April 17, 1956 A. L. H. ALLIBE 2,741,954

REFINING PAPER PULP

Filed Jan. 20, 1954 2 Sheets-Sheet 1

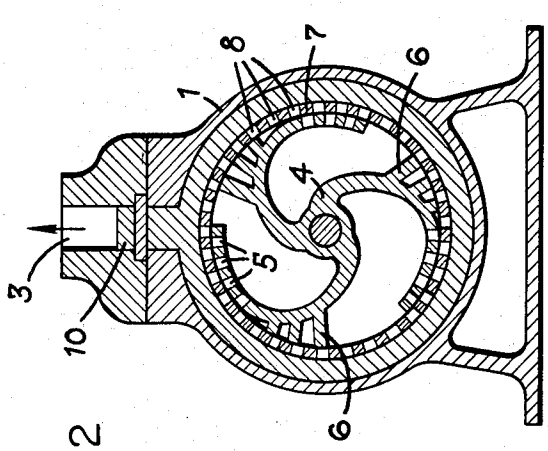


FIG-2

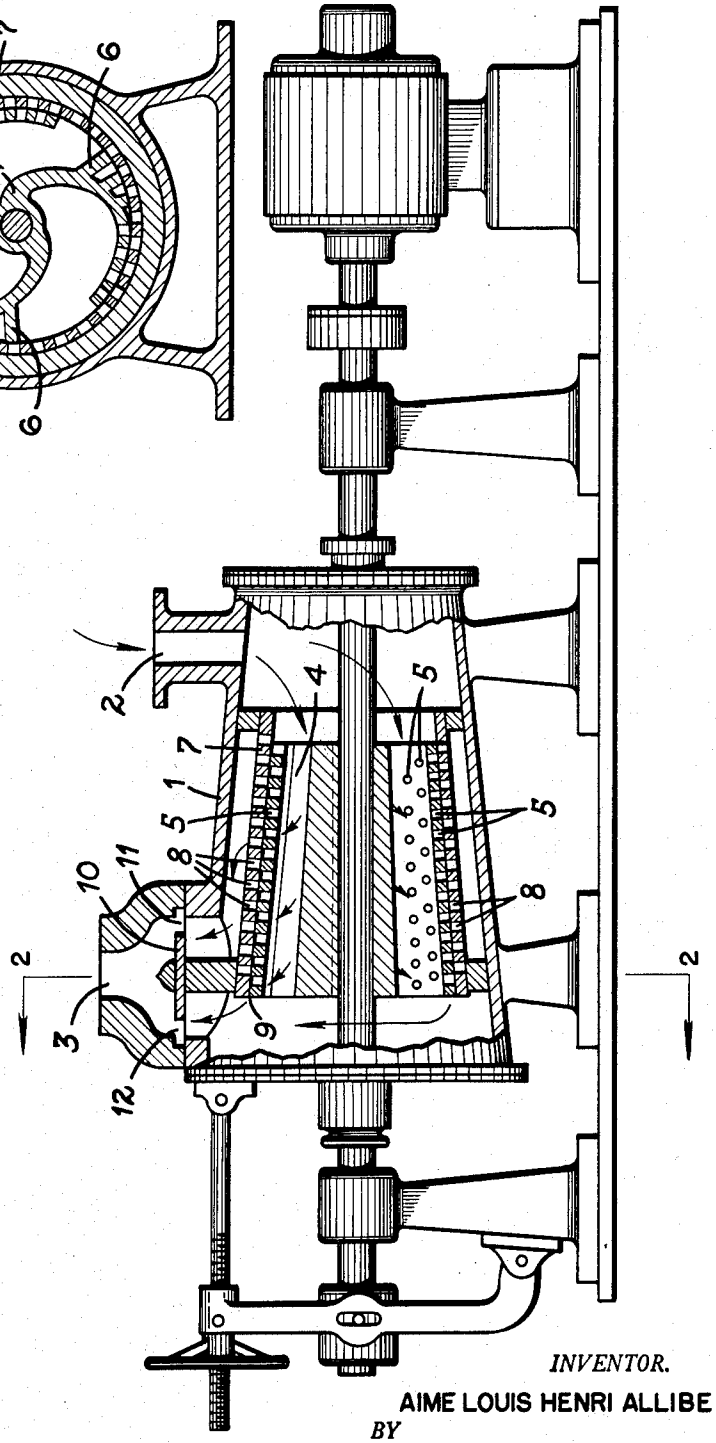


FIG-1

INVENTOR.

