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REFINER PLATE

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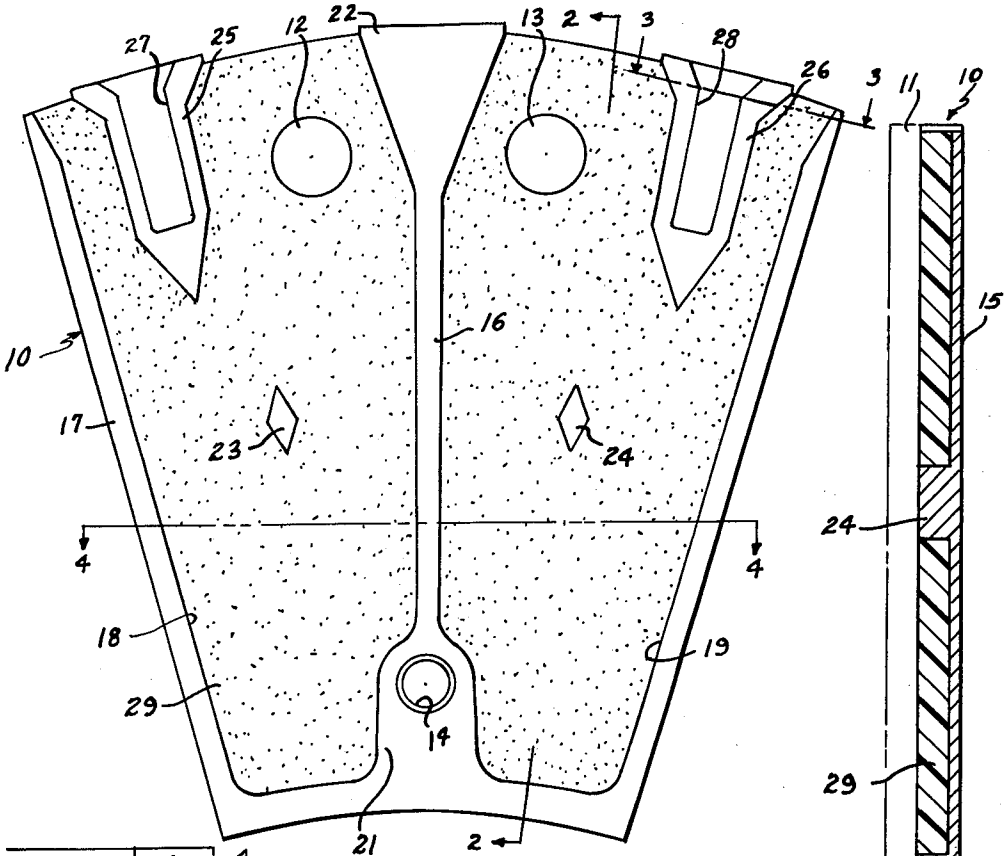


Fig-1

Fig-2

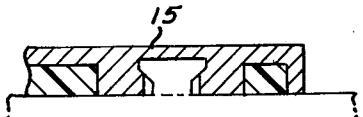


Fig-3

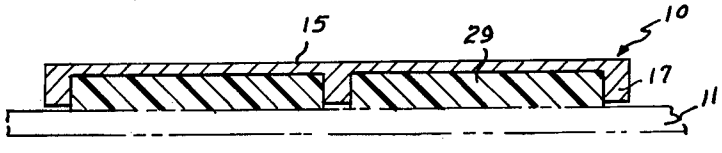


Fig-4

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REFINER PLATE

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This invention relates to rotary disc refiners and the like, and particularly to work plates as installed on a disc to provide thereon a selectively variable and renewable working surface.

Work plates as described are customarily bolted or otherwise removably secured to their mounting disc. A problem heretofore attendant upon their use has been the difficulty of avoiding entrance between the plate and its underlying disc surface of small amounts of the material being refined. A gradual build up of such material may occur at localized points between the plate and disc and a plate so affected may become deformed in its work surface with a consequent unevenness of wear and inequality of work. Also, such a lodging of material under the plates may upset the balance of a disc and so create vibration.

