United States Patent

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[54] **REFINER INSTALLATION**
14 Claims, 12 Drawing Figs.

[52] **U.S. Cl.** **241/251,**
241/38, 241/256, 241/285
[51] **Int. Cl.** **B02c 1/08,**
B02b 1/00
[50] **Field of Search** 241/38, 46,
244, 251, 255, 256, 285, 296, 297, 301, 298, 291

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ABSTRACT: An improved refiner installation characterized by a simplified base structure comprising a unique arrangement of integral lightweight unitized plates resistant to vibration and simply mounting in an optimal relation thereto an improved disc refiner assembly characterized by a refining chamber the surface portions of which are arcuate to form a pressure-resistant housing for the refining discs which like the base is fabricated of thin material. The invention also provides means advantageously and selectively adapting the installation optimally to function for pressurized refining or conventional refining. The refiner housing is further characterized by a segmented form lending economy of fabrication and simplicity of maintenance.

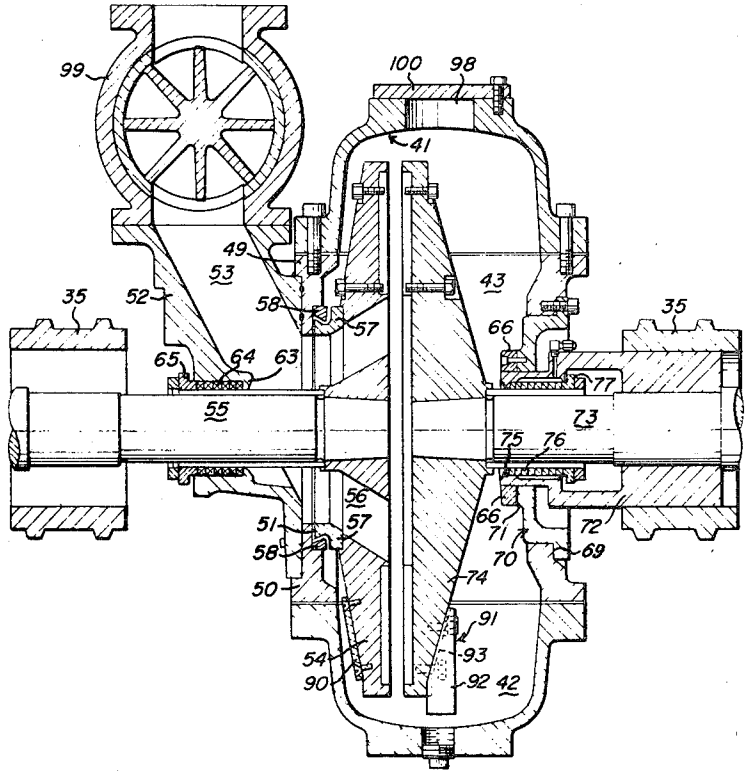


FIG-1

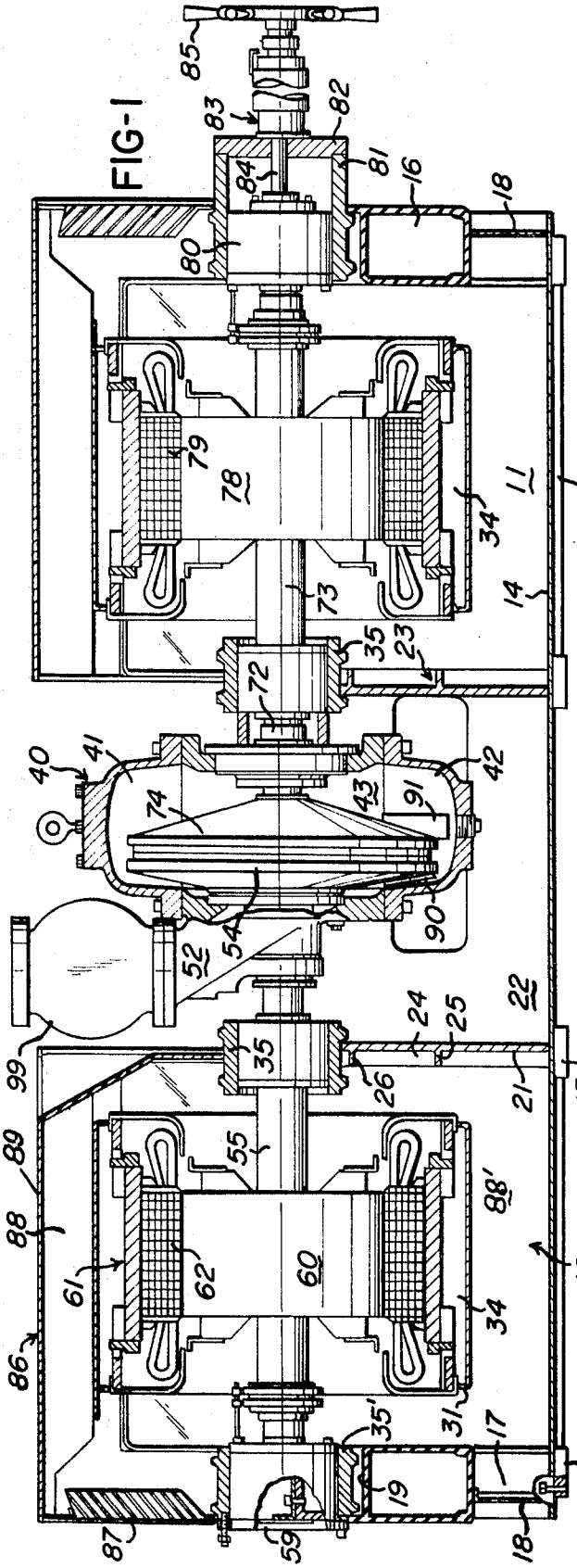
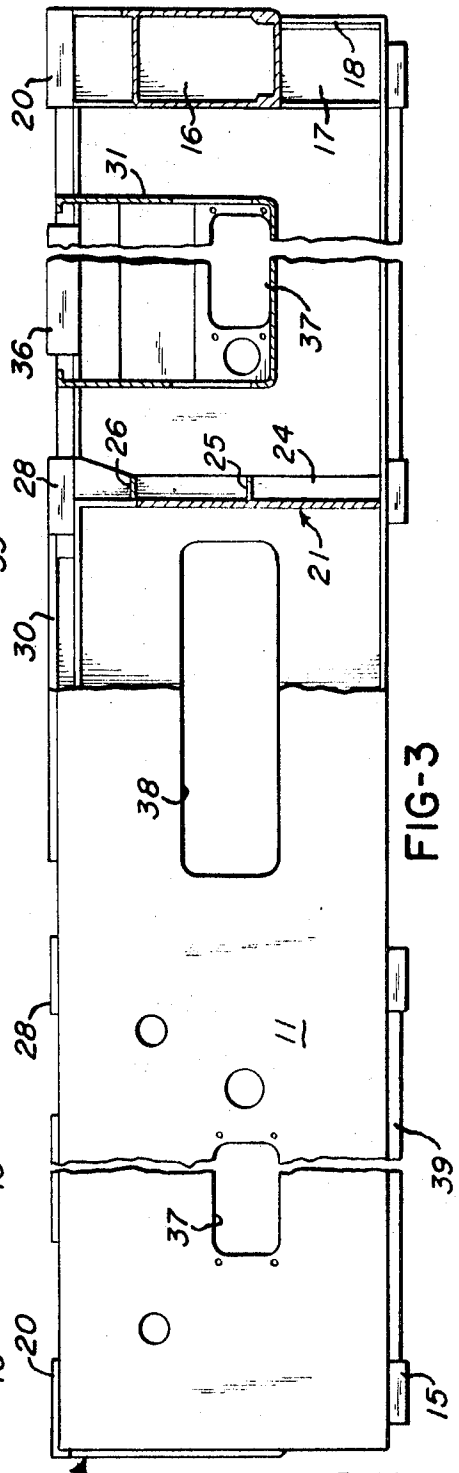


