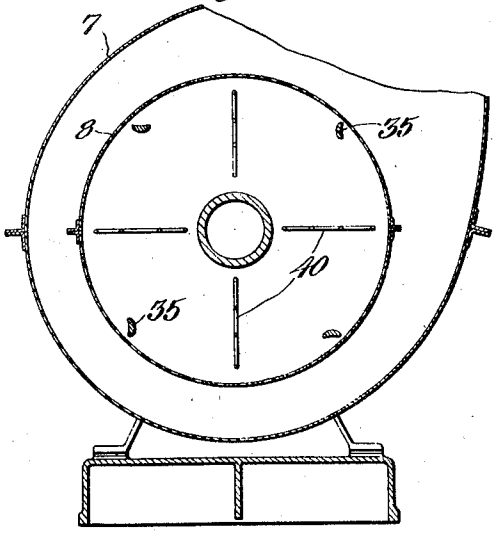
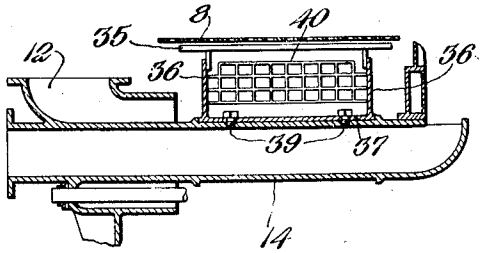


Fig. 3.



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Fig. 4.

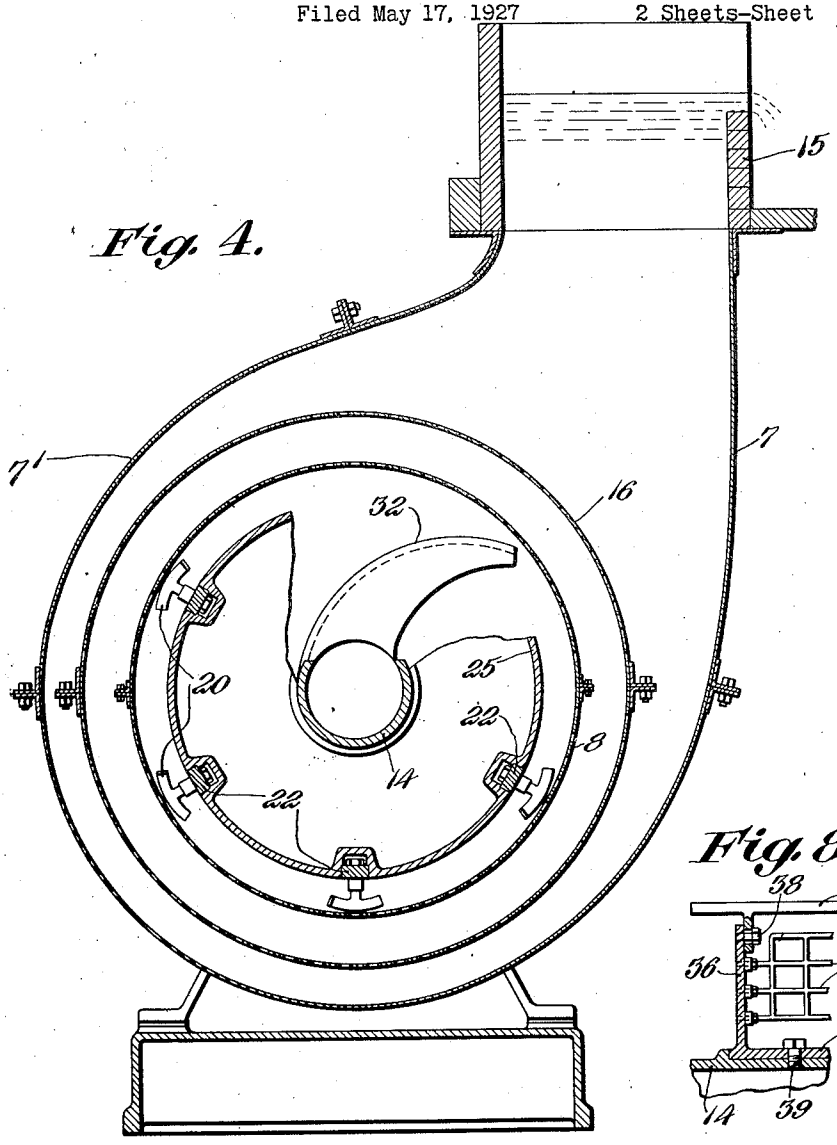


Fig. 8.