In an effort to obviate this condition the plates may be made solid and adapted for flush overall mating engagement with the disc surface. This is considered an undesirable recourse, however, since it adds to the weight and cost of the plates because extensive precision grinding would be necessary to produce a surface on the reverse side of the plate adapted for exact mating contact with the surface of the disc. A plate recessed on its reverse side to provide spaced apart lands for seating engagement with the disc is desirable for reasons of more facile and economic production. Such a plate, however, may emphasize the difficulties involved in excluding materials from the back side of the plate, with the recessed portions providing an area for accumulation and the lands defining dams intercepting and holding the flowing material.

The object of the invention is to simplify the construction as well as the means and mode of operation of refiner plates whereby such plates 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.

A further object of this invention is to utilize the advantages of a work plate with a recessed back without introducing or magnifying the problem of material exclusion.

Another object of the invention is to introduce a generally new work plate construction in which the plate is sealed on its reverse side from access by liquids and refined materials.

A further object of the invention is to make use of a sealing material so characterized as to kind and so structurally positioned as to obtain maximum sealing effect along with an absence of liquid absorption and pulp contamination and which is itself unaffected by chemicals in the flowing pulp material.

A further object of the invention is to provide a refiner plate 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 view in elevation of the reverse side of a work plate constructed in accordance with the illustrated embodiment of the invention;

FIG. 2 is a view in longitudinal section, taken substantially along the line 2—2 of FIG. 1;

FIG. 3 is a fragmentary view in cross-section taken substantially along the line 3—3 of FIG. 1; and

FIG. 4 is a view in cross-section taken substantially along the line 4—4 of FIG. 1.

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

Referring to the drawing, work plates of the kind with which this invention chiefly is concerned are one-piece articles made usually as hard iron castings and conventionally fan-like in shape so that a plurality of plates placed in side by side touching relation comprise an annular working surface. The plates are used on rotary disc refiners wherein a pair of relatively rotatable discs are in aligned face to face relation. Material for milling or refining, for example pretreated fibrous plant stock, is fed into the space between the opposing discs at the center thereof. In response to relative rotation of the discs the material moves radially outward and is discharged under centrifugal force from the disc periphery. In moving outward between the discs the material is refined or fiberized by an attrition-like process and the faces of the discs are suitably formed to produce the desired effect. While the disc faces may directly be shaped with toothed and impact surfaces to produce the desired results, it is more common practice to superimpose on the disc faces work plates as hereinbefore mentioned. Numerous advantages follow from the use of such plates, such as the obtaining at relatively slight expense of a hardened work surface, and relatively inexpensive replacement of worn surfaces as well as the ability to adapt an existing disc assembly to different degrees and kinds of refining work.

The work plate of the illustrated embodiment of the invention is a one-piece hard iron casting, as noted, and in addition to being fan-shaped has a flat planar configuration. Indicated generally at **10**, the work plate is adapted for a flush mounting upon a disc **11** and is formed with a plurality of recesses **12** and **13** and a mounting bolt hole **14**. The recesses **12**—**13** provide pockets to receive lead or similar material for balancing purposes.

When installed on the disc the work plate presents an outwardly facing side **15** suitably formed to carry out a desired character of work upon material fed between adjacent discs. As will be understood, the work plate is mounted on the disc with the narrow end thereof nearer to the center of the disc while the broad end of the plate coincides approximately with the disc periphery. Accordingly the flow of the material over the work plate is from the small end thereof longitudinally toward and beyond the broad end.

The instant invention is concerned principally with the reverse or underside of the work plate or that side directly contacting the disc. As seen, such reverse side is formed with a centrally disposed longitudinally extending boss in the form of a rib **16** and with a like marginal boss or flange **17**. The rib **16** and flange **17** have a common height and define respectively central and marginal surfaces which are drawn down to seat upon the disc **11** in response to tightening of installation bolt means. These spaced apart relatively projecting surfaces define, moreover, recessed marginally enclosed areas **18** and **19**. With respect to such recessed areas the flange and central rib may be considered lands making spaced apart contact with the underlying disc surface.

