April 21, 1964 D. P. MICHEL ETAL 3,129,898

REFINER CONSTRUCTION

Filed April 18, 1961 2 Sheets-Sheet 1

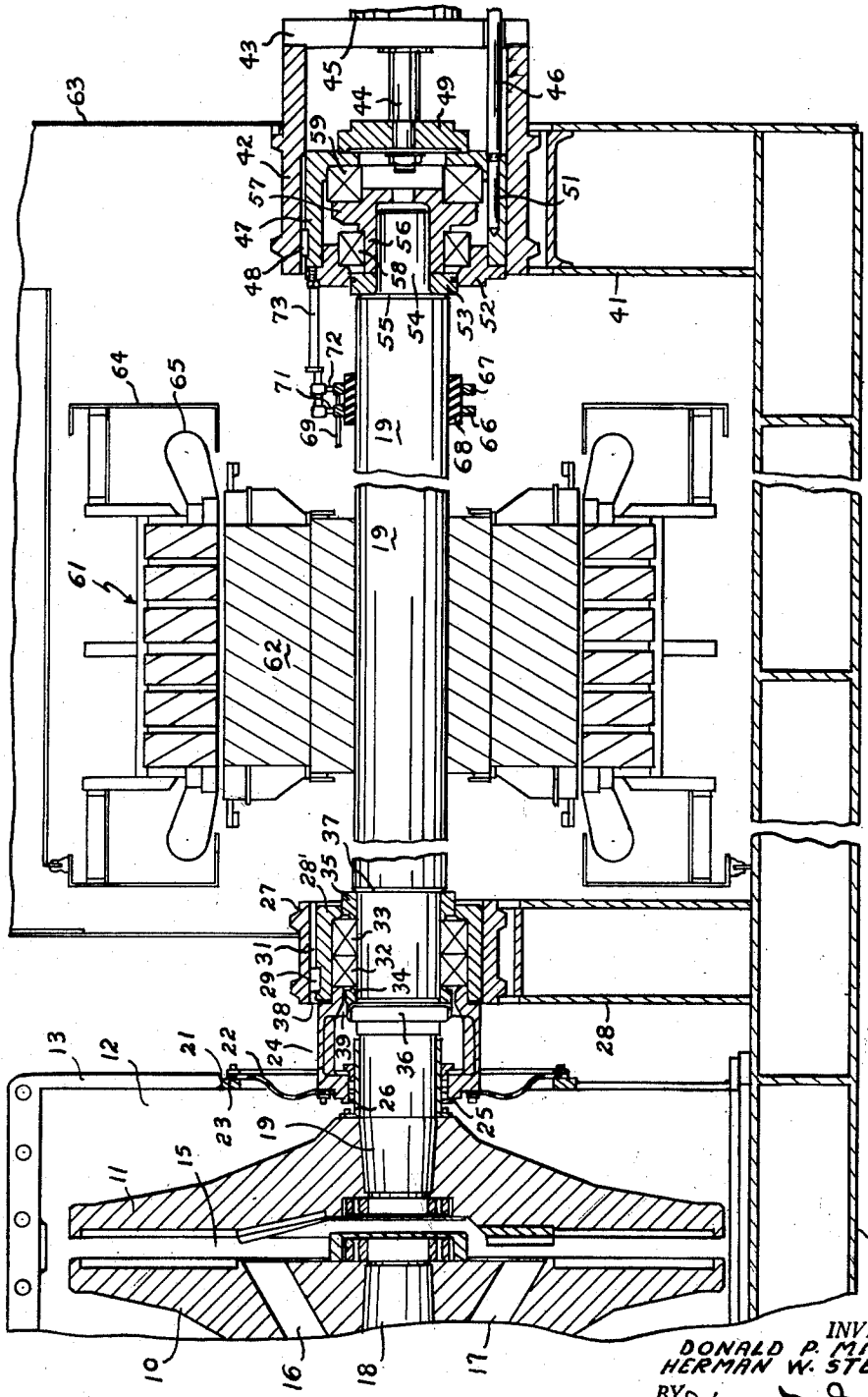


Fig-1

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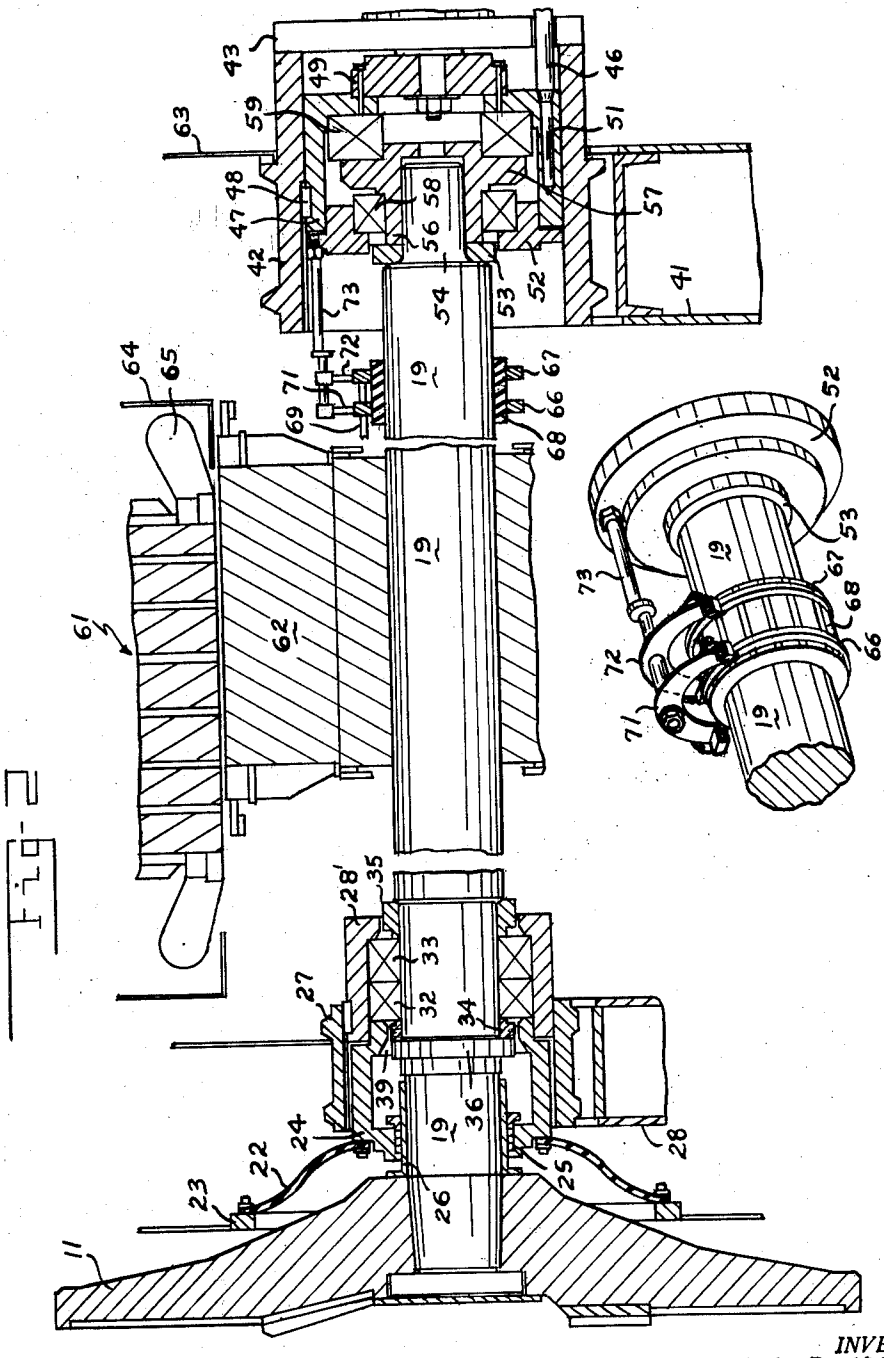


Fig. 2

Fig. 3

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REFINER CONSTRUCTION

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This invention relates to pulp refiners and the like wherein a flowable stock comprising plant fibers or a similar material is subjected to milling between relatively rotatable discs, which discs are movable longitudinally of one another for clearance adjustment, thrust absorption and like purposes.

