

Jan. 21, 1964

D. E. JONES

3,118,622

RECIRCULATING DISK REFINER

Filed Feb. 9, 1962

2 Sheets-Sheet 1

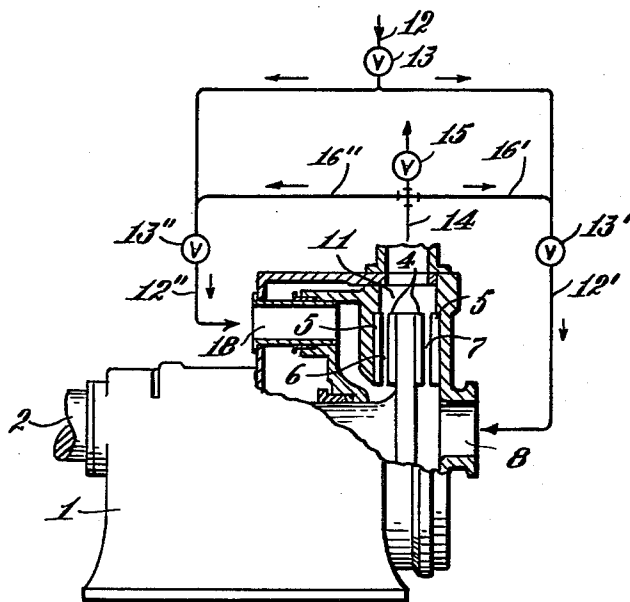


Fig. 2

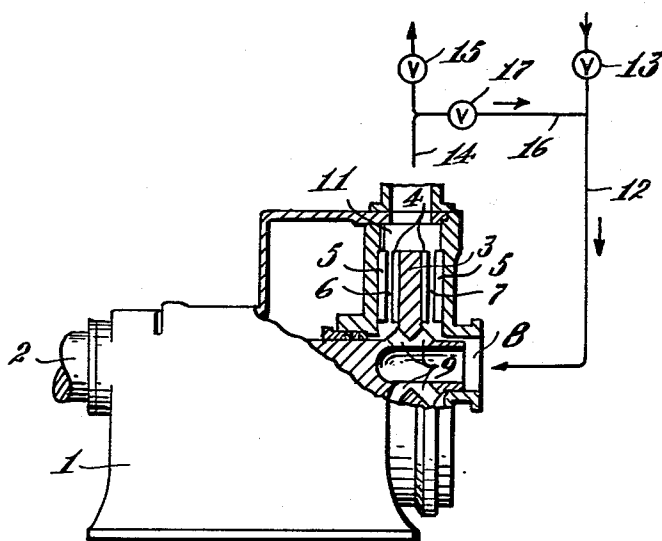


Fig. 1

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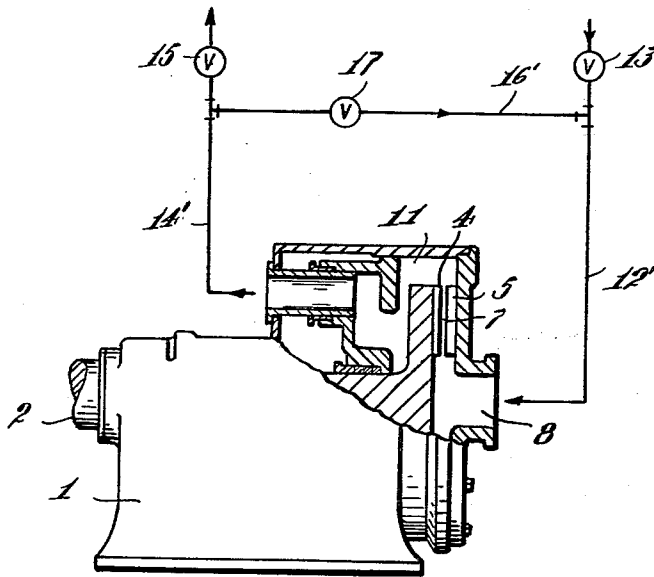