FIG-3



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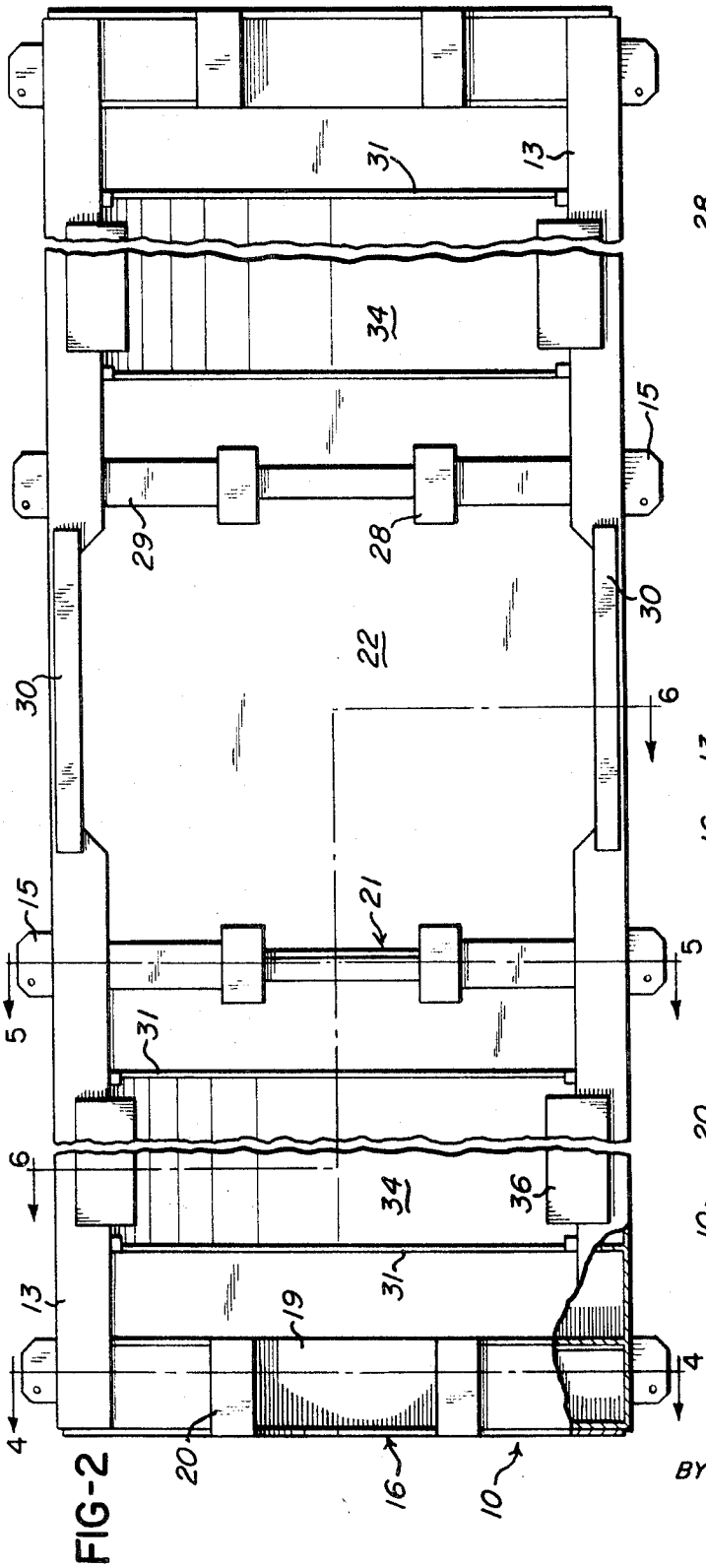