Fig. 5.

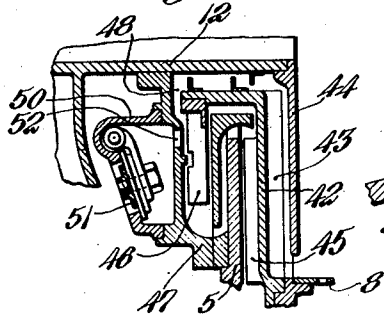


Fig. 6.

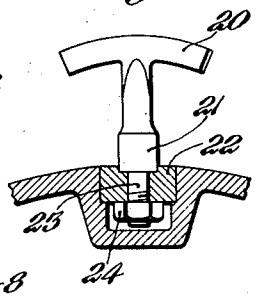
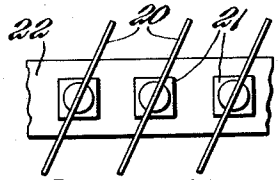


Fig. 7.



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UNITED STATES PATENT OFFICE.

ANTON JOSEPH HAUG, OF NASHUA, NEW HAMPSHIRE.

PULP-SCREENING MACHINE.

Application filed May 17, 1927. Serial No. 192,104.

This invention relates to pulp screening machines and is especially concerned with machines of the type in which the screening operation is effected against a hydraulic head.

In my prior Patents Nos. 1,533,410 and 1,551,953 I have shown pulp screens of this general type, and machines embodying these inventions have proved very satisfactory in practice, having a high screening capacity and being economical of power. The present invention aims further to improve machines of this type with a view to facilitating their manufacture and the assembly and adjustment of the parts, effecting further economies in power consumption, and devising better means for preventing the escape of pulp from the machine when it is stopped. It should be understood, however, that the invention is useful in the screening of other materials than pulp, and that some of the features of the invention may be used to advantage in pulp screens of other types than that particularly mentioned.

The nature of the invention will be readily understood from the following description when read in connection with the accompanying drawings, and the novel features will be particularly pointed out in the appended claims.

In the drawings,

Figure 1 is a vertical, cross-sectional view of a machine embodying this invention;

Figs. 2 and 3 are cross-sectional views showing a modified embodiment of the invention;

Fig. 4 is a cross-sectional view of the machine shown in Fig. 1, the plane of section being transverse to that of Fig. 1;

Fig. 5 is a cross-sectional view showing certain features of the centrifugal packing;

Figs. 6 and 7 are cross-sectional and plan views, respectively, showing the mounting of the blades which act on the tailings in the screen; and

Fig. 8 is a cross-sectional view showing on a larger scale certain details of the construction shown in Fig. 3.

Referring first to Figs. 1 and 4, the machine there shown is very similar in many respects to that described and claimed in my Patent No. 1,551,953. It includes a stationary casing comprising ends 5 and 6 and a shell 7. Mounted within this casing is a cylindrical screen 8 which may be made of any suitable construction, and, as shown, is bolted to the flange of an end piece or head 9 which is secured fast on a shaft 10. This shaft is supported in suitable bearings, as shown in my prior patent above designated, so that it may be driven at a high speed, thus revolving the screen 8 rapidly.

The paper stock or other material to be screened, hereinafter referred to as "pulp", is conducted into the open end of the screen through a spout 12, and this spout encircles, and preferably is formed integral with, a stationary tailings conduit or chute 14 which extends axially through the screen. When the machine is in operation the screen 8 is revolved with sufficient speed to produce a very substantial centrifugal effect on the pulp in contact with it, and the centrifugal force so created forces the pulp through the screen and discharges it from the casing 7. The casing is so constructed, as will be evident from an inspection of Fig. 4, that it maintains the screen constantly submerged in screened pulp, a wier 15 being provided to back up the pulp and increase the head in the casing 7. The advantages of running the screen submerged in pulp in this manner are explained fully in my prior patents above designated. Preferably the wier 15 is made adjustable so that the hydraulic head under which the screen operates can be adjusted to suit different operating conditions.

