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METHOD FOR FINISHING REFINER PLATES

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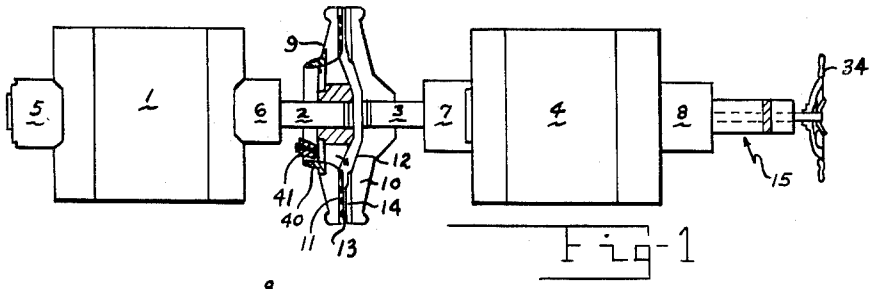


Fig-1

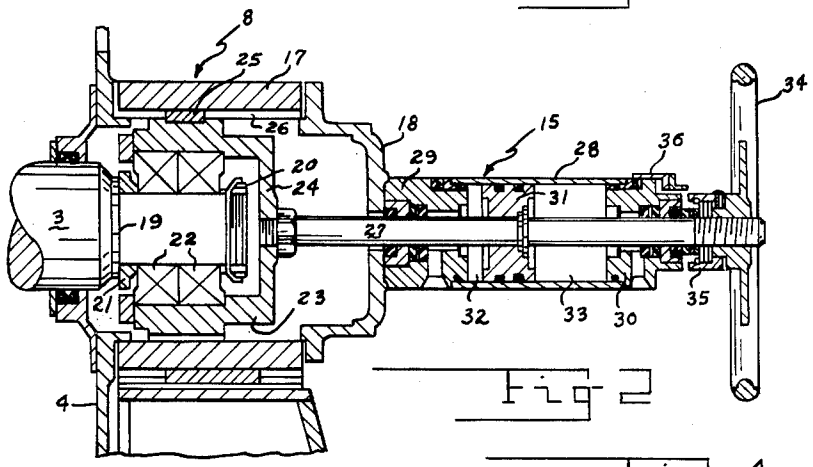
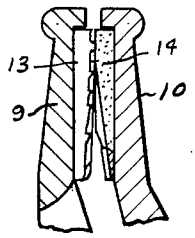
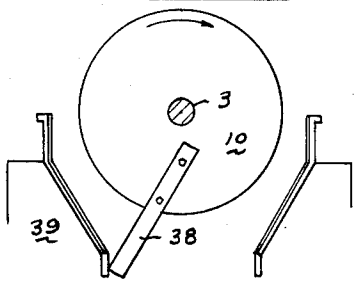


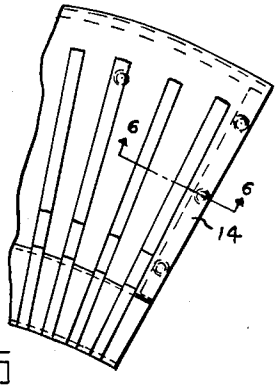
Fig-2

Fig-4

Fig-3







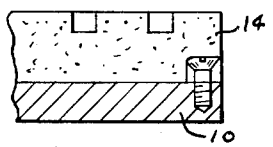


Fig-6

Fig-5

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METHOD FOR FINISHING REFINER PLATES

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This invention relates to improvements in grinding procedures having particular reference to pulp refiner plates and will be so described.

Disc type refiners provide for a flow of pulp between the operating surfaces of opposed relatively rotating discs. These surfaces are formed by refiner plates which function to defiberize the pulp as it flows therebetween. All such plates are normally precision finished prior to shipment and installation using conventional grinding equipment. However, the conventional grinding equipment and procedures do not take into account all the operational factors to which refiner plates are normally subject. Moreover, the complexities of a refiner installation in the field often introduces sufficient misalignment of the discs to which these plates mount as to require that the refiner plates be refinished to suit the installation. As a result, when the refiner plates are installed in the field, it is often found necessary that one of an opposed set of plates be refinished. This entails a loss of time and additional cost since it is usually necessary to ship the plates back to the factory for the refinishing procedure. A further incident of this occurrence is that the time, effort and expense involved in the original precision finish of these plates is essentially wasted.