The rib **16** terminates at what may be considered its

inner end in an embossment 21 which merges with the flange 17 at the inner or smaller end of the plate. At its opposite end the rib 16 terminates in a support portion 22. The embossment 21 and support portion 22 are co-planar with the rib 16 to provide continuations of the seat accomplished thereby on the disc. Within the recessed areas 18 and 19 are projecting studs 23 and 24 also co-planar with the rib 16 and flange 17 and providing intermediate support locations for the plate.

Still further providing intermediate support locations are other lands or embossments 25 and 26 on opposite sides of the support portions 22 at the broad end of the plate. These configurations have respective longitudinally extending undercut slots 27 and 28 open at their outer ends which cooperate with studs on the disc for quick and accurate locating of the work plate. Such studs together with the bolt passing through hole 14 comprise the installation or mounting means holding the plate 10 to the disc 11. The marginal flange 17 is continuous over three edges of the plate but at the outer or broad end thereof the flange is interrupted or in effect omitted. The support portion 22 is made broad relative to the rib 16 for increased lateral contact with the disc while the embossments 25 and 26 are formed with laterally projecting portions similarly accomplishing a more extensive contact with the disc. The intervening spaces between these portions of the plate and the side margins of the flange 17 are left open. Suitably inclined or tapering formations connect the rib 16 to the outer extremity of portion 22 while laterally projecting portions of the embossments 25 and 26 are similarly connected by tapering configurations to the bodies proper of such embossments.

The material undergoing milling in the refiner is subject to powerful forces as a result of which it attempts access to the reverse side of the work plate, passing under the flange 17 into recessed areas of the plate. Flanges, land and other projections on the reverse side of the plate tend to interrupt such movement of the trapped material and define locations where a build up of such material may occur as heretofore mentioned. In accordance with the instant inventive concept, however, the recessed area of the reverse side of the plate is filled with a material effectively precluding entrance therein of refined material. The filler material, indicated at 29, is confined by the flanges 17 and by the tapering configurations on the support portion 22 and embossments 25 and 26 and fills the recessed area of the back side of the plate in such manner as to make a flush contact with the engaged surface of the disc 11, in the manner indicated in FIG. 2, along with the various projecting lands which seat upon the disc. A material 29 is selected which is light in weight, in order not to add appreciably to the weight of the plate, which has a uniform density to obviate problems of balance, which readily adapts itself to mating contact with the various lands and which has semi-rigid characteristics. Additionally, the selected material preferably has little or no capability of liquid absorption and is chemically inert. It neither contaminates the pulp material, nor is itself affected by encountered chemicals. A plastic foam material of the polyurethane or like class has been found suitable for the described purpose. The plastic foam is, in a liquid-like form, poured into the recesses 18 and 19 and flows therein to all parts of such recessed area and into intimate approximately sealing contact with the lands 23, 24, 25 and 26 and with the rib and flange surfaces. Allowed to set within the plate, which acts as a mold, the plastic foam material then assumes the desired condition and characteristics as described above.

In accordance with a further feature of the invention the introduced foam material may be cast or formed to a height normally exceeding the common plane of the projecting extremities of the flange 17, rib 16 and lands 23—26. Thus, as shown in FIG. 4, upon application of the work plate to the disc 11 the foam material 29 contacts the discs before the flange 17. Then, as the plate is

forced into seating engagement with the disc, as by drawing down upon the described bolt means, the foam material is placed under compression hence achieving a more secure seal between the plate and disc to exclude liquid and entrained materials from the underside of the plate.

The foam material is unconfined along portions of the outer end of the plate in a manner to allow for limited expansion. In this regard, while a work plate has been shown herein of a particular configuration it will be understood that this is in the main for illustrative purposes. The invention contemplates broadly the use of a plastic or like filler for a recessed work plate which may be formed in any convenient manner with spaced apart lands providing limited seating area for engagement of the work plate with the supporting discs.

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 feature, 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 the best mode presently contemplated 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 plate for application to a backing plate of a disc refiner or the like having on one face a working surface and, on the opposite face, means projected for firm abutment thereof to a backing plate, said means defining recesses having a filling of chemically inert, compressible substance normally arranged to project therefrom and form a seal with the backing plate on application of the refiner plate thereto, said sealing substance being operative to prevent sifting and build up of the material being refined to the rear of the refiner plate.