FIG-2

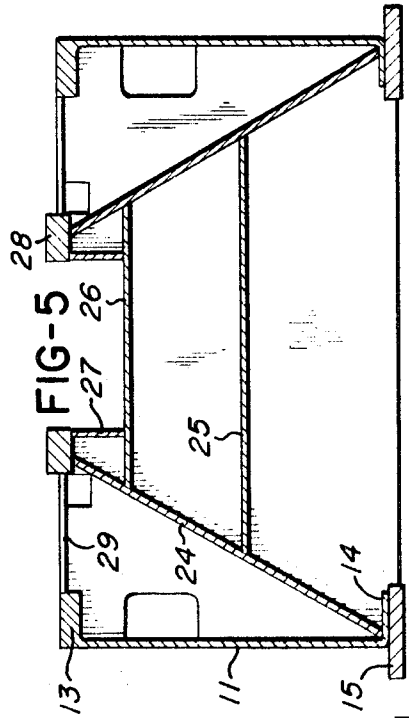


FIG-5

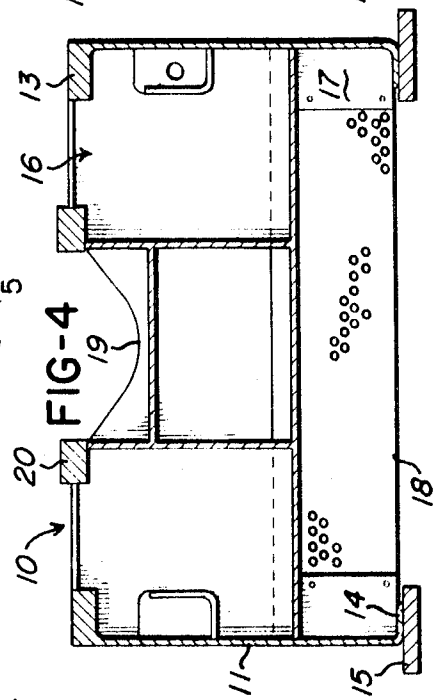


FIG-4

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FIG-6

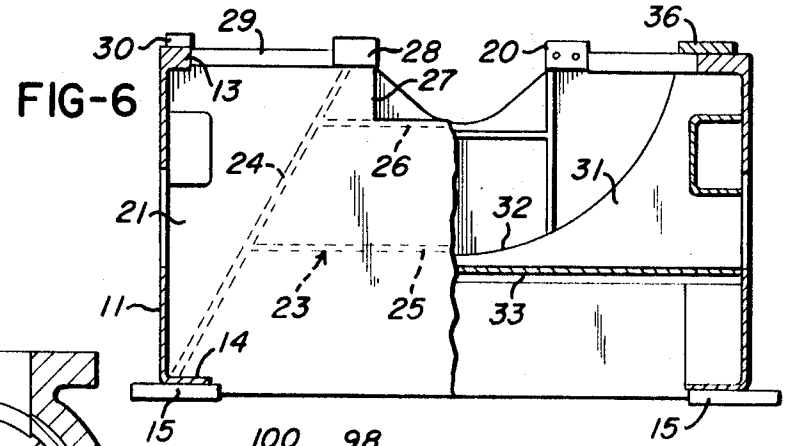
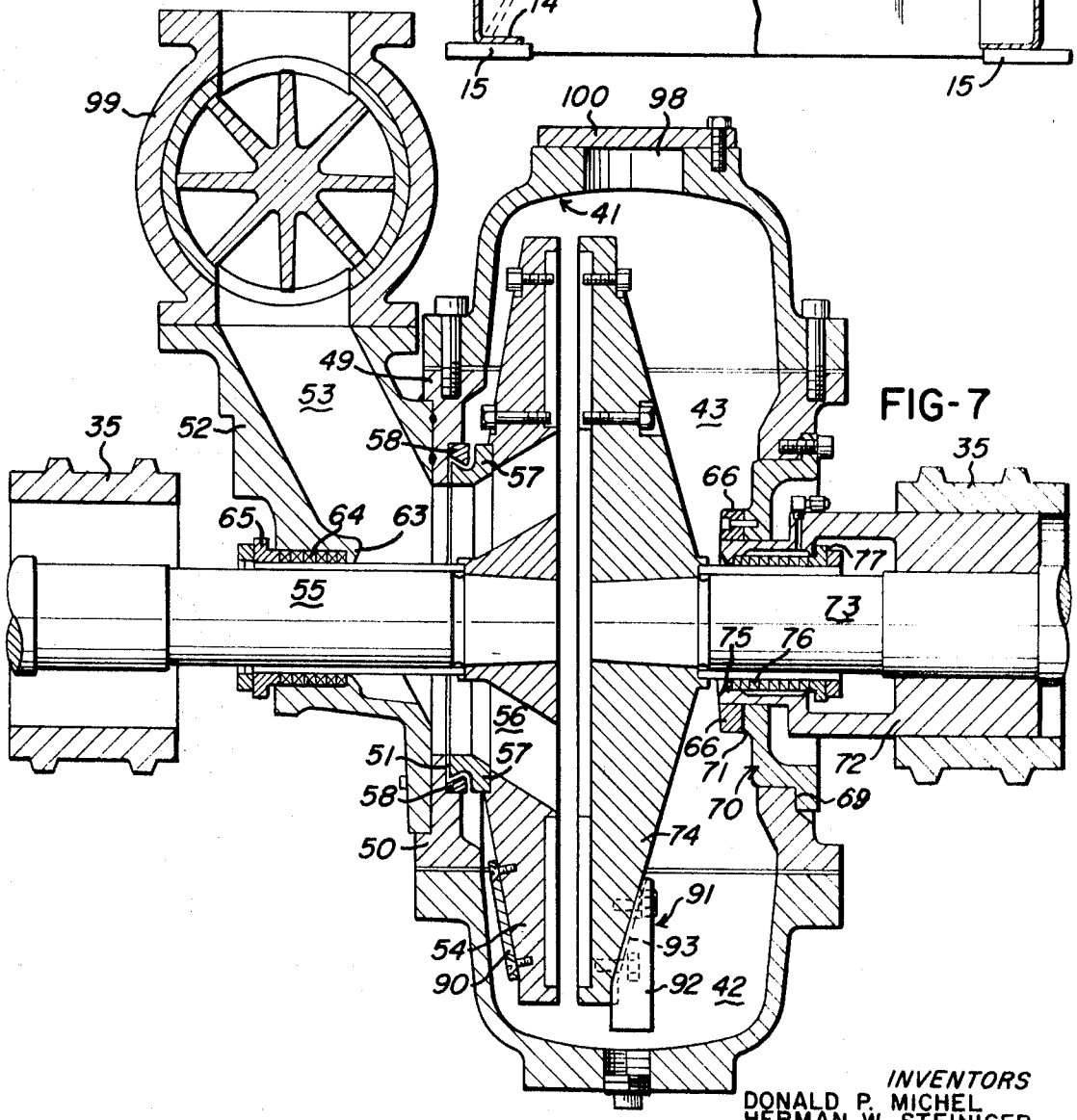