The present invention is directed to minimizing problems of the nature above described. It provides for the conversion of the pulp refiner per se into a machine tool which may be used to finish refiner plates under actual operating conditions. This is of particular advantage in the field where the employment of the invention procedures facilitates a final finishing of refiner plates and a precision fit of relatively opposite refiner plates. Thus, the invention enables refiner plates to be more economically produced and installed, faciltates a precision fit of opposed refiner plates and thereby reduces the need for maintenance thereof to a minimum. The use of refiner plates precision finished and fit in accordance with the invention enables the installation of a pulp refiner unit of greater integrity and durability than previously was thought possible.

A primary object of the invention is to provide improvements in procedures for the finish grinding of pulp refiner plates and the like rendering such plates more economical to fabricate, more efficient and satisfactory in use, adaptable to a wide variety of applications and easy to maintain.

Another object of the invention is to provide a novel method for effecting a precision fit of opposed sets of refiner plates.

An additional object of the invention is to provide procedure facilitating a precision installation of refiner plates in pulp refiners and similar equipment.

Another object of the invention is to provide a method for grinding refiner plates under actual operating conditions.

A further object of the invention is to provide a method for precision grinding refiner plates in the field.

An additional object of the invention is to provide a method for refinishing refiner plates to a condition which facilitates a more efficient and economical refiner operation.

Another object of the invention is to provide novel method for modifying refiner plates and the like which

facilitates more efficient and economical operation of the apparatus in which they are employed.

Another object of the invention is to provide a method of finishing refiner plates possessing the inherent meritorious characteristics and mode of operation 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 is a schematic illustration of the operating elements of a double disc refiner embodying aspects of the present invention;

FIG. 2 of the drawings is a fragmentary cross-sectional view of a portion of the structure illustrated in FIG. 1;

FIG. 3 of the drawings is a fragmentary cross-sectional view illustrating the orientation of a grinding plate relative a refiner plate as installed in a double disc refiner such as illustrated in FIG. 1;

FIG. 4 schematically illustrates an anchoring of one of the discs in the refiner of FIG. 1;

FIG. 5 is a plan view of a grinding plate utilized in practicing the invention method and procedure; and

FIG. 6 is a cross-sectional view taken on line 6—6 of FIG. 5.

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

The invention can be best described with particular reference to the accompanying drawings. A double disc refiner is schematically shown in FIG. 1 to include a motor 1 having a drive shaft 2 projecting in coaxial end spaced relation to the drive shaft 3 of a motor 4. Supports 5 and 6 to either end of the motor 1 house bearing units for the shaft 2. Supports 7 and 8 to either end of the motor 4 house bearing units for the shaft 3. The bearing units in the supports 7 and 8 are fixed for movement with the shaft 3 and relative the housings provided by their supports 7 and 8 as and for purposes to be further described. Discs 9 and 10 are respectively fixed to the relatively adjacent extremities of the shafts 2 and 3 for movement therewith.

The operating face 11 of the disc 9 has a central male projection while the directly opposed operating face 12 of the disc 10 has a central female recess. The female recess in the disc 10 accommodates a nesting of the male projection on the disc 9 and immediately adjacent positioning of the faces 11 and 12.

The operating face 11 of disc 9 is adapted to conventionally mount a set of refiner plate segments 13 positioned concentric to the male projection thereon. In the instance of the present invention, the segments 13 are applied to the disc 9 at a stage where they require a precision finish. The opposed face 12 of the disc 10 mounts finish contoured refiner plate segments 14. The segments 14 are arranged directly opposite the segments 13 on the disc 9. Moreover, the segments 14 are so fabricated to present an exterior surface to the segments 13 composed of abrasive material which is significantly harder than the material of which the segments 13 are fabricated. Basically, the segments 14 present the precise outer configuration of a plate-type refiner surface as desired in a double disc-type refiner as illustrated. Further, on a relatively rotating contact of the set of segments 13 with the segments 14 in a manner to be further described, the segments 14 operate to effect a required

precision finish on the segments 13 to suit the intended application.