2. A refiner plate for application to a backing plate of a disc refiner or the like having on one face a working surface and, on an opposite face thereof, marginally projected flange means defining a recessed area, additional means forming spaced apart lands projected from said opposite face for firm abutment to a backing plate on application of the refiner plate thereto and a plastic foam filling said recessed area to bridge the space between said lands and marginal flange means and project therefrom, said filling being arranged to form a seal with the backing plate on application of the refiner plate thereto.

3. A refiner plate for application to a backing plate of a disc refiner or the like having on one face a working surface and, on the opposite face, means projected for firm abutment thereof in seating relation to a backing plate, said means defining a recessed area of said opposite face, and a foam filling for the recessed area of a depth to normally project beyond said projecting means, said filling being compressible and arranged to form a seal with the backing plate on application of the refiner plate thereto.

4. A refiner plate according to claim 3, characterized in that the filling is a plastic foam of the polyurethane or like class.

5. A refiner plate according to claim 3 characterized in that the filling is in the form of a semi-rigid body of chemically inert material.

6. A refiner plate for application to a backing plate of a disc refiner or the like having on one face a working surface and including, on the opposite face, a relatively

projected marginal flange and a relatively projected longitudinally extending rib, said flange and rib being arranged to seat in firm abutment with a backing plate or application of the refiner plate thereto, portions of said opposite face bounded by said flange and rib being displaced from the backing plate and forming recessed area thereby and a compressible filler substance in the recessed area bounded by said flange and rib, arranged to normally project therefrom and form a seal with the backing plate on application of the refiner plate to seat in firm abutment thereto.

7. A refiner plate for application to a backing plate of a disc refiner or the like having on one face a working surface and, on an opposite face, relatively projected means providing spaced apart lands which firmly seat to a backing plate on application of the refiner plate thereto and compressible, chemically inert sealing means confined between said lands to fill the space therebetween to a depth normally greater than that of the lands whereby, on application of the refiner plate to a backing plate, said lands will seat in firm abutment to the backing plate and said sealing means will be compressed and form a seal with said backing plate therebetween.

8. A refiner plate according to claim 7 characterized in that one of said lands is provided by flange means arranged peripherally of said sealing means and formed to define an opening to accommodate a limited lateral expansion of the sealing means on the refiner plate being applied to a backing plate.

9. A work plate for installation on a disc in a rotary disc refiner, said plate having a fan-like shape with its narrow end disposed toward the center of the disc in the installation thereof so that refined material travels over one face and longitudinally of the plate from the narrower end toward the broader end, the reverse side of said plate having a marginal flange on three edges thereof, said flange being omitted at the broader end of the plate, said reverse side of the plate further having a longi-

tudinally extending center rib terminating at its one end in a relatively broad support portion at the broader end of the plate, said rib being connected to said broad support portion by sloping surfaces, said rib with its support portion and said flange occupying a relatively small part of the area of said reverse side of the plate and being co-planar to define relative projecting portions on the reverse side of the plate adapted to seat on the disc while holding intermediate portions of the reverse side of the plate spaced from the disc, and a body of plastic foam material received in and filling said intermediate portions of the reverse side of the plate, said body normally exceeding in depth the co-planar surfaces of said flange and said rib whereby to be compressed by mounting of the plate on the disc, the spaces between said flange and the support portion of said center rib defining openings at the broader end of the plate at which points said layer of plastic foam material is unconfined.

10. A refiner plate for application to a backing plate of a disc refiner or the like having on one face a working surface and, on an opposite face, spaced apart relatively projected lands for seating of the refiner plate in firm abutment to a backing plate, a light weight compressible filler material molded about and in common intimate contact with the sides of said lands to form an integral part of said refiner plate and normally project therefrom whereby to provide a seal with the backing plate on application of the refiner plate thereto and a marginal flange projected from said opposite face to peripherally confine the major portion of said filler material by seating to the backing plate.

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