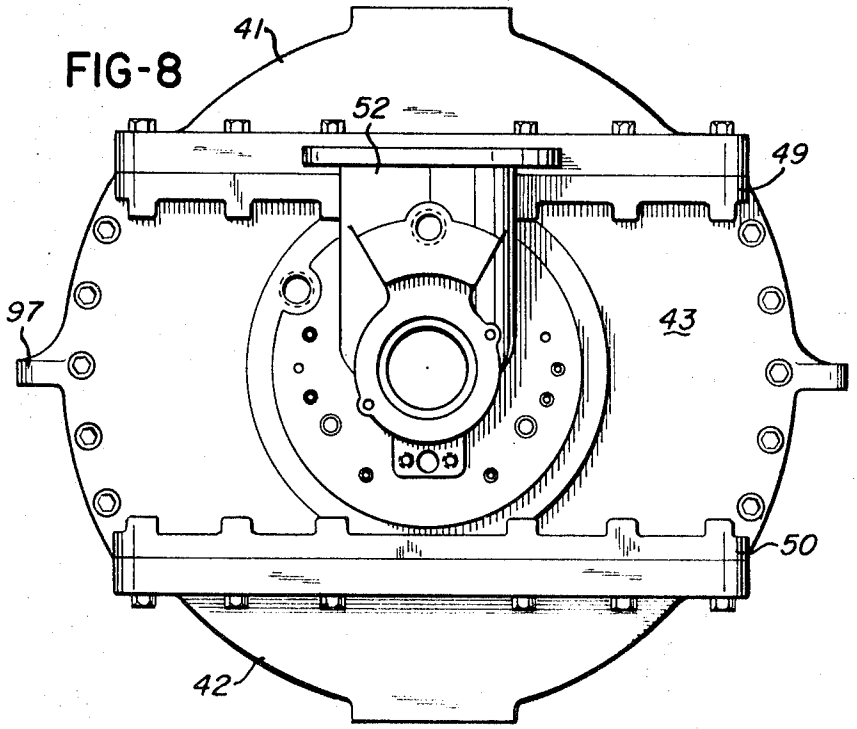
FIG-7



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FIG-8



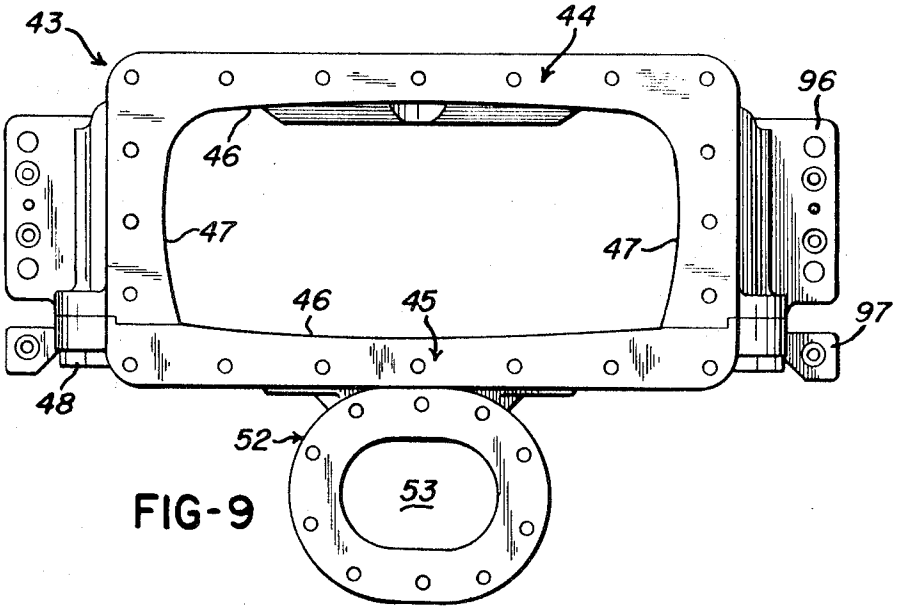


FIG-9

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FIG-10

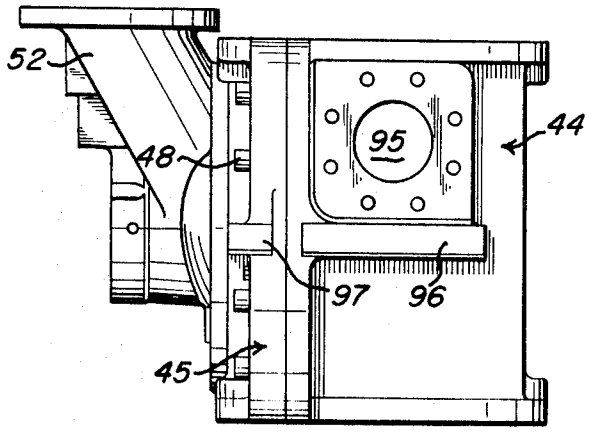


FIG-11

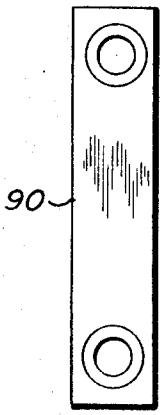
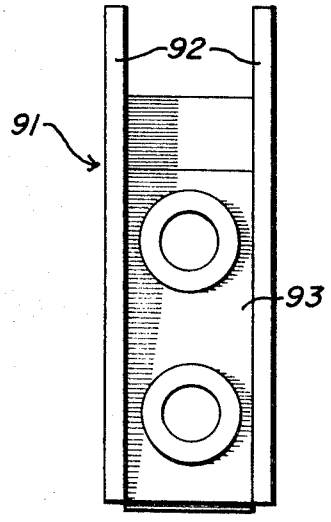


FIG-12



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REFINER INSTALLATION

This invention relates to a new and improved refiner installation having particular though not limited application to fibrous pulps. It features a simplified base and a uniquely designed case structure enabling the contained refiner elements to per se function in a more efficient and satisfactory manner. Embodiment thereof results in pressurized double-disc refiner installations which are novel in form and readily convertible to an unpressurized operation.

It is exceedingly important that double or other disc refiners are so securely balanced as to operate in a relatively vibration-free condition. If this objective can be obtained it insures better end products, less wear of refiner components and the attendant drive structure, and a minimal requirement for maintenance of parts. Efforts to achieve this objective have met with continuing problems. In the pulp-refining industry the problem has been somewhat alleviated by variously contrived base structures. However, most of these structures have been relatively complex, formed of heavy plate materials and are therefore costly to fabricated and install. By contrast the present invention provides for a base structure the substance of which is less bulky and the design of which enables that it may be formed in a more efficient manner and of less material than previously contemplated as necessary. Nevertheless the resulting base unit affords an improved and more secure mount not only of the refiner elements per se but also their drive motors.

In conjunction with this novel base, the invention provides further for a novelly contrived housing forming an economical and effective case for the disc elements of an operating refiner. Such case facilitates a double-disc refiner installation which may be so pressurized as to operate with optimal efficiency. The novel case has a form and composition enabling it to more uniformly withstand operating pressures and without imbalance. Its design lends a strength enabling that it be fabricated of material of minimal thickness. It features a segmented form enabling a ready conversion thereof for selective operation in a pressurized or unpressurized condition.

The sum and substance of the invention structure provides a more economical refiner installation and one which facilitates a more uniform dissipation of stresses and strains which are normally incident to the operation of a disc refiner, particularly in a pressurized condition.

It is therefore a primary object of the invention to provide improvements in disc refiner installations rendering such installations more economical to fabricate, more efficient and satisfactory in use, adaptable to a greater variety of applications and less likely to malfunction.

Another object of the invention is to provide a refiner installation featuring a uniquely designed base which is quite economical to fabricate.

A further object of the invention is to provide in a disc refiner a case structure which is particularly effective in dissipating the stresses and strains which are a normal incident of a pressurized refiner operation.

An additional object of the invention is to provide an improved case structure for a double disc refiner.

Another object of the invention is to provide for a double-disc refiner installation affording the refiner elements an ability to operate in a balanced condition and to function in an equally efficient manner whether pressurized or unpressurized.

A further object of the invention is to provide means enabling improvements in the functional components of double disc refiners which render such refiners particularly effective for use in a pressurized condition.

An additional object of the invention is to provide a refiner installation possessing the advantageous structural features and components, the inherent meritorious characteristics and the means and mode of use 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 Pat. 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 shows a longitudinal section of a disc refiner installation in accordance with the present invention;

FIG. 2 is a top plan view of the refiner base, shown partly in section;

FIG. 3 is a side elevation of the refiner base of FIG. 2, shown partly in section;

FIG. 4 is a view taken on line 4—4 of FIG. 2;

FIG. 5 is a view taken on line 5—5 of FIG. 2;

FIG. 6 is a view taken on line 6—6 of FIG. 2;

FIG. 7 is a fragmentary view, in longitudinal section, illustrating pertinent details of the refiner components embodied in the refiner installation of FIG. 1;

FIG. 8 is a side elevation view of the refiner case;

FIG. 9 is a top view of the waist section of the refiner case;

FIG. 10 shows a further side elevation of the refiner case;

FIG. 11 is a plan view of a novel case wiper which is incorporated in the illustrated refiner structure of FIG. 7; and

FIG. 12 is a plan view of a further case wiper shown in FIG. 7.

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

Referring to the drawings the novel base 10 of the improved refiner installation there illustrated has a rectangular form. The base 10 comprises a pair of longitudinally extended, transversely spaced, coextensive sideplates 11. The latter are distinguished by a uniformly flat configuration save for their upper and lower edges. Each edge has an integrally formed right-angled flange the upper flange being defined by the numeral 13 and the lower by 14. The respective upper and lower flanges are disposed in a transversely spaced coplanar relation. Each sideplate is elevated by a series of identically oriented longitudinally spaced pads 15, fixed in underlying relation to its lower flange 14.