When the screen is in operation a considerable volume of screened pulp immediately outside the screen revolves substantially in unison with it. It is desirable to have the pulp in contact with the outer surface of the screen revolve in this manner, but if this body of pulp becomes too large an excessive amount of power is consumed in keeping such a volume of pulp in motion. The machine shown, therefore, is provided with a stationary drum 16, Figs. 1 and 4, which encircles the screen 8 and which serves to limit the volume of screened pulp which will revolve with the screen. Preferably this drum is made of perforated sheet metal and in two or more sections so that it can be easily installed and removed. It is supported on annular flanges 17 and 18 which project inwardly from the respective end pieces 5 and 6 of the casing. Since the drum is perforated it allows the screened pulp to flow freely away from the screen 8 and into the space between the drum 16 and the casing 7, and the casing preferably is given a form approximately of a double volute, as shown in Fig. 4, the clearance between the screen and the inne

wall of the casing increasing from points opposite the lower part of the screen as the casing extends upwardly so that a free path is provided for the flow of the screened pulp to the wier 15.

In order to clear the screen 8 of knots, slivers, and coarser materials which will not pass through the meshes, a series of stationary members 20 are located inside the screen with their active portions closely adjacent to the inner surface of the screen, these members being so shaped and arranged that they will force the materials rejected by the screen (usually referred to as "tailings") along the screen toward the right-hand end thereof, Fig. 1. These members may take various forms, but as shown in Figs. 1, 4, 6 and 7 their active portions consist of relatively flat blades, their edges being curved to conform approximately with the curvature of the screen. Each blade has a shank 21 of square cross-section which sets into a correspondingly shaped socket in a bar 22. A reduced threaded extension 23, Fig. 6, of the shank projects through the bar and is secured thereon by a nut 24. The entire series of blades is secured to the bar before it is installed in the screen, and the bar, with the blades attached thereto, is then set into a groove formed in the wall of a hollow core 25 and is secured to this core by bolts 26—26, Fig. 1. The core 25 is supported on the tailings conduit 14, as clearly shown in Fig. 1, and water is conducted into it through a pipe 27, this water being discharged through apertures 28 where it serves to wash the tailings which adhere to the inner surface of the screen.

In assembling the parts of the machine the core is mounted loosely on the conduit 14 so that it can be revolved around this conduit. At this time the lower half only of the screen 8 has been installed, the upper half of the stationary drum 6 has not yet been placed in position, and the casing section 7′ is removed so that the workmen have free access to the outer surface of the core. They can then install the bars 22 with the blades 20 secured to them, and these blades can be adjusted toward or from the screen either by using shims under the bars 22, or by using shims under the squared shanks 21 of the blades 20. The fact that the core is rotatable at this time greatly facilitates the placing and adjustment of the blades. When this operation has been completed the core 25 may be secured in its permanent and stationary position by bolts, one of which is shown at 30, Fig. 1.

The pulp entering the screen through the spout 12 quickly takes on a rotary motion due to its contact with the screen, and most of the pulp flows quickly through the screen leaving a certain amount of rejected material adhering to the inner surface of the screen. The blades 20 are inclined with reference to the path of revolution of this material so that they urge the tailings toward the right-hand end, Fig. 1, of the machine, the tailings being washed by the water directed through the outlets 28 in the core 25 as they are moved across the screen. It should be observed that the blades 20 are spaced more closely together toward the tailings discharge end, since a greater quantity of tailings must be handled at and near the right-hand end of the screen. For this reason, also, the spacing of the holes 28 is reduced toward the latter end of the screen. When the tailings finally are ejected from the screen they are caught in the circular flanged portion 31, Fig. 1, of the head 9, and a scraper 32 then catches them and guides them into the tailings conduit 14 through which they are discharged from the machine in a continuous stream. It will be observed that the hollow core 25 is made of approximately frusto-conical form with its smaller end toward the pulp inlet. This provides a greater space in the end of the screen where the larger volume of pulp must be handled and a correspondingly reduced space at the other end. It also brings the discharge openings 28 for the tailings water closer to the screen at those portions of the screen where the tailings are most numerous.

