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[54] **ADJUSTABLE NONCOAXIAL DISC REFINER**
10 Claims, 1 Drawing Fig.

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[50] **Field of Search** 241/252, 254, 256

[56] **References Cited**

UNITED STATES PATENTS

RE.4,807	3/1872	Belcher	241/252
2,718,821	9/1955	Cumpston	241/252 X
3,028,632	4/1962	Coghill	241/252 X

FOREIGN PATENTS

8,808	2/1880	Germany	241/252

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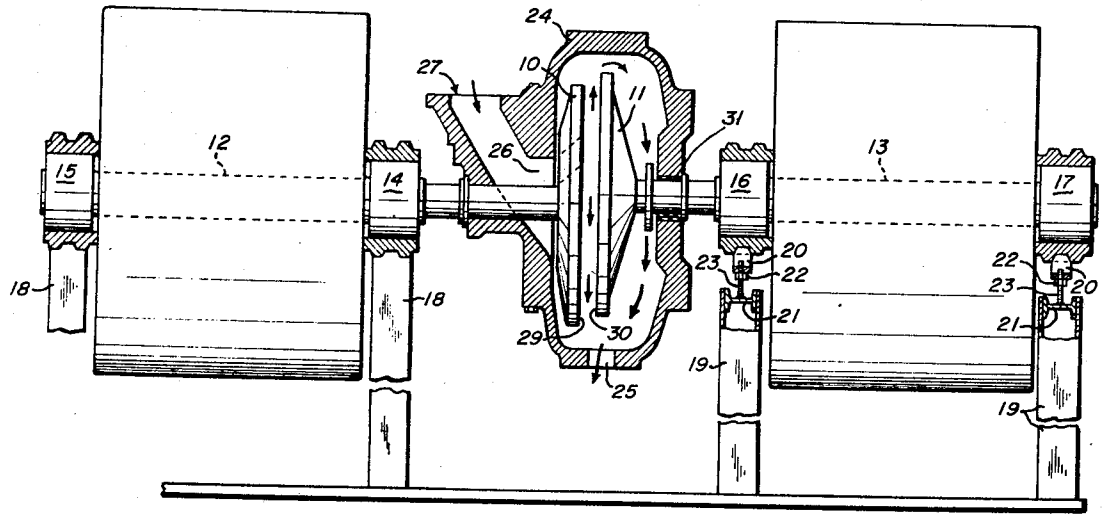
ABSTRACT: A disc refiner including opposed refining surfaces at least one of which rotates relative the other, characterized by said opposed surfaces being parallel and the center of one being radially offset from the center of the other. The disc refiner surfaces are each mounted on shafts, one of which shafts being adjustable to establish the surfaces in parallelism and to produce the desired radial offset thereof.



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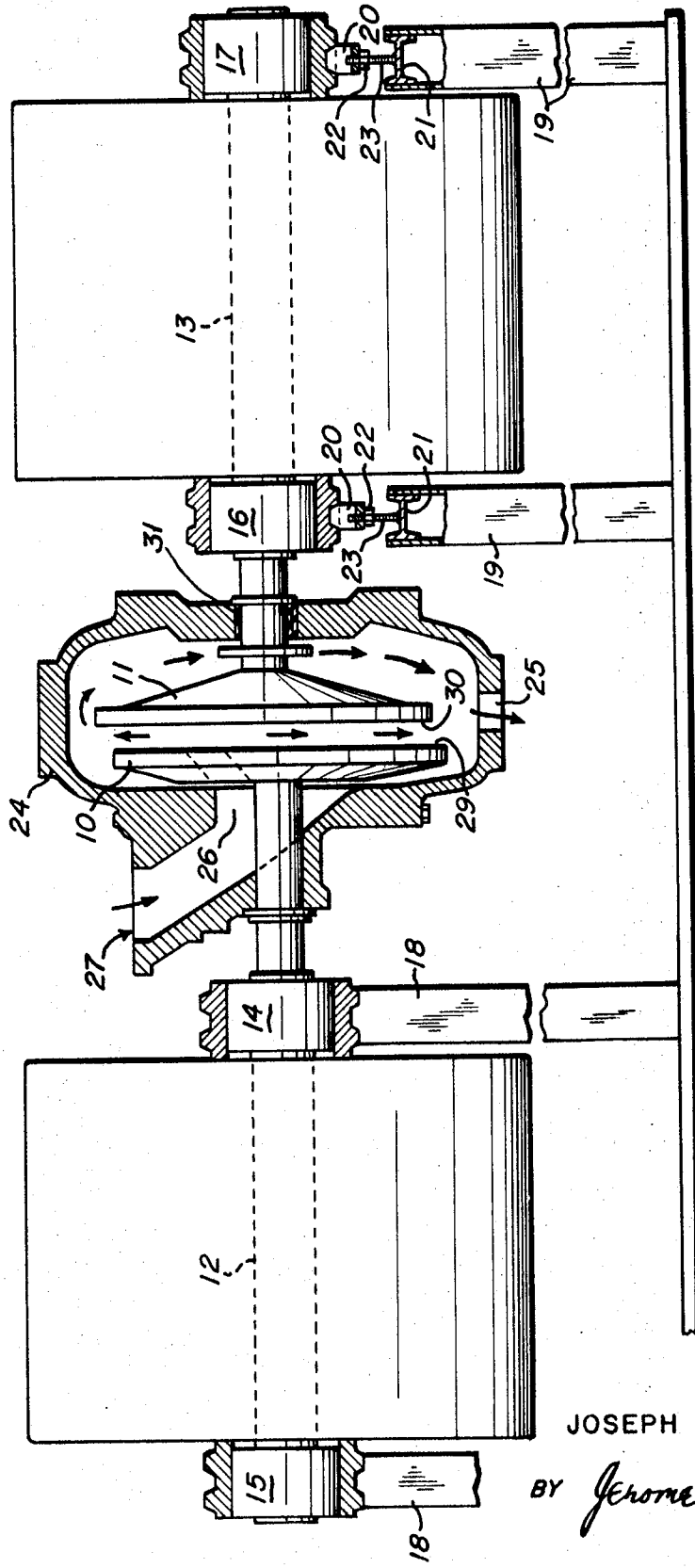