AIME LOUIS HENRI ALLIBE

BY

Marechal Biebel French & Bugg

ATTORNEYS

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FIG-3

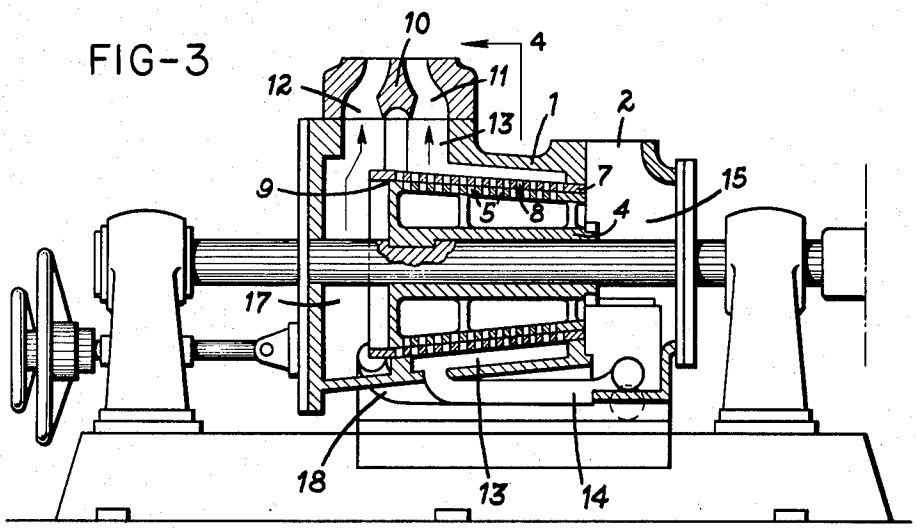


FIG-4

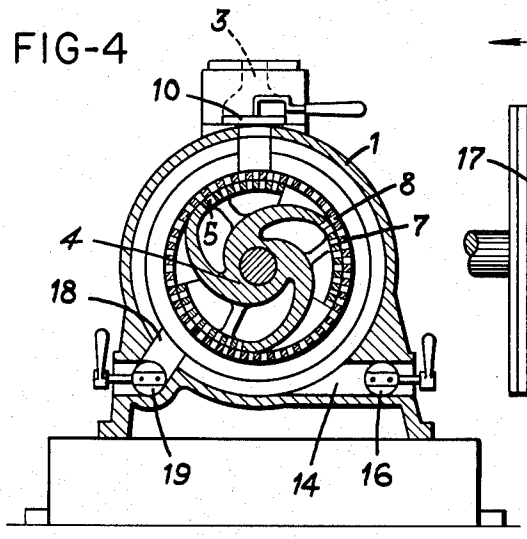


FIG-5

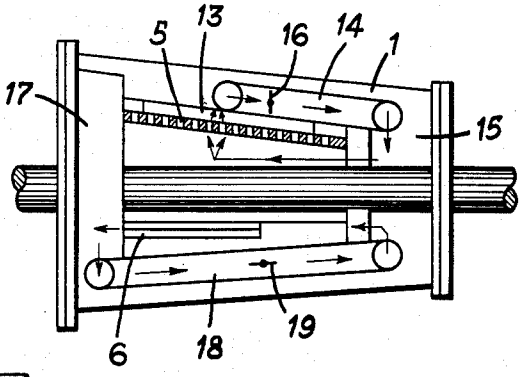
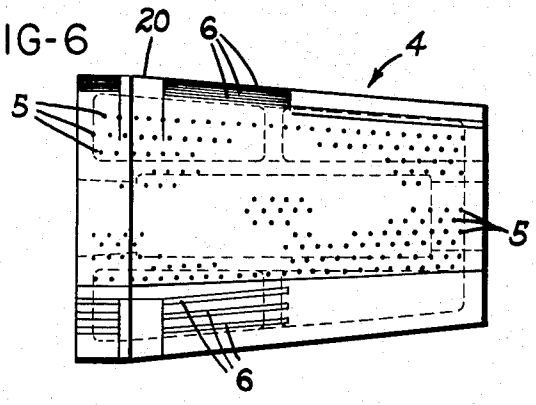


FIG-6



INVENTOR.