It should be observed that the disc 9 has intake apertures concentric with the shaft 2, positioned immediately thereabout and within the space defined by the inner periphery of the segments 13. The entrance to these intake apertures at the face of disc 9 remote from the face 11 is defined by a ring 40. As seen in FIG. 1 of the drawings, positioned within the inner periphery of the ring 40 is a conventional plug wiper 41 associated therewith as in a conventional double revolving disc refiner. In this instance the wiper 41 serves to deliver coolant to the space between discs 9 and 10. Relative rotation of these discs causes the coolant to move outwardly therebetween over the relatively opposed surfaces of the segments 13 and 14. This will be further described.

The end of shaft 3 remote from the disc 10 terminates in a cylindrical shell 17 in the support 8. The motor 4 caps one end of this shell while its other end is capped by a bell shaped plate 18. The end portion of shaft 3 in shell 17 is relatively reduced in diameter and a shoulder 19 is provided thereby. A puller ring 21 is positioned on shaft 3 in abutment with the shoulder 19, followed by thrust bearings 22. A nut 20 is threadedly engaged on the projected extremity of the shaft 3 in shell 17 to clamp the inner races of the bearings 22 and the ring 21 in a fixed position with reference to the shoulder 19. The outer races of bearings 22 are contained to a shoulder in a cup shaped cage 23, the base of which forms an enclosure for the projected extremity of shaft 3. The shell 17 provides a bearing for the cage 23 which mounts a key 25 externally thereof. The key 25 projects to bear in a slot oriented longitudinally of the inner wall of the shell 17. This slot provides a guide way for the key 25 which adapts the cage 23 for a sliding movement longitudinally of the shell 17 and the shaft 3 therewith.

Since the bearing for the shaft 3 in the support 7 is of a character similar to that in the support 8, a detailed review thereof is unnecessary. It suffices to state that the bearing units for the shaft 3 so mount in the supports 7 and 8 to accommodate an axial adjustment of the shaft 3 and the disc 10 thereby. This adjustment is under the influence of a hydraulic control unit 15. The unit 15 consists of a cylinder 28 capped to one end by a head 29 and to its other end by a head 30. The head end 29 abuts the center of the plate 18 to orient the cylinder 28 co-axial with the shaft 3. A piston 31 slides in the chamber defined by the cylinder 28 between the head 29 and 30. The piston 31 is fixed about a rod 27 intermediate its extremities. Rod 27 is coaxial with the shaft 3 and one end projects through the cylinder head 29 and plate 18 in bearing relation thereto to threadedly engage in the base 24 of the bearing cage 23. The other end of rod 27 projects through the head 30, in bearing relation thereto, and mounts a wheel 34. The wheel 34 is threadedly engaged about the relatively projected extremity of the rod 27.

The cylindrical heads 29 and 30 conventionally provide passages and have conventional apparatus associated therewith for selective delivery of the hydraulic fluid to either side of the piston 31. The delivery of fluid is therefore capable of selectively moving the piston 31, the rod 27, the shaft 3 and the disc 10 in a direction to or from the disc 9. This enables a selective contact or space between the segments 14 and 13 in a manner believed obvious. A fine adjustment of the segments 14 relative the segments 13 in a closed position thereof, as shown in FIG. 3 may be accomplished by a fine adjustment of wheel 34 on the rod 27. This is accomplished by threading the wheel 34 to or from the unit 15. The adjustments of the wheel 34 can be conventionally observed on a ring 35 connected therewith as it moves with reference to a pointer 36 on the head end 30 of the unit 15.

As is believed obvious, the movement of the disc 10 from the disc 9 may be limited by the extent of travel of the piston 31 in the cylinder 28 or, if desired, by cylinder screws engaged in the plate 18 to project in the path of the cage 23. The movement of the disc 10 and the plate segments 14 thereon in the direction of the segments 13 is limited by the selected positioning of the hand wheel on the rod 27. A conventional mechanism is thus utilized to provide selective adjustment of the shaft 3 relative the shaft 2 to place the segments 14 in a position to establish contact with or to lie in opposed spaced relation to segments 13 on the disc 9.