Instead of making the members which urge the tailings along the screen in the form of blades, as above described, they may take the form of bars 35, as shown in Figs. 2, 3 and 8, and as shown in my Patent No. 1,551,953. In this construction, also, it is preferable to mount the stationary support for the bars in essentially the same manner that the core 25 is supported. As shown in Figs. 3 and 8, the bar 35 is provided with two arms which are bolted to the flanges or projections 36—36 of a supporting member, this member including a sleeve portion 37 which fits loosely on the tailings conduit 14. The arms of the bars 35 are slotted to receive bolts 38, as shown in Fig. 8, so that the bars may be adjusted toward and from the screen 8, and the fact that the supporting member 37 can be rotated on the conduit 14 is of advantage in assembling and adjusting the parts. When the bars have once been adjusted the support 37 is secured in its stationary position by bolts 39. This construction also lends itself conveniently to the installation of grids 40, Figs. 2, 3 and 8. These grids comprise rods or bars extending parallel to the axis of the supporting member 37 with transverse bars welded or otherwise secured to them. The longitudinal bars are turned outwardly at their ends and bolted to the parts 36—36, Figs. 3 and 8. In some cases one or more grids of this character are useful for the purpose of maintaining the stock in the thoroughly mixed condition in which it enters the screen.

Due to the fact that the screen is constantly submerged, there is a very considerable tendency for the pulp to escape through the clearance spaces between the revolving heads of the screen and the casing. This tendency is effectually overcome by providing these heads with vanes which operate centrifugally on the fluids in contact with them, both to set up a back pressure in the liquids tending to escape, and also to create an inwardly directed pressure in the air in the outer portions of said clearance spaces, as fully shown and described in my Patent No. 1,551,953 and in my pending application Serial No. 743,109.

If, however, the machine is stopped, the centrifugal force created by the vanes dies away, and the pulp then is free to flow through the clearances due to gravity. One feature of this invention, therefore, involves the provision of means for preventing the escape of the pulp when the machine is stopped.

Referring to Figs. 1 and 5, it will be observed that the screen 8 is provided at its left-hand end with an annular member 42 which has a set of vanes 43 formed thereon lying between the main part of the member 42 and the stationary annular end plate 44 which is secured to the intake spout 12. This set of vanes operates on the unscreened pulp to prevent it from escaping through the clearance space between the part 42 and the spout 12. The part 42 also carries two more sets of vanes 45 and 46 which cooperate with the casing member 5 and an annular plate 47 secured thereto to prevent the leakage of screened pulp between the part 42 and the casing. It is important that free access of air be permitted to the annular chamber 48 with which both clearance spaces communicate, since otherwise a greater centrifugal force set up by one set of blades than the other might cause a flow of pulp from the inside to the outside of the screen through this mechanism, or vice versa. As shown, a valve casing 50 is secured to the outer side of the annular plate 47 and carries a check valve 51 which permits air to flow freely inwardly, and this air finds a free passage through the aperture 52 into the chamber 48. Consequently, this centrifugal packing mechanism operates normally exactly as described in my Patent No. 1,551,963 and in said application. When, however, the machine is stopped, the centrifugal effect produced by the vanes dies out and the pulp tends to rush through the clearances, but its escape is effectually blocked by the check valve 51. This valve opens again shortly after the machine is started up, and the packing mechanism continues to operate in its normal manner so long as the machine is running.

Another check valve 53 is used at the right-hand end of the machine in approximately the same relationship to the packing mechanism provided at this end.

It should be noted that the blades 20 act independently of each other on the tailings and thus subject the tailings to separate advancing actions, each blade moving the tailings which it strikes only a short step. Also that the blades are so narrow that they do not exert any such advancing action on the main body of the pulp, their operation being confined to that material closely adjacent to inner surface of the screen.

While I have herein shown and described a preferred embodiment of my invention, it will be understood that the invention may be embodied in other forms without departing from the spirit or scope thereof.

Having thus described my invention, what I desire to claim as new is:

1. In a pulp screening machine, the combination of a rotary screen, means for conducting pulp into said screen, a stationary support in the screen and a series of members mounted on said support and adapted to advance the tailings step by step through the machine, said members having stock advancing portions located close to the surface of the screen and having their parts more remote from said surface shaped to avoid such advancing action.

2. In a pulp screening machine, the combination of a rotary screen, means for conducting pulp into said screen, members mounted in said screen for advancing the tailings along the surface of the screen, said members being substantially ineffective with relation to the body of pulp nearest the center of the screen, and stationary means supporting said members for adjustment toward or from said screen.