AIME LOUIS HENRI ALLIBE

BY

Marechal Biebel French & Bugg

ATTORNEYS

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2,741,954

REFINING PAPER PULP

Aime Louis Henri Allibe, Fures, France, assignor to The Black-Clawson Company, Hamilton, Ohio, a corporation of Ohio

Application January 20, 1954, Serial No. 405,210

8 Claims. (Cl. 92—27)

The present invention relates to an apparatus for refining paper pulp comprising a conical refining chamber in which is mounted a stationary perforated stator and inside which is journalled a rotor including perforated blades having a spirally shaped cross section adapted to revolve inside said stator, the paper pulp which requires to be refined being introduced at one end of said chamber and being discharged at its other end, the rotor and stator being so mounted as to be regulatable lengthwise with respect to each other for eventually providing between this rotor and this stator an interval for the flow of the pulp which has passed through the orifices in the rotor, the discharge of the pulp being thus selectively achievable after it has passed through the orifices in the rotor and stator or only the orifices in the rotor.

According to features of the invention, the discharge of the pulp that has passed through the apparatus is insured through two different ducts depending upon whether the pulp has passed through orifices in the rotor and in the stator or only through orifices in the rotor, and each of these ducts is connected by a recirculation channel with the part of the chamber communicating with the inlet mouth of the apparatus so that any excess pulp which may be present in such discharge ducts and which is not sent to the paper-making machine may be sent back to the inlet end of the apparatus.

The following description which is given with reference to the accompanying drawing given non-limitatively will permit a better understanding of the invention.

Fig. 1 is partly an elevational view and partly a longitudinal sectional view of the apparatus;

Fig. 2 is a section on the line 2—2 of Fig. 1;

Fig. 3 is a view similar to Fig. 1 showing the construction in accordance with the invention to provide recirculation channels within the apparatus;

Fig. 4 is a section on the line 4—4 of Fig. 3;

Fig. 5 is a somewhat diagrammatic view similar to Fig. 3 illustrating the operation of the recirculation channels; and

Fig. 6 is a detail elevational view of the rotor.

Reference being had to the drawing, the conical refining chamber 1 has an inlet mouth 2 and an outlet mouth 3. The rotor 4 in the refining chamber includes blades which have a conical helical pitch and are formed with multiple holes or perforations 5, and these blades include longitudinal wings 6 having a progressively increasing slant and a degressive degree of projection from the axis of the rotor. The chamber 1 is also equipped with a stator 7 the wall of which is uniformly perforated with holes 8. As shown in Figs. 5 and 6, the wings 6 are located only along the larger portion of the rotor, and they are interrupted near the end of the rotor by a shoulder or band 20 filling the longitudinal grooves between adjacent blades.

The rotor 4 may be so mounted as to be shiftable lengthwise in the refining chamber 1 with respect to the stator 7 for permitting the rate of delivery through their

respective holes 5 and 8 to be adjusted, which holes may, depending upon the position of the rotor and stator, exactly register, or partly register or be off registration.

The stator 7 may be also movable lengthwise to a certain extent with respect to the rotor 4 which is then stationary in the longitudinal direction for facilitating the necessary offsetting between them. An obvious constructional advantage resides in the longitudinal movableness of the stator.

Moreover, the rotor 4 and the stator 7 may be mounted at a small distance apart, said distance being rendered adjustable if required.

Those mechanisms which impart relative movableness to the rotor and stator have not been shown on the drawing for the sake of clearness. This also applies to mechanisms adapted to impart an adjustable spacing between the stator 7 and the rotor 4.

Owing to this construction, the paper pulp may either pass through the holes 5 in the rotor and then through the holes 8 in the stator or alternatively flow lengthwise between the rotor 4 and the stator 7 and be discharged at 9 through one end of the latter or else flow through these two channels simultaneously.

A by-pass valve 10 provided upstream with respect to the outlet opening 3 permits in the first constructional arrangement the pulp to be discharged through the duct 11, in the second constructional arrangement to be discharged through the duct 12 and in the third constructional arrangement to be discharged simultaneously through the ducts 11 and 12 so as to insure the delivery of a mixed pulp.

This construction is particularly advantageous for delivering longer and fatter paper pulps, for example for the manufacture of so-called "kraft" paper.

The two flow channels for the paper pulp may be adopted either separately or simultaneously according to the respective position which is given to the stator or to the rotor of the apparatus. Thus for example when it is desired to obtain mixed pulps, there is a definite advantage in allowing the pulp to pass both through the rotor holes and through the stator holes by causing said respective holes to coincide more or less, the pulp flowing longitudinally between the rotor and the stator by moving them slightly apart (an operating position which, however, is not the one shown in the drawing). In such case, the pulp is simultaneously delivered through the ducts 11 and 12.