To either end the upper portions of the plates 11 are bridged by an internally reinforced boxlike panel structure 16. Extending from immediately below the respective end panels to their bottoms, the plates 11 have short coplanar gussets 17 which mount a transversely disposed screen 18. At its upper edge, each panel 16 has a central arcuately depressed surface portion 19 located intermediate fixed bearing pads 20. The latter project upwardly to define, at their support surfaces, a plane which is slightly above and parallel to the top of the related end panel.

Intermediately of and equidistantly spaced from the respective end panels 16 the side plates 11 are further bridged by a pair of plate partitions 21. The partitions 21 are longitudinally spaced to define therebetween a refiner well 22. Each partition 21 includes a plate having at one face thereof an integrally connected truncated "A" frame 23. The frame 23 includes relatively inclined side plates 24, the base edges of which respectively seat at the junctions of the respective side plates 11 with their lower flanges 14. Intermediate their respective vertical extremities the plates 24 are bridged by vertically spaced, horizontally disposed, cross plates 25 and 26. A short plate 27 is fixed perpendicular to the upper plate 26, adjacent and spaced from each of its respective ends. Each plate 27 forms with the upper most portion of the adjacent sideplate 24 a truncated right triangle, the upper edges of which mount a bearing pad 28. Each partition 21 is completed by top plate portions 29 which extend between and connect with the respective flanges 13 and the most adjacent bearing pad 28.

Thus, the base structure 10 includes inboard pedestals which are provided by the partitions 21. Such pedestals mount bearing pads 28 to either side of a rectangular depressions the sidewalls of which are defined by the plates 27. It further in-

cludes outboard pedestals open to their bottoms by screen elements for free airflow and mounting to their tops the outboard bearing pads **20**. All pads are arranged in a relatively longitudinally aligned relation and have their upper surfaces in a generally common plane.

It is to be noted that the upper flanges **13** on the side plates **11** are relatively thicker than the lower flanges **14**. This lends a particular support strength to the sideplates in the areas where it is needed most. Further, in the area of the refiner well **22** the flanges **13** have a lesser projection and mount thereon, coextensively therewith, case support pads **30**. The upper surfaces of the pads **30** are also in the plane common to the upper surfaces of the pads **20** and **28**.

Centered intermediately of each partition **21** and the most adjacent end panel **16**, the sideplates **11** are brid ged by a pair of longitudinally spaced plates **31** the upper edges of which have deep arcuate central depressions **32**. The depth of the plates **31** corresponds generally to the depth of the panel **16**. Their lowermost edges are bridged by a bottom panel **33** to form thereby a motor well **34**. The flanges **13** to either side of each motor well **34** fixedly mount motor support pads **36**. The well structure defines a nest for containing the lower half of the stator and the housing of a motor, as will be further described. Again, pads **36** have their upper surfaces in the plane common to the previously mentioned pad elements **20**, **28** and **30**.

Additional details of the refiner base may be observed in FIGS. **3** and **4** of the drawings. Each sideplate **11** has an opening **37** in communication with each motor well **34**. It also includes, on the same level, a longitudinally extended aperture **38** which opens to the refiner well **22**. Further, intermediate the inboard and outboard pedestals to either end of the base, strips **39** are fixed coextensively with the undersurface of the lower flange elements of the plates **11**. These strips serve as air seals to insure the aforementioned controlled circulation of air about the motors. Note also from the drawings that while the outboard bearing pads **20** are coextensive in depth with the panels **16**, the inboard bearing pads **28** relatively project to overlie the respective ends of the refiner well **22**.

The invention thus provides a most simply and economically effected base structure which is elevated by the support pads **15**. The pads **15** are shown in the areas of the inboard and the outboard pedestals and to have plate portions which project outwardly of the base. Through the medium of the latter, the base may be securely fastened to an underlying floor structure in a highly stable and balanced conditions. The significance of this composition and mount of the base will be further described.

The pads **30** serve to balance on the base **10** a uniquely designed refiner case **40**. The case **40** is formed in four segments, a top **41**, a bottom **42** and a waist section **43**, the latter consisting of two parts **44** and **45**. In their assembled relation the parts **44** and **45** define a tubular structure the interior surface of which is arcuately formed in its cross-sectional configuration. Such surface includes oppositely disposed portions **46** which are relatively elongated and have a flatly arcuate contour. The extremities of portions **56** are bridged by two additional oppositely disposed portions **47**. The latter are shorter and formed on a much smaller radius.

The waist section **43** is split on a vertical plane adjacent one surface **46**. Thus, the one part **44** is generally U-shaped and, in cross section, includes opposite surface portions **47** which connect to and merge with the respective ends of a flatly arcuate surface portion **46**. The other part **45** has a platelike form and its inner face forms the other flatly arcuate surface portion **46**.

At their mating edges the parts **44** and **45** are formed to have a male-female fit. They include external flanges which are fixed in a relative sealing abutment by bolt elements **48**, pressure seals being disposed between the facing flanges.

The waist portion **45** has at its respective upper and lower edges a flange **49** and a flange **50**. Bolted to these flanges are respectively abutting flanges of the caplike case segments **41** and **42**. Remote surface portions of waist portion **44** and the segments **41** and **42** are similarly formed with relatively abutting flanges which are interconnected by bolts.

Waist portion **45** has a central opening defining an inlet aperture. The inner peripheral edge of this aperture is stepped to form a shoulder **51** facing inwardly of the case **40**. Fixed to the case **40** through the medium of the part **45** is a vertically inclined feed spout **52** defining a feed passage **53**. The lower end of the spout **52** is welded in abutment to the exterior surface of the plate **45** in a generally surrounding relation to its central aperture. However, the lowermost edge of the opening from the feed spout is slightly elevated as referenced to the lower edge of the central aperture.

In the example illustrated, a pair of mating relatively opposed refiner disc assemblies are disposed interiorly of the case **40**. The one assembly **54** mounts to the innermost end of a drive shaft **55**. In immediately surrounding relation to the drive shaft **55** the disc portion of the assembly is formed with a series of divergent flow passages **56**. The entrance ends to the passages **56** are rimmed by a cylindrically formed, axially projected ring **57**. The ring **57** is part of the disc assembly and provides, at its projected extremity, an outwardly divergent exterior surface which rotates within and is immediately confined by a complementarily formed ring element **58** which seats to the outer peripheral portion of the shoulder **51** in the plate **45**. The flow passages **56** are placed in direct communication with the lower end of the feed passage **53** in the spout **52** by means of the passage defined by the ring **57** and the central aperture in the plate **45**.

The shaft **55** projects coaxial with the case **40** to extend longitudinally of and coextensively with the underlying portion of the base **10**, its central axis lying in a plane generally parallel to and slightly above that of the support pads **20**, **28** **30** and **36**.

The portion of the shaft **55** which overlies the adjacent inboard partition **21** passes through a bearing confined in a one piece bearing housing **35**. The circular periphery of the housing **35** has outwardly projected horizontal flanges which seat on, and are bolted to the bearing support pads **28**. The lower portion of the bearing housing nests in the rectangular depression defined between the plates **27** of the "A" frame.