It should be obvious from the preceding that the disc 9 serves as a conventional holder for a set of refiner segments 13 which are to be precision finished and that the conventionally precision contoured set of segments 14 on the disc 10 function as a grinding tool. The refiner unit thus provided enables a precision finishing of sets of refiner segments under actual operating conditions. In the practice of the invention wherein the refiner structure above described is utilized for precision finishing of refiner plate units defined by the segments 13, a bar 38 may be fixed to the disc 10 to prevent its rotation. FIG. 4 of the drawings shows a manner in which this may be accomplished, the bar 38 being arranged to project and abut a housing 39 such as conventionally provided for the rotating discs in a disc refiner.

Accordingly, the invention contemplates that sets of segments 13 will be received from a foundry prior to a precision finish being placed thereon. A set of segments 13 may be installed on the disc 9 in opposed relation to the grinding segments 14 which, in effect, provide a precision finished set of refiner plates. Once the segments 13 are conventionally mounted, an adjustment of the shaft 3 may be effected to provide for a contact orientation of the segments 14 with reference to the segments 13 opposed. With the disc 10 being held through the medium of the bar 38, the shaft 2 is driven while a coextensive contact between the segments 13 and 14 is maintained. A grinding operation takes place, the shaft 3 being selectively adjusted, as required, as the finish grinding procedure progresses. It is therefore obvious, with the inclusion of abrasive refiner plate unit on one of the opposed discs in operative relation to a conventional set of refiner plate units on the other, that a precision finish of the latter may be effected under what amounts to operating conditions. By this means successive sets of refiner plates may be quickly and accurately precision finished taking into account actual operating condition factors. The contact between the segments 13 and 14 in the grinding procedure is coextensive so that in effect the segments 13 are finished for a precision fit with reference to the segments 14.

The utilization of a refiner unit as a machine tool as above described simplifies and renders more accurate the precision finishing operation with reference to a refiner plate unit. This means that pulp refining plants can order less precise refiner plates from the foundry at a lower cost and they can utilize a disc type refiner unit which is available in their plant for the actual finishing procedure. Moreover, the finishing procedure is such to minimize its cost. Much handling of refiner plate segments is avoided thereby. Further, the apparatus and procedure not only enables a final finishing on plates direct from the foundry but also a resharpening and recontouring of refiner plate units at the mill site.

A further feature contemplated by the invention is that in the case where at a mill site it is found that opposed sets of refiner plates on installation are found to be misaligned due to elements not attributable to the contour of the refiner plate units per se, this problem can be corrected in place. All it requires is availability of a precision contoured set of refiner segments 14 which may be substituted, referring to FIG. 1 of the drawings, for a conventional set of segments on the disc 10. Once this is accomplished and the disc 10 anchored in a manner

as previously described or in a manner equivalent thereto, then one need only establish a contact between the segments **13** which remain on the opposed plate **9** and a rotation thereof with reference to the abrasive segments **14**. In the process, a precision finish of the segments **13** will be naturally effected which takes into consideration the installation errors that might exist with reference to the disc supports and compensates therefor in establishing a precision fit between the segments **13** on the disc **9** and the opposed set of segments which are due to be re-installed in place of the grinding segments **14**.

In any of the above procedures, wiper **41** is conventionally rendered operative on rotation of the disc **9** to flow coolant between segments **13** and **14**. A controlled grinding procedure is provided thereby.

While the features and advantages of the invention become self-evident with reference to the preceding disclosure, it follows that the application of the principles of the invention need not be limited to the application described.

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 claim.

Having thus described my invention I claim:

A method of refinishing refiner plate units in a disc refiner including opposed relatively rotatable discs mounting opposed refiner plate units consisting of the steps of replacing one of said refiner plate units with an identical unit having a more abrasive exterior surface, inducing relative rotation and contact between the other of said units and the more abrasive surface to produce a refinishing of said other unit under actual operating conditions.

References Cited in the file of this patent

UNITED STATES PATENTS

1,691,196	Jirotka	Nov. 13, 1928
1,795,603	Hussey	Mar. 10, 1931
1,814,587	Daniels	July 14, 1931
1,903,101	Faley	Mar. 28, 1933
2,725,697	Christensen	Dec. 6, 1955
3,040,996	Ginaven	June 26, 1962