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ADJUSTABLE NONCOAXIAL DISC REFINER

This invention relates to improvements in disc refiners which render them particularly advantageous for use in high-density pulp-refining procedures. While the application of the invention embodiments is obviously not so limited, for purposes of illustration they will be described as used for the defiberizing of fibrous pulps which are presented in slurry form the solids content of which is 10 percent or more.

The plates of conventionally provided single and double disc refiners have a high incidence of wear. This has necessitated frequent replacement and maintenance procedures. Moreover, on application to fibrous materials such as raw wood chips, for example, they absorb a considerable amount of energy and draw a great amount of power. Both these conditions are objectionable and have invited a considerable amount of research and experimentation, mainly directed to improvements in the refining plates per se.

By contrast the present invention affords a simple but effective solution to these problems. Not only does the invention effectively reduce or obviate these problems but it renders the disc refiners much more effective in their ability to separate fiber bundles. There naturally results a higher quality product at a lower cost.

It is therefore a primary object of the invention to provide disc refiners which are not only economical to fabricate but more efficient and satisfactory in use, adaptable to a wide variety of applications, and unlikely to malfunction.

Another object of the invention is to provide an improved disc refiner characterized by low-power draw and a high capacity to defiberize without fiber deterioration.

A further object of the invention is to provide an improved disc refiner characterized by opposed refiner plates in parallel and eccentrically offset as to their centers whereby to produce particularly improved separation of the fiber content of fiber solids which are moved therebetween.

An additional object of the invention is to provide means and methods whereby disc refiners may be more effectively applied to improve and simplify high-consistency or high-density refining procedures.

A further object of the invention is to provide a disc refiner and a method of its use possessing the advantageous structural features, the inherent meritorious characteristics, and the method of employment herein described.

With the above and other incidental objects in view as will more fully appear in the specification, the invention intended to be protected by Letters Patent consists of the features of construction, the parts and combinations thereof, and the mode of operation as hereinafter described or illustrated in the accompanying drawings, or their equivalents.

Referring to the accompanying drawing wherein is shown one but obviously not necessarily the only form of embodiment of the invention,

FIG. 1 of the drawings reveals a strictly schematic showing of a double rotary disc refiner, in elevation, embodying the various features of the present invention.

Like parts are indicated by similar characters of reference throughout the several views.

Referring to the drawings we find a schematic illustration of a double-disc refiner. The view is fragmentary and limited only to such elements as are necessary for an understanding of the present invention.

The refining disc units **10** and **11** respectively mount to adjacent ends of shafts **12** and **13** to have their refining surfaces disposed in an adjacent opposed relation in a manner to be further described. Each shaft is supported in inboard and outboard bearings. As seen, the shaft **12** projects through and mounts in bearings **14** and **15** while the shaft **13** projects through and mounts in bearings **16** and **17**. The bearings **14** and **15** each mount, in turn, to pedestal supports **18** and are established thereby to position the shaft **12** at a fixed level referenced to a common base for all the pedestals. The details of the base are not illustrated since in and of themselves they form no particular part of the present invention except to establish a reference plane.