At its projected extremity the shaft **55** is confined for rotation within a bearing in a housing **35'**. The latter is similar to the bearing housing **35** but diametrically split in a horizontal plane. In this instance the lower half of the housing **35'** is accommodated in the upper surface of the underlying end panel **16** by its arcuately recessed surface portion **19**. The horizontal oppositely projected flanges on the mating ends of the bearing housing respectively seat on and are bolted to the support pads **20**. A plate **59** is bolted across the outermost end face of the bearing housing **35'** to confine and create a limiting bearing abutment for the shaft **55**.

Between the partition **21** and end panel **16**, the shaft **55** fixedly mounts the rotor **60** of a motor **61** the lower half of which depends in the intermediate well section **34**. The well structure nests the motor housing including the stator **62** in a surrounding relation to the rotor **60**. The peripheral limits of the latter are rimmed by the contour of the well sideplates **31**.

In the projection of the shaft **55** outwardly from the case **40** it extends through a passage formed in the outermost wall portion of the chute **52** and in so doing passes through a lower portion of the feed passage **53**. The shaft passage provided in the feed spout is of a diameter uniformly larger than that of the shaft except at its end adjacent the inner surface of the feed passage which includes an internal flange **63**. The flange **63** serves as an abutment for one end of a tubular packing gland **64**, confined thereto by a tubular nut **65** engaged to the spout in the outermost end of the shaft passage. The gland **64** provides a seal and serves both as a bearing and a lubricating medium for the shaft **55**.

Schematically illustrated at the entrance to the spout **52** is a rotary inlet valve **99** of a conventional type which maintains a pressure seal while delivering to the spout successive charges of the material to be processed between the refiner discs.

Referring again to the case 40 the portion of the waist segment 44 remote from the segment 45 also has a central aperture. The waist segment 44 is dished inwardly about this central aperture to form a recessed shoulder 69 at its outer face. Fixed in abutment with the shoulder 69 is an external flange on the lip of a cup-shaped member 70 which nests interiorly of the segment 44, appropriate seals being provided therebetween. The base of the member 70 positions interiorly of the case 40 and has a central aperture defined by a ringlike extension 71. Fixed in abutment with the extension 71 is a bearing ring 66 which together therewith forms a bearing and a seal about the cylindrically formed reduced end of a tubular cartridge 72.

The cartridge 72 provides a through passage for a drive shaft 73 the inner end of which fixedly mounts the second disc assembly 74. The shaft 73 projects oppositely from and coaxially with the drive shaft 55 to extend through but in a concentric spaced relation to the inner wall of the cartridge at its reduced end. The innermost end of the cartridge has an internal flange 75 serving as an abutment for one end of a tubular packing gland 76 providing a bearing and a seal about the shaft 73 adjacent the disc assembly 74. The inner wall of the cartridge provides an expanded chamber formed immediately outward of the gland 76 to accommodate a nut 77 engaged thereto in a manner to load the gland 76 about the drive shaft.

As the shaft 73 projects outwardly of the case 40, beyond the cartridge 72 it extends through and bears in a bearing supported over the adjacent inboard partition 21. This bearing is contained in a housing 35 such as previously described in reference to the shaft 55. However, while in this instance the bearing is nonrotatably contained, it is nevertheless axially adjustable within its housing.

In this instance also the flanges of the housing 35 seat on and are bolted to the pads 28 on the underlying partition 21.

Beyond the inboard partition the shaft 73 fixedly mounts the rotor 78 of a second drive motor for powering the disc assembly 74. The rotor 78 is located over a refiner well 34 which in this instance nests, as previously described, the lower half of a motor stator 79 and its housing. Beyond the well 34 the shaft 73 terminates in a bearing unit 80 slidably but nonrotatively contained in a bearing housing 81. The latter seats over the end panel 16 in a manner as previously described with reference to the bearing housing 35', supported by its diametrically projected flanges which seat on and are bolted to pads 20 on either side. In this instance, however the housing 81 is elongated to project beyond and outwardly of the end panel 16. The housing 81 is capped at its projected extremity by a plate 82. The shaft 73 has related thereto an adjusting unit 83 which is bolted to the outer surface of the plate 82. The assembly providing the unit 83 will be described only to the extent necessary for an understanding of the present disclosure since the details thereof form no particular part of the present invention. It does however provide a shaft 84 which projects inwardly of the housing 81 through an aperture in the plate 82 where it is suitably fixed to the outermost end of the bearing unit 80. The latter is fixed against axial movement in respect to the contained end of the drive shaft 73.

As will be obvious from FIG. 1 of the drawings, on rotation of suitable mechanism provided in the assembly 83 through the medium of a control wheel 85 one may axially shift the shaft 84 and thereby move the drive shaft 73 in a sense axially of the base 10. It is by this means that one may easily adjust the position of the disc assembly 74 in reference to the relatively opposed disc assembly 54.

It is noted that the cartridge 72 has a relatively fixed relation to the shaft 73. It therefore moves therewith and in the course of its axial adjustment it maintains a proper seal of the case 40.

Referring again to FIG. 1 of the drawings, it will be noted that the top of the base 10 to either end of the refiner well 22 is capped by a shell-like cover 86, the sidewalls of which seat to flanges 13 and the end walls of which seat respectively on the tops of an end panel 16 and the adjacent partition 21. One thereby achieves an enclosure of the respective motors which power the drive shafts 55 and 73.

The remote end walls and tops of the caps 86 are louvered respectively at 87 and 89 to provide for a free circulation of air which in the main passes about and through the upper portions of the motors. Suitable duct work provides a well defined air channel 88 about the upper periphery of the contained motor in each instance while a channel 88' is defined about the lower portion of the motor in the refiner well 34. Note FIG. 1 in this respect.

Thus, the refiner base provides for a relatively free movement of cool air both through the medium of and by way of the perforations in panels 18 and the louvers 87 to move to, through and about the motor components to finally exit through the louvers 89 in the tops of the caps 86. This free but controlled flow of air, as thus provided enables a thorough and completely satisfactory air cooling of a contained motor, simple but most effective.

Other important features of the invention are evidenced in connection with the refiner disc assemblies. Note that a flat plate 90 is fixed on each of diametrically opposite portions of the rearmost face of the disc assembly 54. The latter, as has been previously observed, provides for inflow of the materials to be worked between the discs. The plates 90 serve in this case as case wipers. Additionally, however, in the rotation and drive of the disc assembly 54, the plates 90, though flat, actually function to produce a fanlike action, creating a turbulence adjacent the surface 46 on the waist portion 45. This increases the pressure in the case 40 adjacent the intake side of the disc assembly 54 to the extent it prevents flow thereto and buildup thereon of the materials delivered to and worked between the disc assemblies.

A different type of wiper 91 is on the back of the disc assembly 74, also at diametrically spaced locations. The wiper 91 includes a pair of transversely spaced, edge-mounted flat plates 92 which project from and in a sense perpendicular to the back of the refiner disc, at its outer periphery. In the rotation of the discs, the plates 92 move within the cap portions 41 and 42. Their bases are interconnected by a flat plate 93. The latter conforms to the disc contour and is secured thereto by bolt elements 94. The plate 93 is so oriented to cause the plates 92 to project in a sense radially outward of the disc assembly.