The object of the invention is to simplify the construction as well as the means and mode of operation of pulp refiners, whereby such refiners may not only be economically manufactured, but will be more efficient and satisfactory in use, adaptable to a wide variety of applications, and be unlikely to get out of order.

An object of the invention is to provide for disc adjustment as described without elongation of the machine, and in a manner to obviate increased maintenance and operational hazards.

Another object of the invention is to achieve electric powering of disc rotation in accordance with a structural concept by which longitudinal adjustment of a disc and the shaft to which it is connected imposes no unusual requirements upon the electro-motive means.

Still another object of the invention is to accomplish disc rotation by an electric induction motor which despite relatively longitudinal adjustment of the rotor makes use of standard collector rings and brushes.

A still further object of the invention is to utilize in an electric motor powered refiner as described a generally new rotor shaft assembly, wherein the milling disc thereon, bearings, closure for the refining chamber and collector rings and brushes move as a unit with the shaft for disc adjustment.

A further object of the invention is to provide a refiner possessing the advantageous structural features, the inherent meritorious characteristics and the mode of operation herein mentioned.

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 is a fragmentary view, partly diagrammatic and in longitudinal section, of the refined constructed in accordance with the illustrated form of the invention, the adjustable shaft and disc assembly being there shown positioned after having been moved leftwardly or in a direction to cause the one disc to approach the other;

FIG. 2 is a fragmentary view like FIG. 1, and relatively enlarged, showing the shaft and disc assembly shifted outwardly or to the right as viewed therein; and

FIG. 3 is a fragmentary perspective view of the brush holder assembly.

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

Referring to the drawings, the invention is disclosed as embodied in a disc refiner useful, for example, in the treatment of plant fibers in paper making and allied industries. Thus a pair of opposing discs **10** and **11** operate in a refining chamber **12** defined by a housing **13** upon a base **14**. The fibrous material, accompanied by

liquid to form a flowable stock, enters a space **15** between the discs **10** and **11** by way of inlet passages **16** and **17** located near the center of the disc **10**. In the space **15** the stock material is acted upon by toothed or formed surfaces on the faces of the discs **10** and **11** as the discs rotate relatively to one another. The direction of movement of the stock material is radially outward and it discharges from the space **15** at the peripheries of the discs **10** and **11** into the chamber **12** whence it is removed from the bottom of the refining chamber through a suitable opening (not shown) in the base **14**.

The disc **10** is mounted on a shaft **18** and may be either stationary or in rotary motion in the operation of the machine. The disc **11** is mounted on what may be considered to be the inner end of a shaft **19** projecting transversely through the housing **13** into the chamber **12**. The shaft **19** is adapted for powered rotation as well as axial adjustment, as will be seen, and accordingly is capable of rotating the disc **11** and of effecting relative approaching and withdrawing movements thereof with respect to the disc **10**. The shaft **19** enters chamber **12** through an opening **21** in the housing **13**. This opening is closed around the shaft **19**, to prevent escape of the treated stock material therefrom, by means including a flexible diaphragm **22**. The latter is secured at its outer edge to a ring **23** stationarily mounted in the opening **21**. The inner edge of the diaphragm, which is ring shaped to accommodate passage of the shaft **19** therethrough, is secured to a collar **24** mounted on bearings **25** interposed between the collar and a sleeve **26** secured to the rear of disc **11**. The collar is thus in effect rotatably mounted upon the shaft **19** which is free to rotate without affecting the closure achieved by diaphragm **22**.

The collar **24** extends outwardly or to the right of bearings **25** to form a part of a stuffing box which includes a circular stationary bearing mount **27** resting on a pedestal **28** projecting upwardly from the base **14**. Within the mount **27** is an interior bearing sleeve **28'** connected by a key **29** and slot **31** to the mount **27** for relative longitudinal motion while being held against relative rotary motion. The interior bearing sleeve **28'** engages the shaft **19** through roller bearings **32** and **33** restrained from relative longitudinal motion by rings **34** and **35** on either side thereof. These are in turn held between spaced apart increased diameter flanges **36** and **37** on the shaft **19**. The described outer end of the collar **24** enters between the ring **34** and the inner end of sleeve **28'** and frictionally grips both elements through oil seals **38** and **39**. The opposite end of the sleeve **28'** is turned over upon the ring **35** with the result that there is defined a substantially enclosed bearing supporting the shaft **19** in the mount **27** for freedom of rotation therein but integrated with the shaft for unitary axial motion therewith.