Referring to Figs. 3–5, the excess paper pulp which tends to escape from the apparatus through the duct 11 but which is not used for feeding the paper-making machine fills up the chamber 13 provided between the stator 7 and the refining chamber 1 of the apparatus and is forced through the recirculation channel 14 which establishes a communication between said chamber and the portion 15 of the chamber 1 which is adjacent the inlet end 2 whereafter it is led back to the normal circuit. A valve 16 is provided for permitting the flow of the pulp through the channel 14 or for closing off the latter. Likewise, the excess pulp which tends to escape from the apparatus through the duct 12 but is not used by the paper-making machine fills up the portion 17 of the chamber 1 situated at the end of the rotor and communicating through a recirculation channel 18 with said portion 15 for returning the pulp into the normal circuit. Another valve 19 is provided for controlling the flow of the excess pulp through the channel 18.

Constructional modifications may be introduced into the apparatus as above described, within the field of technical equivalencies, without departing from the ambit of the invention.

What is claimed is:

1. An apparatus for refining paper pulp comprising a

conical refining chamber, a perforated frusto-conical stator mounted in said chamber, the perforated wall of the stator being spaced from the chamber wall, a frustoconical rotor having perforated blades journalled inside the stator, the rotor blades having a spirally shaped cross section, an inlet opening for the paper pulp at one end of the chamber, means for adjusting the relative positions of the stator and rotor lengthwise of the chamber so as to provide between the rotor and stator a gap for the flow of the pulp that has passed through the perforated blades of the rotor or for bringing nearer together the rotor and stator for compelling the pulp to pass both through the perforated blades of the rotor and stator, a primary outlet orifice for the discharge of the pulp that has passed only through the perforated blades of the rotor, a secondary outlet orifice for the discharge of the pulp that has passed both through the rotor blades and the stator blades, and a valve for selectively controlling the extent of opening and closing of said orifices.

2. An apparatus for refining paper pulp comprising a conical refining chamber, a perforated frustoconical stator mounted in said chamber, an annular zone provided around said stator between the latter and the chamber, a frustoconical rotor having perforated blades journalled inside the stator, the rotor blades having a spirally shaped cross section, an inlet opening for the paper pulp at one end of the chamber, an end inlet zone in the chamber in communication with said inlet opening, an outlet opening for the discharge of the refined pulp at the opposite end of the chamber, a collecting zone provided in the chamber in front of the rotor, a primary recirculating channel establishing a communication between the annular zone and the end inlet zone, a secondary recirculating channel establishing a communication with said collecting zone and said inlet zone, control valves arranged in said channels, and means for adjusting the relative positions of the stator and rotor lengthwise of the chamber for selectively directing the pulp toward the outlet opening through said annular zone or through said collecting zone.

3. An apparatus for refining paper pulp comprising a conical refining chamber, a perforated frustoconical stator mounted in said chamber, an annular zone provided around said stator between the latter and the rotor, a frustoconical rotor having perforated blades journalled inside the stator, the rotor blades having a spirally shaped cross section, an inlet opening for charging the pulp at one end of said chamber, an inlet zone provided at one end in the chamber and in communication with the inlet opening, a primary discharge opening communicating with said annular zone, a collecting zone in the chamber in front of the rotor, a secondary outlet opening in communication with the collecting zone, a valve for the selective control of the outlet openings, a primary channel for recirculating the pulp providing communication between the annular zone and the inlet zone of the chamber, a secondary channel for recirculating the pulp establishing a communication between said collecting zone and the inlet zone, control valves arranged in said channels, and means for adjusting the relative positions of the rotor and stator longitudinally of the chamber so as to provide between the rotor and stator a gap for directing the pulp in the refined state toward the collecting zone and the secondary outlet opening or for bringing the stator and rotor nearer together for directing the refined pulp toward said annular zone and the primary discharge opening.

4. A refiner of the character described comprising a shell defining a refining chamber having an inlet and an outlet for stock at opposite ends thereof, a tubular stator having multiple substantially radial perforations therethrough mounted within said shell and of smaller diameter than said shell to define therebetween an annular collecting zone, a hollow rotor mounted within said stator and having multiple substantially radial perforations therethrough, the end of said rotor adjacent said inlet being open to receive stock therefrom and the other end of said rotor being closed, means defining a collecting chamber in said shell adjacent said closed end of said rotor, means for rotating said rotor to cause a portion of said stock to pass from said inlet through said perforations in both said rotor and stator to said collecting zone and to cause the remainder of said stock to pass through said rotor perforations and between said rotor and stator to said collecting chamber, means forming a connection to said outlet from said collecting chamber and zone, and valve means controlling said connection to vary the proportions of stock discharged through said outlet from said collecting chamber and zone.