It has been found, in the operation of a disc refiner as described, particularly in a pressurized operation thereof, that the pair of plates 92 may be quite thin and very light in weight. Nevertheless, they do function more effectively than previous case wipers to the end of preventing undue buildup of materials in the case and a premature deterioration of the attaching bolts due to erosion. The attaching bolts 94 are nested in a protected relation between the relatively projected wiper plates 92. For this reason the case wipers remain securely attached to the disc assembly, even throughout prolonged periods of use. This last is an important contribution to the art.

The wiper plates 92 function optimally in the position shown in FIG. 7, in or adjacent the vertical center of the case 40. It has been found they are most efficient in that they also keep stock in suspension while maintaining its orbital path prior to discharge.

Referring once more to the case 40, noting FIG. 10 of the drawings, it will be seen that outlet apertures 95 are defined in the respectively opposite surfaces 47 of the waist section 44, in their upper halves. They may be selectively employed as discharge openings or capped, depending on the application, Immediately below each aperture 95 and centered between its vertical extremities the waist section 44 has an integrally formed outwardly projected flange 96. To either side thereof, waist section 45 has an additional flange section 97 in the same plane as the adjacent flange 96. The flanges 96 and 97 rest on the pads 30 to either side of the refiner well and are bolted thereto. They thereby support the case 40 in an elevated relation to the bottom of the sideplates 11. Note further in FIG. 7 that the cap 41 of the case 40 also has a discharge aperture 98 which may be selectively sealed by a plate 100. In the example shown the aperture in bottom cap 42 provides a drain.

The availability of a plurality of selectively employed discharge apertures **95** and **98**, as illustrated, enables that the invention case unit may be readily adapted to serve the required needs of any installation and in a particularly advantageous fashion where the disc assemblies are required to function in a pressurized atmosphere. In any case if the operation is to be unpressurized, one need only remove the bottom **42** in an obvious manner to provide for a gravity discharge. Thus, the case **40** is so fabricated to make it extremely versatile in application, enabling thereby a significant economy in its use. Of course, if the refiner installation is to be employed in a pressurized form, a rotary outlet valve similar to the inlet valve **99** previously described will be connected to the refiner case at the selected discharge outlet. In this way one may maintain a seal of the refiner case at all times.

In summary, the above-described structure produces a refiner installation having many unique features which in their composite relation produce distinct advantages in the art. Considering the case **40**, one of the primary advantages of its segmented form as here described is that it provides an ability to change plates on disc assemblies or to service such plates with the utmost simplicity and without disturbing stuffing boxes or inlet and outlet connections. To service a unit one need only remove the top cap **41**. This is simply achieved by removal of its attaching bolts, a procedure requiring a minimum of effort and time. The lower cap **42** is of similar form and therefore interchangeable with the upper cap and can be similarly removed to facilitate use of the refiner for a free discharge operation. Thus, as described, the refiner unit may therefore serve dually for both pressurized and conventional operations.

It is of particular significance that the interior surface of the case **40** approaches a spherical contour. This is of extreme advantage for pressurized operating conditions. This form and contour of the interior surface enables it to withstand operating pressures more uniformly and without imbalance. Moreover, the contour provides the case unit with such a strength it may be fabricated with a thin wall.

Further, the case segments are connected so simply and there is a rigidity in their connection and their design such that stresses and strains are more uniformly dissipated thereby. This minimizes wear factors both on the case and the contained operating components. It enables, for example that bearing and shaft alignments are more readily maintained, as a result of which the eventual product which the refiner discharges is of a more uniformly controlled nature.

In considering the disc assemblies and the relation of their drive shafts to the case **40**, it should be noted that the simplicity of the cartridge seal **72** which moves with the shaft **73** in the adjustment of the disc assembly **74** provides a most simple structure whereby a seal of the case is insured at all times. Even during adjustment of the relative spacing of the disc assemblies during their operation there is no loss of pressure.

Interiorly of the case **40** we find the discs mounting unique case wipers which by their form and construction may be very light in weight. They therefore pose little threat to a balanced operation of the disc assemblies. Moreover they function in a highly effective manner.

Not the least of the installation is the improved base construction which provides a balanced support of the unique refiner case and the related operating components. The construction of the base is such to enable an effective and continuous cooling of the motor drive units by the free circulation of the available air. This obviates the need for water cooling and the attendant structural materials usually necessary to this end.

The base structure has in fact a design of extreme simplicity. The form of the sideplates, though basic, provides adequate strength for a full and balanced support of the refining unit. The thickened flanges at the upper edges of the plates are in the plane of greatest stress and therefore have optimal strength characteristics.

The fact that the flat sideplates are elevated by the foot pads below their lower flanges necessitates that the foot pads need be bolted to a floor foundation only in the areas of the inboard and outboard bearing units, that is in the area of the end panels **16** and partitions **21**. This last is important. In the operation of the refiner system the disc refiner will be at a considerably elevated temperature. This will apply resultant stresses in the base which are simply dissipated through the coextensive flanges and the flat platelike forms constituting the sideplates **11**. The form of the plates is such that the stress and strength patterns set up in the operation of a refiner system are relatively easily accommodated through the balanced pads which are located at the significant load stations. This is all achieved without the need for extensive and heavy base elements. The fact that by the present base construction there is an elimination of a need for any added cooling fluid in the base taken together with the simplicity and basic platelike structure of the base enables a ready and more uniform distribution of the heat transmitted from the mounted generating elements. The composite result of the enumerated factors is the provision of a simpler and more economical base structure, one which is unlikely to have produced therein a significant imbalance due to differentials of temperature and pressure in its various parts.

It is to be noted that there is together with the simplicity of the base construction the provision of a uniform plane for the superposed support pads. One achieves thereby an insurance that both a static and dynamic balance of the supported structure will occur. In this context, making the top rails of the base continuous members as defined by the upper flanges **13**, enables them to adequately resist the refining pressure exerted by the shafts against the support pedestals. Since the support plane is the same throughout, there is a simple stress path. The weight reactions of the rotating shaft assemblies and the motors are resultingly carried directly to the mounting feet by the four cross members welded to the base. The base mounting feet provide clearance to allow the sidemembers to elongate therebetween, to compensate in instance of thermal expansion. The base is nevertheless securely held to its foundation to keep the bearing housings in a straight line.

The discs in the case **40** have a rigid mount to the side rails. Thermal expansion sidewise and vertically is so controlled by the base formation as to hold stuffing box housings on the shaft axis.

The expressed and other advantages of the inventive features should be obvious from the preceding. It should be kept in mind that only so much of the installation has been detailed as appears necessary for an understanding of the essential features of the invention. Several elements have been schematically illustrated for this reason also.

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 double-disc refiner unit comprising a pair of relatively opposed cooperating refiner discs each of which rotates relative the other, a housing forming a chamber for said discs the interior wall surface of which is arcuately formed in both vertical and horizontal senses, said housing including a waist portion and detachable top and bottom portions, the interior surface of said waist portion of said housing including opposite portions of flatly arcuate contour connected by surface portions which are each arcuately contoured on a smaller radius,

said top and bottom portions having an interior surface configuration complementary to that of said waist portion and said waist portion having oppositely projecting means for attachment thereof to said top and bottom portions.