3. In a pulp screening machine, the combination of a rotary screen, means for conducting pulp into said screen, members mounted in said screen for advancing the tailings along the surface of the screen, a support for said members mounted for rotation inside the screen, and means for securing said support in a stationary position.

4. In a pulp screening machine, the combination of a rotary screen, means for conducting pulp into said screen, and a series of inclined stationary blades mounted inside said screen for advancing the tailings along the surface of the screen, said blades being spaced more closely together adjacent to the tailings outlet end of the screen than at the pulp inlet end thereof.

5. In a pulp screening machine, the combination of a screen, means for conducting pulp into said screen, a support in the screen, members mounted on said support for adjustment relatively to the screen, each of said members being adapted to advance the tailings a predetermined distance along the surface of the screen, and means supporting said

screen and said support for relative rotation.

6. In a pulp screening machine, the combination of a hollow cylindrical screen, a casing in which said screen is mounted, means supporting said screen for rapid rotation, a hollow core mounted in said screen, and means for conducting pulp into one end of said screen, said core increasing in diameter as it extends from the pulp intake end of the screen toward the opposite end of the screen.

7. In a pulp screening machine, the combination of a screen mounted for rapid rotation, means for conducting pulp into said screen, a casing in which said screen is mounted, said casing being constructed to provide a gradually increasing clearance between the screen and the adjacent inner surface of the casing as the casing extends upwardly above the lower part of the screen, and a wier over which the screened pulp is discharged from said casing.

8. In a pulp screening machine, the combination of a screen mounted for rapid rotation, means for conducting pulp into said screen, a casing in which said screen is mounted and which maintains the screen submerged in screened pulp, and means in said casing for limiting the volume of screened pulp external to the screen which tends to rotate with the screen.

9. In a pulp screening machine, the combination of a screen mounted for rapid rotation, means for conducting pulp into said screen, a casing in which said screen is mounted and which maintains the screen submerged in screened pulp, and a stationary perforated drum surrounding said screen and located in said casing.

10. In a pulp screening machine, the combination of a casing having an aperture through one wall thereof, a rotary member mounted in said casing, a part revoluble with said member and projecting through said aperture, means operable through centrifugal action to prevent the escape of liquids from said casing through said aperture when the machine is running, and additional means for preventing the escape of liquid through said aperture when the machine is stopped.

11. In a pulp screening machine, the combination of a casing having an aperture through one wall thereof, a rotary member mounted in said casing, a part revoluble with said member and projecting through said aperture, means revoluble with said member and arranged to operate centrifugally on fluids adjacent to said aperture to prevent the escape of liquids outwardly through the aperture, and a check valve associated with said means for permitting a free inflow of air through said aperture but preventing the escape of liquid outwardly therethrough.

12. In a pulp screening machine, the combination of a casing having an aperture through one wall thereof, a rotary screen mounted in said casing, a part revoluble with said screen and projecting through said aperture, a series of blades revolving with said member and mounted closely adjacent to said aperture, said blades being arranged to act on fluid tending to escape through said aperture to force it backwardly away from said aperture and into said casing, and automatic valve means for preventing any substantial escape of liquid through said aperture when the machine is stopped but permitting a free inflow of air to said aperture when the machine is in operation.

13. In a pulp screening machine, the combination of a screen, means supporting said screen for rapid rotation, a casing in which said screen is mounted, means for conducting pulp into said screen, wherein it is screened by centrifugal force, means to convey the tailings along the inner surface of the screen, and means to wash said tailings along substantially their entire path of advance.

14. In a pulp screening machine, the combination of a screen mounted for rapid rotation, means for conducting pulp into said screen, and a casing in which said screen is mounted, said casing being constructed to maintain said screen submerged in screened stock and permitting the free upflow of screened pulp from all points on the screen toward the discharge outlet for the screened pulp.

ANTON JOSEPH HAUG.

CERTIFICATE OF CORRECTION.

Patent No. 1,696,354. Granted December 25, 1928, to

ANTON JOSEPH HAUG.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, line 54, for "No. 1,551,963" read "No. 1,551,953"; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 19th day of February, A. D. 1929.

M. J. Moore,
Acting Commissioner of Patents.

(Seal)