The pedestal **28**, bearing mount **27** and the stuffing box supported thereby provide what may be considered inboard support for the shaft **19**. Outboard support is provided by an upstanding pedestal **41** stationarily supporting a circular bearing mount **42**. The outer end of the bearing mount **42** is closed by a plate **43** through which extends a rod **44** from a hydraulic cylinder **45**. Additionally, guide rods **46** (one shown) extend through the end plate **43** into the space enclosed by bearing mount **42**. An interior bearing sleeve or enclosure **47** is slidably mounted in the bearing mount **42** and non-rotatably connected thereto by means including a key **48**. That end of the interior sleeve **47** facing end plate **43** is flanged and abutted by a collar **49** secured to the inwardly projecting end of rod **44**. Bores **51** (one shown) receive the guide rods **46**. The opposite end of the sleeve **47** has a ring **52** pressed therein. The latter in turn centrally receives an annular member **53** in surrounding relation to

a reduced diameter terminal portion 54 of the shaft 19. A shoulder 55 at the base of portion 54 abuts the annular member 53. Thus a bearing enclosure is retained between the collar 49 on rod 44 and shoulder 55 on shaft 19 with such bearing enclosure being longitudinally adjustable in the mount 42 in response to endwise thrust delivered to the shaft 19 from the refining chamber or in response to axial adjustment of the rod 44 effected from the hydraulic actuating cylinder 45.

Within the described bearing enclosure is a cup-like part 56 seated on the reduced diameter terminal 54 of the shaft 19 and formed with a radially projecting intermediately disposed flange 57. On opposite sides of the flange 57 are respective roller bearings 58 and 59. As a result the outer or outboard end of the shaft 19 is supported for free rotary motion but is adapted for movement with the bearing assembly in which it is received, the bearing assembly and shaft moving as a unit. It will in the latter connection be noted that the bearings 58 and 59 are interposed between the flange 57 and the opposite ends of the bearing enclosure in such manner as to inhibit relative axial motion of the shaft.

Intermediate the inboard and outboard bearing supports is electro-motive means for rotating the shaft. In accordance with the instant inventive concept this is or includes an induction motor comprising only essential motor elements such as a stator 61 stationarily mounted upon the main support or base 14 and surrounding the shaft 19, plus a rotor 62 encircled by the stator and secured to the shaft 19 for unison movement therewith. The motor elements are not enclosed in a conventional motor housing but are protected by super-structure 63 mounted on the base which together with baffle means 64 may define confined flow passages for air to move in cooling relation to the motor. In accordance with the mode of operation of induction motors, energization of the stator windings, diagrammatically indicated at 65, produces an induced current in the rotor and the latter is constrained to rotate as the induced current assumes a following relation to the rotating magnetic field in the stator. Current collector means is mounted upon the rotor or more particularly upon the shaft 19 of which the rotor is a part.

In accordance with the instant inventive idea, the collector means takes the form of rings 66 and 67 secured to the shaft 19 through an insulator 68 at a location near the outboard bearing mount 42. The collector rings are electrically connected to the rotor by means including a cable 69. Brushes 71 and 72 contact the respective rings 66 and 67 and these are stationarily supported by a stud 73 anchored in the bearing enclosure within mount 42 or more particularly in end ring 52 thereof. The stud 73 projects from the bearing enclosure in overlying parallel relation to the shaft 19, and, while it occupies a stationary position as compared to the rotary motion of the shaft 19 and collector rings 72 and 71, is integrated with the shaft and collector rings for longitudinal or endwise motion.

The endwise, traversing movement of the shaft 19 may be suitably initiated and controlled. The hydraulic cylinder 45 may provide a means for damping thrusts originating in the refining chamber as well as a means for effecting selective longitudinal positions for the shaft. The collar 49 may, in this connection, be detachably connected to the end bearing housing as by being bolted to the abutting closed end of sleeve member 47. The shaft 19 and parts mounted thereon make up an integrated assembly movable as a unit from extreme positions as shown in FIGS. 1 and 2 as well as to intermediate positions. According to a feature of the invention the collector rings 66—67 and cooperating brushes 71—72 may be of a standard size and construction since their relative positions do not change under longitudinal adjustment of the shaft assembly. The need for making special elongated rings or brushes, or both, accordingly is avoided, making it unnecessary to increase the overall length of the machine as well as achieving advantages of simplified maintenance, servicing and the like reducing hazards of operation.