Fig. 3

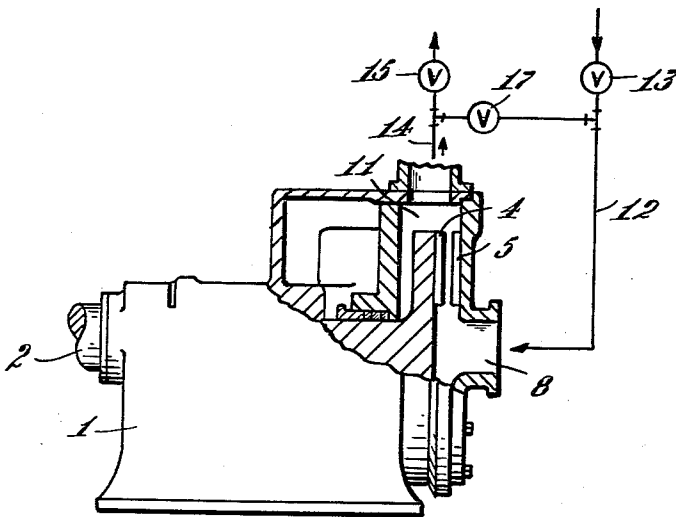


Fig. 4

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3,118,622

RECIRCULATING DISK REFINER

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This invention relates to machines for refining paper pulp and other materials of the type comprising a rotary disk having a set of blades on one or both sides and a set of stationary blades facing each of the rotary sets with a passageway extending radially between the tips of the blades of each pair of opposed rotary and stationary blades and a circumferential space at the outer end of said passageway or passageways. Such a machine is disclosed in my Patent 2,991,020, granted July 4, 1961. However this machine has various drawbacks. One drawback is that the output of the machine cannot be varied to suit different mill requirements from time to time without affecting the degree of refining. As the output is increased, as by opening the outlet valve wider, the rate of flow through the passageways increases and the degree of refining decreases. Conversely as the discharge valve is closed down the rotary disk pumps the material to the outer periphery of the passageways and the inner ends of the passageways are not properly flooded. When the passageways are not fully flooded the opposed refining blades are not properly lubricated, therefore wearing rapidly, and the quality of refined stock is inferior.

According to this invention a by-pass is provided from the outlet to the inlet so that some of the material may be recirculated through the aforesaid radial passageway or passageways and the width of the passageways is adjusted to produce the desired degree of refining at maximum output. Then, as the discharge valve is moved toward closed position, an increasing amount of the material is recirculated through the by-pass so that the rate of flow through the machine is maintained, the radial passageways are kept flooded and all of the material is properly refined at all outputs from maximum down to a small percent of maximum. For example, in a machine having a maximum capacity of 1,000 g.p.m. (gallons per minute), the output may be reduced as low as 200 g.p.m., permitting 800 g.p.m. to recirculate, while maintaining the quality of the pulp.

The patent to Curtis 2,982,482 discloses a disk refining machine with a by-pass but it is differently located for a different purpose and does not serve the purpose of the present invention. The outlet of the machine is not located at the periphery of the disk; on the contrary, both inlet and outlet are located at the axis, the material flowing from the axis to the periphery through one passageway and from the periphery to the axis through the other passageway. And instead of the by-pass leading from the outlet to the inlet it leads from a location halfway between. This arrangement is suitable for making slight variations in the by-pass to maintain equal pressure on opposite sides of the disk, the purpose of the patent, but it is entirely unsuitable to make substantial variations in the by-pass to control the output of the machine. Indeed substantial variations in the by-pass would defeat the purpose of the patent because they would upset the balance of pressure on the two sides of the disk, thereby adversely affecting the flow of material, causing excessive wear on one pair of opposed disks and producing an inferior product.

For the purpose of illustration typical embodiments of the invention are shown in the accompanying drawing in which

FIG. 1 is a side view of one embodiment with a portion in central axial section; and

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FIGS. 2, 3 and 4 are similar views of other embodiments.

The particular embodiment shown in FIG. 1 comprises a housing 1 in which is journaled a shaft 2. Fast to the shaft is a disk 3 carrying the aforesaid blades 4 on opposite sides thereof. Facing each set of rotary blades is a set of stationary blades 5 mounted on the housing 1 opposite the rotary blades 4 with narrow passageways 6 and 7 therebetween. The end of the shaft 2 is hollow to provide an inlet 8 communicating with the passageways 6 and 7 through ducts 9. Extending around the outer ends of the two passageways is an annular space 11. An inlet pipe 12 containing a valve 13 leads to the inlet 8 and an outlet pipe 14 containing a discharged valve 15 leads from annular space 11.