2. A disc refiner unit as in claim 1 characterized by said waist portion being split in a vertical plane to provide therein a vertically coextensive plate section which is separable from the balance thereof, said balance having a U-shaped configuration.

3. A disc refiner unit as in claim 2 characterized by said housing being formed of four segments, said waist portion being capped to either end by said top and bottom portions which have a dome shape and form with said waist portion a thin-walled casing for said discs accommodating the operation thereof under highly pressurized conditions.

4. A disc refining unit as in claim 2 characterized by said separable plate section having therein an inlet aperture and means integrated therewith defining an inlet spout the delivery end of which opens to said inlet aperture.

5. A disc refiner unit including opposed cooperating refiner discs at least one of which rotates relative the other characterized by a housing forming a chamber for said discs the interior wall surface of which is arcuately formed in both vertical and horizontal senses, said housing comprising a case which is split in spaced planes transverse to said discs to either end of a central waist section of said housing to provide thereon separable domelike cap sections which are interchangeable, said waist section having a longitudinal dimension which is less than the comparable dimension of said discs.

6. A disc refiner unit as in claim 5 characterized by said waist section being split in a vertical plane immediately adjacent a side portion thereof.

7. A double-disc refiner unit including a housing, a pair of opposed refiner discs within said housing, means mounting said discs for individual rotation, each relative the other, said housing having a hollow shell-like form and comprising a thin walled case having interior surface portions thereof arcuately formed in both a horizontal and a vertical sense to provide a surface in enclosing and relatively adjacent spaced relation to said relatively rotatable discs and said case being split in spaced planes transverse to said discs to either end of a central waist section of said housing to provide thereon separable domelike cap sections, said waist section including means defining an inlet to said housing, means defining an outlet from said housing, means for sealing said inlet and outlet to define thereby a pressurized double disc refiner and said waist section having a longitudinal dimension which is less that the dimension of said discs in the same sense.

8. A disc refiner unit as in claim 7 characterized by said discs respectively mounting to adjacent end portions of a pair of oppositely directed powered shaft means, said shaft means projecting from said discs through openings in generally opposite wall portions of said housing, there being seal means about projected portions of said shafts to maintain a seal thereabout in respect to said housing, at least one of said seal means having a housing thereabout in the form of a cartridge and there being means providing for a bearing relation of said cartridge in respect to said housing, said cartridge being fixed for movement with the related shaft to facilitate the axial adjustment of the shaft to vary the operative spacing between said discs, while maintaining a seal of said housing.

9. A disc refiner unit as set forth in claim 7 characterized by shaft means, said discs respectively mounting on adjacent ends of said shaft means within said housing, said shaft means being relatively oppositely projected to project through seal means in connection with and defining openings from said housing, said housing having spout means defining said inlet which is positioned to the rear of one of said discs, there being means for passage of material fed through said inlet spout through said of one of said discs for discharge between said discs and from said housing, said one of said discs having on the back thereof most adjacent said inlet spout wiper means consisting of abutted flat plate means operating on rotation of the disc to create a fanlike pressured flow thereabout in a manner to inhibit the movement of materials fed to and refined between said disc assemblies to the back of said one disc.

10. A double-disc refiner as set forth in claim 7 characterized by said waist portion being split in at least one substantially vertical plane to provide at one side thereof a separable platelike segment which includes said inlet and said waist portion having means integral therewith commonly to project from a horizontal medial plane thereof flange means to serve for the support of said housing, said waist portion including therein means adapted to provide an outlet from said housing.

11. Apparatus as set forth in claim 9 characterized by the other said disc mounting to the rear thereof blade segments which are perpendicularly projected both rearwardly and peripherally of said other disc whereby on rotation thereof to move through the interior of said housing adjacent its vertical center to thereby preclude accumulations of material on the interior surface of said housing.

12. A disc refiner unit including opposed cooperating refiner discs each of which rotates relative the other characterized by a housing forming a chamber for said discs interior wall surface portions of which are spaced from said discs and arcuately formed in both vertical and horizontal senses, said refiner discs being respectively fixed to oppositely projected drive shafts, seal means provided about said drive shafts as they project from said housing said housing being formed of simple segments by splits in planes thereof which are vertically spaced and directed in a sense transverse to the body of said discs to produce domelike cap sections and a central waist section of said housing about said discs, said waist section including means defining an inlet to said housing, and an outlet from said housing displaced from said inlet and said waist section having integrated flange means projecting therefrom in a horizontal medial plane intermediate its vertical extremities.

13. A double disc refining installation as set forth in claim 12 characterized by supports for said flange means comprising vertically disposed flat plates the upper and lower extremities of which are respectively angled to provide upper and lower base supports for said housing, further plate means interconnecting said plates at longitudinally spaced intervals to form a rectangular base structure elevating said housing from an underlying floor structure, and said lower supports, constituting portions of said plates, having thereunder pads which are positioned in the areas of said interconnecting plate means, said plate means interconnecting said plates including end panels having a lesser vertical depth than said plates and the lower extremity thereof in spaced elevated relation to said lower supports and mounting thereon pad means, said oppositely projected drive shafts mounting thereon the respective discs and projecting from said housing to the respective end panels, at least two of said plate means providing inboard partitions intermediate said end panels forming a well for said housing and mounting thereon bearing means for said drive shafts, said end panels, through the medium of the pads thereon, mounting further bearing means for said drive shafts, and motor means about said drive shafts between the respective inboard partitions and end panels, said end panels providing thereunder paths for flow of air directed inwardly from the respective ends of said base structure to move under and about said motor means.

14. Apparatus as set forth in claim 1 characterized by said housing having means defining an inlet thereto and an outlet therefrom and in connection therewith means providing a seal of said inlet and said outlet during movement therethrough of a pressured flow of slurry, said discs having in connection therewith drive shafts which project through generally opposite portions of said housing, there being sealing means about said drive shafts as they project from said housing, means in connection with said drive shafts to produce a relative rotation of said disc means for refining the substance of the slurry as it moves through said housing, said housing having base support means in a form of a rectangular frame including sidewalls formed of flat plates the upper and lower ex-

tremities of which are bent inwardly generally coextensive therewith, there being means balancing said housing on the upper bent portions of said plates, further means defining end walls interconnecting said sideplates and providing for a free passage therethrough of air, integrated plate means bridging said sideplates intermediate their ends to form a well for said housing and mount on the upper edge thereof bearings for said drive shafts, said drive shafts further mounting electrical rotors and there being means inwardly of said base adjacent said end panels nesting a stator about each of said rotors to form therewith a motor for drive of the related shaft.

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,589,629 Dated June 29, 1971

Inventor(s) Donald P. Michel; Herman W. Steiniger; Franklin F. Landis; Lawrence E. Skeen

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Col. 1, line 21, "fabricated" is amended to read -- fabricate --.

Col. 2, line 74, "depressions" is amended to read -- depression --.

Col. 3, line 47, "conditions" is amended to read -- condition --.

Col. 3, line 59, "56" is amended to read -- 46 --.

Signed and sealed this 15th day of February 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

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