The inboard and the outboard bearings **16** and **17** for the shaft **13** respectively mount to pedestal supports **19**. The pedestal supports **19** each include a saddle portion **20**, which in part encompasses and supports the lower portion of the bearing housing which mounts thereto, and a surrounding underlying base portion **21**. The base portion **21** may be considered as nothing more involved than an H-frame the projected upper extremities of which are adapted to nest the related saddle portion **20**. Projecting vertically from the bridging portion of the H-frame, in the example schematically illustrated, is a threaded body **23** of a screw which projects through an aperture in the center of the overlying saddle **20**. As may be seen, a nut **22** may be fixed for rotation in connection with the bottom of saddle **20** and in threaded engagement about the related screw **23**. It should thus be obvious that the disposition of the shaft **13** may be variously controlled by rotation of the nuts **22** in respect to each of the screws **23** in the pedestal supports **19**.

It must be understood that the method illustrated for the adjustment or the orientation of the shaft **13**, and thereby of the connected refining disc unit, may be achieved by various other means and that the mechanism illustrated for this purpose is purely by way of example and not to be construed as limiting.

The drawings reveal the refining disc units **10** and **11** as encased in a housing **24** having a discharge outlet **25** at a peripheral portion of the rotatable disc units and an inlet **26** defined by an inlet spout **27**. As may be seen, the disc unit **10** mounts to the shaft **12** which has a relatively fixed horizontal orientation. Moreover, the unit **10** has through passages adjacent the shaft **12** for delivery therethrough of raw wood or other material in a high-consistency or high-density slurry form. As will be obvious, the wood and the accompanying liquid forming the vehicle for its movement is passed by way of spout **27** through the inlet **26** and openings in the disc **10** to move between the respectively opposed refining surfaces **29** and **30** of the disc unit **10** and the opposed disc unit **11** to exit at their periphery and discharge in a defiberized condition.

As is normally contemplated in a refining unit as here described, the shafts **12** and **13** will each mount a rotor element of a motor which is centered between the inboard and outboard support pedestals. In each instance the motor will conventionally house a stator in surrounding relation to the rotor. These as well as other related details are well within the comprehension of those versed in the art and therefore not here described. However note in this case the respective motor housings embody and support the stator and are fixedly attached to the adjacent bearing housings to thereby maintain a uniform airgap or clearance between the stator and rotor.

In the practice of the invention, on installation of the refiner unit, the nuts **22** will be respectively adjusted on the screws **23** to establish the refining surface **30** of disc unit **11** in parallel with the refining surface **29** of the disc unit **10**. This procedure establishing the refining surfaces in parallel will be carried out in an operating condition of the refiner. Under such circumstances, the disc units will be relatively rotated under the influence of their respective drive motors and suitable measuring means will be utilized for insuring a positive parallel relation of the refining surfaces. Since the details of the apparatus for and method of such measurement for establishing the parallel relation are not a specific aspect of the present invention, suffice it to say that any convenient method and means for measurement within the knowledge of those skilled in the art may be here employed.

In establishing and maintaining parallelism of the refining surfaces there must also be provided in accordance with the present concepts an adjustment of the position of the shaft **13** to establish its end portion defining the center of the disc unit **11** in an eccentric offset or radially displaced relation to the adjacent end portion of the shaft **12** which defines the center of the disc unit **10**. This radial offset should be from 0.005 inch to 1 inch, depending on the application of the refiner unit at the particular time and the end product desired.

In application to the refining of raw wood chips, for example, in the use of the double rotary disc refiner here illustrated, the refining surfaces of the disc units will be established in parallel and eccentrically offset at their centers as described. Then on energizing the disc units the raw wood chips may be delivered therebetween in a high-consistency slurry form. The chips move outwardly between the relatively rotating refining surfaces **29** and **30** and in the process there is produced a relatively compound or eccentric action on the chips due to the radial offset of the refining surfaces. This action provides for separating forces simultaneously both in the sense of and transverse to the axis of the chips, and results in a positive and critical separation of the fiber bundles of which the chips are comprised. The action of the refining surfaces offset and parallel as described prove to separate fibers much more easily than with the refining surfaces merely in "hot tram" as conventionally provided. Moreover, there results a minimal power draw because of the ease of separation achieved with the refining disc units so relatively positioned as described. An incident of the operation with refining surfaces in parallelism and their centers eccentrically and radially offset is a reduction of the wear of the refining plates which form the refining surfaces of the respective units.