From the foregoing it will be understood that the stock flowing through the inlet 8 is divided equally between the two passageways 6 and 7 so that the pressure on opposite sides of the disk is equalized, all as described in my Patent 2,991,020 granted July 4, 1961.

According to this invention a by-pass 16 is connected between the inlet and outlet pipes 12 and 14, the by-pass containing a valve 17. By adjusting the valves 13, 15 and 17 the output of the machine can be adjusted to suit the requirements of a mill from time to time, the amount of recirculation through the pipe 16 increasing as the output decreases.

The embodiment shown in FIG. 2 is like that shown in FIG. 1 and corresponding parts are correspondingly designated. However the second embodiment has a second inlet 13 to the left passageway 6, the inlet 8 supplying material only to the right passageway 7. The inlet pipe 12 has two branches 12' and 12'' leading to the two inlets respectively, the branches containing valves 13' and 13'', and by-passes 16' and 16'' lead from the outlet to the two inlets respectively. The operation of the second embodiment is like that of the first embodiment. However by closing one of the valves 13' and 13'' only one of the two passageways 6 and 7 may be utilized, thereby further reducing the output.

The modifications shown in FIGS. 3 and 4 are like those shown in FIG. 2 and FIG. 1 respectively and corresponding parts are correspondingly designated, the modifications having only one pair of disks and one by-pass instead of two.

It should be understood that the present disclosure is for the purpose of illustration only and that this invention includes all modifications and equivalents which fall within the scope of the appended claims.

I claim:

1. For refining material such as pulp, apparatus comprising a rotary disk having a set of blades on one side, a housing surrounding the disk, a set of stationary blades in the housing facing said set with a radial passageway between the sets throughout the circumference of the disk, the housing having an inlet to the inner end of said passageway and an outlet from the outer end of the passageway so that the material flows outwardly from the center of the disk to its periphery, and a by-pass from said outlet to said inlet to keep the inner end of said passageway properly flooded when the output is decreased, thereby keeping said blades properly lubricated at low output.

2. For refining material such as pulp, apparatus comprising a rotary disk having a set of blades on each side, a housing surrounding the disk, a set of stationary blades in the housing facing each of said sets with a radial passageway between each pair of opposed rotary and stationary blades throughout the circumference of the disk, the housing having an inlet to the inner end of said passageways and an outlet from the outer end of the passageways so that the material flows outwardly from

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the center of the disk to its periphery through said passageways in parallel, and a by-pass from said outlet to said inlet to keep the inner end of said passageways properly flooded when the output is decreased, thereby keeping said blades properly lubricated at low output.

3. For refining material such as pulp, apparatus comprising a rotary disk having a set of blades on each side, a housing surrounding the disk, a set of stationary blades in the housing facing each of said sets with a radial passageway between each pair of opposed rotary and stationary blades throughout the circumference of the disk, the housing having separate inlets to the inner end of said passageways and an outlet from the outer end of the passageways so that the material flows only outwardly from the center of the disk to its periphery, and a by-pass from said outlet to each of said inlets to keep the inner end of said passageways properly flooded when the output is decreased, thereby keeping said blades properly lubricated at low output.

4. For refining material such as pulp, apparatus comprising a rotary disk having a set of blades on each side, a housing surrounding the disk, a set of stationary blades

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in the housing facing each of said sets with a radial passageway between each pair of opposed rotary and stationary blades throughout the circumference of the disk, a shaft supporting said disk, the shaft having an opening extending lengthwise thereof with ducts communicating with said passageways respectively, said opening having an inlet through which material may be fed and the housing having an outlet at the periphery of the passageways so that material flows outwardly through said passageways in parallel from the center of the disk to said periphery, and a by-pass from said outlet to said inlet to keep the inner end of said passageways properly flooded when the output is decreased, thereby keeping said blades properly lubricated at low output.

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