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 our invention, we claim:

1. A refiner or like device, including a main support; relatively stationary bearing mounts occupying spaced apart locations on said support; bearing units contained in said mounts adapted for relative longitudinal motion; a shaft rotatable in said bearing units and connected thereto for unison longitudinal motion; a refiner disc on said shaft; electro-motive means for rotating said shaft including a rotor and collector rings connected to the shaft for motion therewith, brushes mounted to one of said bearing units to contact said rings and means in connection with said shaft through the medium of at least one of said bearing units arranged to accommodate end thrusts thereon on operation of said disc.

2. A refiner or like device according to claim 1, characterized in that each of said bearing units includes a bearing enclosure slidably received in a respective bearing mount and a stud installed in and projecting from one of said enclosures mounting said brushes.

3. A refiner or like device according to claim 1, characterized in that said electro-motive means further includes a stator stationarily held by said main support in surrounding relation to said rotor.

4. In a refiner or like device providing a main support, a refiner chamber, and spaced bearing mounts; a unitary shaft assembly mounted on said support, said shaft assembly including a shaft and a refining disc thereon in said refining chamber, bearing assemblies connected to said shaft for relative rotary and unison longitudinal motion and slidingly received in respective bearing mounts, each of said bearing assemblies including a bearing enclosure; and electro-motive means for rotating said shaft including an electrically energizable stator mounted on said support in surrounding relation to said shaft, a rotor on said shaft, collector rings on said shaft, and brushes for said collector rings installed on one of said bearing enclosures.

5. A refiner or like device, including a main support, a housing on said support defining a refining chamber, a shaft supported by said main support for relative rotary and axial motions, said shaft extending through said housing into said chamber, a disc on said shaft in said chamber turned by rotation of said shaft and adjusted longitudinally by axial motion thereof, electro-motive means for rotating said shaft, said last named means including collector rings secured to said shaft and brushes contacting said rings, and means connected to said shaft for unison axial and relative rotary motion for mounting said brushes, said shaft and the parts mounted on and supported thereby, including said brushes, forming an assembly movable as a unit in the axial adjustment of said shaft and means for axially adjusting said shaft and resiliently accommodating an axial thrust thereon through the medium of said disc.

6. A refiner or like device, including a main support, a housing on said support, defining a refining chamber, inboard and outboard bearing mounts stationary on said

main support to one side of said housing, a bearing assembly in each said mount held against relative rotary motion and slidably connected therein for relative longitudinal motion, a shaft extending through the assemblies in said bearing mounts and projecting through and beyond the inboard mount to extend through an opening in said housing into said refining chamber, a disc on said shaft in said chamber, said shaft being rotatable in said bearing assemblies and connected thereto for unison longitudinal motion, said shaft, said bearing assemblies and said disc defining a shaft assembly longitudinally movable as a unit for adjustment of said disc in said refining chamber, and electro-motive means for rotating said shaft, said last named means being positioned about said shaft between said bearing mounts and including spaced collector rings on said shaft and brushes on said rings in connection with said shaft.

7. A refiner unit, including a main support, a housing on said support defining a refining chamber, a shaft having one end extending through an opening in said housing into said refining chamber, a refiner disc on said shaft within said chamber, a flexible diaphragm closing the opening in said housing around said shaft, said diaphragm being secured at its outer edge to said housing, spaced

apart bearing mounts on said support to one side of said housing in which said shaft is received, a bearing assembly in each of said mounts connected to said shaft for unison longitudinal motion and relative rotary motion, means in connection with one of said bearing assemblies connecting the inner edge of said diaphragm to said shaft for movement therewith, said bearing assemblies having a sliding mount in respective bearing mounts, electromotive means for rotating said shaft, including an electrically energizable stator mounted on said main support in surrounding relation to said shaft between said bearing mounts, a rotor secured to said shaft, and collector rings secured to said shaft and brushes contacting the rings and carried by one of said bearing assemblies.

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