As described, the invention is particularly important when applied to high-density or high-consistency refining of pulp of fibrous content where the material is flowed to and through the refiner in a slurry form at a consistency of 10 percent solids or more. This is highly advantageous in that the refining or defiberizing which is the end result is achieved to an optimal degree and with a minimum of fluid present.

As noted above, depending on the application, the offset of the centers of the disc refiner units may be between 0.005 inch and 1 inch. However, a range of offset between 0.020 inch and 0.080 inch is most advantageous for the greater majority of the applications of the invention units and system.

It is of course obvious, that due to the requirement for adjustment of the shaft **13**, the seal **31** about the area thereof passing through the opening in the refiner housing will incorporate a flexible member to accommodate adjustment of the shaft. In this manner, one insures the ability to adjust the shaft **13**, as required, in the hot or running condition of the refiner.

Therefore, by exceedingly simple mechanics the invention defines a unique advance in the art of refining, particularly high-consistency refining. As should be obvious, the advantages inherent in high-consistency refining will appear in the application to low-consistency refining as well.

The invention has been schematically illustrated but it should be readily apparent from the disclosure herein how its concepts may be embodied in various shape and form and applied in both single and double disc refiners.

From the above description it will be apparent that there is thus provided a device of the character described possessing the particular features of advantage before enumerated as desirable, but which obviously is susceptible of modification in its form, proportions, detail construction, and arrangement of parts without departing from the principle involved or sacrificing any of its advantages.

While in order to comply with the statute the invention has been described in language more or less specific as to structural features, it is to be understood that the invention is not limited to the specific features shown, but that the means and construction herein disclosed comprise but one of several modes of putting the invention into effect, and the invention is therefore claimed in any of its forms or modifications within the legitimate and valid scope of the appended claims.

Having thus described my invention, I claim:

1. A refiner comprising a pair of disc refiner units, at least one of which rotates relative the other, characterized by said disc refiner units having adjacent relatively opposed refining surfaces and in connection therewith means for applying said refining surfaces to produce an eccentric action on any pulp mass which is passed therebetween, each of said disc units having a fixed mount to a shaft, means mounting said shafts in an elevated relation to a base surface thereunder, and one of said shafts having a fixed orientation and the other having in connection therewith means for adjusting the orientation thereof to establish the opposed refining surfaces substantially in parallelism and to produce a selective offset of one of said refining surfaces relative the other whereby in operation to produce said eccentric action.

2. A disc refiner unit as set forth in claim **1** characterized by the center of one of said disc units being radially offset from the center of the other between 0.005 inch and 1 inch.

3. A disc refiner unit as set forth in claim **1** characterized by the center of one of said disc units being radially offset from the center of the other between 0.020 inch and 0.080 inch.

4. A disc refiner, including a pair of discs having front faces in opposing adjacent relation, each disc being fixed to a shaft extending from its back face, at its center and perpendicularly thereof, means defining spaced bearing supports for each said shaft, and means included in the supports for at least one of said shafts for bodily shifting said shaft to accomplish precise parallelism of the said front faces of said discs and to achieve a selected nonaligned relation of said shafts for an eccentric offset disposition of said opposing front faces.

5. A disc refiner according to claim **4**, wherein there are means included in said supports for said one of said shafts which operate independently of one another whereby adjustment of one relatively to the other relatively tilts said discs and adjustment of both in conjunction with one another relatively offsets said shafts and said discs while maintaining parallelism of the front faces of discs.

6. A disc refiner according to claim **4**, wherein said discs have a vertical disposition and said shafts extend horizontally therefrom, and said spaced bearing supports include pedestals spaced apart longitudinally of a respective shaft and a saddle mounted on each pedestal for relative raising and lowering movement, said saddles being each in an independent supporting relation to said shaft.

7. A disc refiner according to claim **6**, wherein each shaft is supported by a pair of longitudinally spaced-apart saddles on respective pedestals.

8. A disc refiner according to claim **6**, characterized by means positively to raise each saddle and to control the lowering thereof.

9. A disc refiner according to claim **4**, wherein said discs are surrounded by a case having an inlet for the entrance of material to be refined and an outlet for the discharge of refined material, and having further substantially oppositely disposed openings through which said shafts project, and a seal in at least one of said openings incorporating a flexible member to accommodate movements of a bodily shiftable shaft which projects therethrough.

10. A refiner according to claim **4**, wherein said spaced bearing supports include a pair of spaced-apart pedestals for each shaft, characterized by a rotor fixed to each shaft, each rotor disposing between a pair of said pedestals, a stator surrounding each rotor, the rotor on a shiftable shaft bodily shifting in accompaniment therewith, and the surrounding stator being fixed relative the bearing supports for the shiftable shaft to move therewith.