5. A refiner of the character described comprising a shell defining a refining chamber having an inlet and an outlet for stock, a tubular frustoconical stator having multiple substantially radial perforations therethrough mounted within said shell and of smaller diameter than said shell to define therebetween an annular collecting zone, a hollow frustoconical rotor mounted within said stator and having multiple substantially radial perforations therethrough, the smaller end of said rotor being open and adjacent said inlet to receive stock therefrom and the larger end of said rotor being closed, means defining a collecting chamber in said shell adjacent the larger end of said rotor, means for providing a variable annular clearance between said rotor and stator by adjusting the axial relation thereof to cause a portion of said stock to pass from said inlet through said perforations in both said rotor and stator to said collecting zone and to cause the remainder of said stock to pass through said rotor perforations and said clearance between said rotor and stator to said collecting chamber, means forming a connection to said outlet from said collecting chamber and zone, and valve means controlling said connection to vary the proportions of stock discharged through said outlet from said collecting chamber and zone.

6. A refiner of the character described comprising a shell defining a refining chamber having an inlet and an outlet for stock at opposite ends thereof, a tubular stator having multiple substantially radial perforations therethrough mounted within said shell and of smaller diameter than said shell to define therebetween an annular collecting zone, a hollow rotor mounted within said stator and having multiple substantially radial perforations therethrough, the end of said rotor adjacent said inlet being open to receive stock therefrom and the other end of said rotor being closed, means defining a collecting chamber in said shell adjacent said closed end of said rotor, means for rotating said rotor to cause a portion of said stock to pass from said inlet through said perforations in both said rotor and stator to said collecting zone and to cause the remainder of said stock to pass through said rotor perforations and between said rotor and stator to said collecting chamber, means forming a connection to said outlet from said collecting chamber and zone, valve means controlling said connection to vary the proportions of stock discharged through said outlet from said collecting chamber and zone, means defining separate recirculating channels from said collecting chamber and zone to said inlet, and separate valve means controlling said channels to vary the proportion of stock recirculated therethrough.

7. A refiner of the character described comprising a shell defining a refining chamber having an inlet and an outlet for stock, a tubular frustoconical stator having multiple substantially radial perforations therethrough mounted within said shell and of smaller diameter than said shell to define therebetween an annular collecting zone, a hollow frustoconical rotor mounted within said stator and having multiple substantially radial perforations therethrough, the smaller end of said rotor being open and adjacent said inlet to receive stock therefrom and the larger end of said rotor being closed, means defining a collecting chamber in said shell adjacent the larger end of said rotor, means for providing a variable

annular clearance between said rotor and stator by adjusting the axial relation thereof to cause a first part of said stock to pass from said inlet through said perforations in both said rotor and stator to said collecting zone and to cause the second part of said stock to pass through said rotor perforations and said clearance between said rotor and stator to said collecting chamber, means forming a connection to said outlet from said collecting chamber and zone, valve means controlling said connection to vary the proportions of stock discharged through said outlet from said collecting chamber and zone, means defining separate recirculating channels from said collecting chamber and zone to said inlet, and separate valve means controlling said channels to vary the proportion of stock recirculated therethrough.

8. A refiner of the character described comprising a shell defining a refining chamber having an inlet and an outlet for stock, a tubular frustoconical stator having multiple substantially radial perforations therethrough mounted within said shell and of smaller diameter than said shell to define therebetween an annular collecting zone, a hollow frustoconical rotor mounted within said stator and having multiple substantially radial perforations therethrough, the smaller end of said rotor being open and adjacent said inlet to receive stock therefrom and the larger end of said rotor being closed, means defining a collecting chamber in said shell adjacent the larger end of said rotor, means for providing a variable annular clearance between said rotor and stator by adjusting the axial relation thereof to cause a first part of said stock to pass from said inlet through said perforations in both said rotor and stator to said collecting zone and to cause the second part of said stock to pass through said rotor perforations and said clearance between said rotor and stator to said collecting chamber, longitudinally extending wings carried by said rotor for working on said stock passing through said clearance to said collecting chamber, means forming a connection to said outlet from said collecting chamber and zone, valve means controlling said connection to vary the proportions of stock discharged through said outlet from said collecting chamber and zone, means defining separate recirculating channels from said collecting chamber and zone to said inlet, and separate valve means controlling said channels to vary the proportion of stock recirculated therethrough.

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