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SELF CLEANING REFINER PLATE

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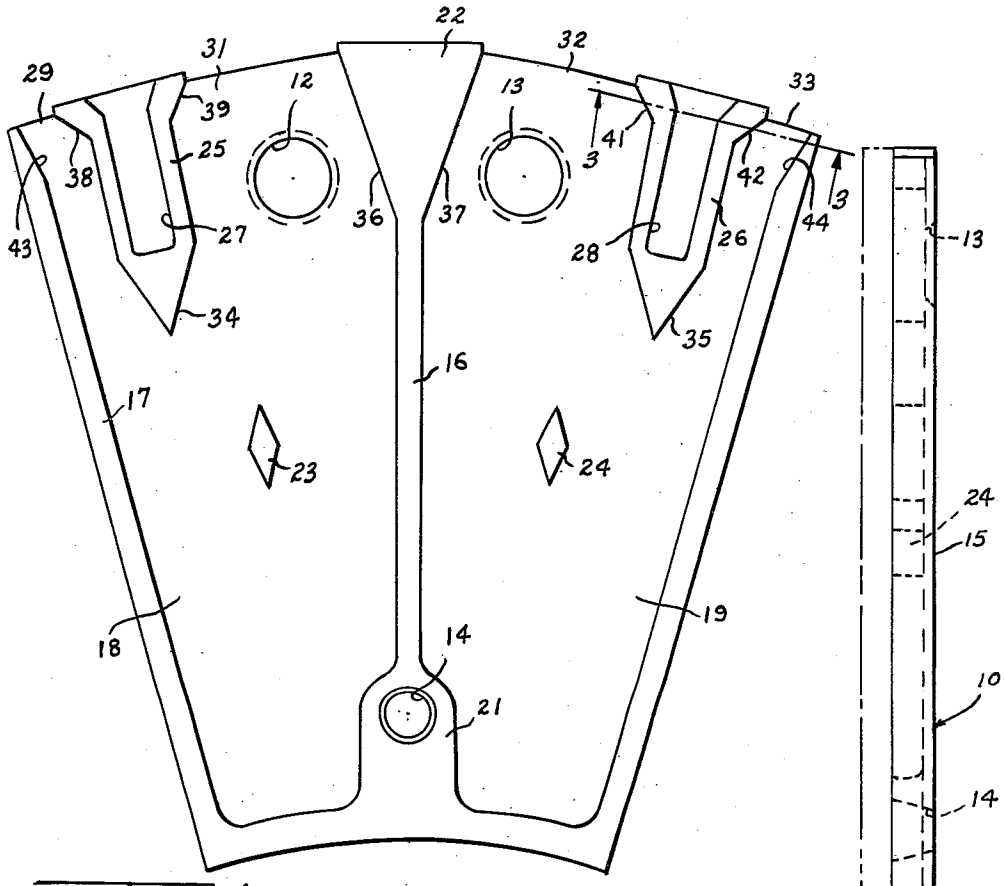


Fig-1

Fig-2

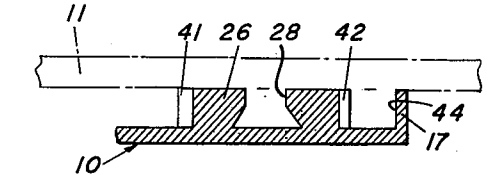


Fig-3

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SELF CLEANING 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. Although provision may be made for drawing the plates down tightly upon the disc there is no practicable way to avoid the entrance between the plate and its underlying disc surface of small amounts of the material being refined. A gradual build-up of such material accordingly occurs at localized points 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. While this condition may be averted by regular dismantling of a disc assembly and removal and cleaning of the work plates, this is a recourse of obvious disadvantages.

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

Another object of the invention is to introduce in a disc refiner as described a concept of continuous self-cleaning in which material finding its way to the reverse or underside of the work plate is free to discharge therefrom as a part of and in consequence of continuing refiner operation.

A further object of the invention is to utilize the centrifugal force generated in the operation of the rotary disc refiner to obtain a self-cleaning of the reverse sides of the working plates.

Still another object of the invention is to prevent a generally new work plate for use in disc refiners and the like, especially characterized by a construction on its reverse side providing for a relatively free movement and escape of material gaining access to such reverse side in the operation of the refiner.

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 the best presently contemplated but obviously not necessarily the only form of embodiment of the invention,

FIG. 1 is an elevational view of a work plate in accordance with the illustrated embodiment of the invention, showing the back or reverse side thereof;

FIG. 2 is a view in side elevation of the plate of FIG. 1; and

FIG. 3 is a fragmentary view in cross-section taken substantially along the line 3—3 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 path of the flow of material over the work plate is from the small end thereof longitudinally toward and beyond the broad end.

The instant invention is concerned 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 the installation bolts. These spaced apart relatively projecting surfaces define, moreover, recessed, marginally enclosed areas **18** and **19**. The rib 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 lands **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 on the disc. Such studs together with the bolt which passes through hold 14 comprise the installation or mounting bolts which hold the plate 10 to the disc 11.

The material undergoing milling in the refiner is subject to powerful forces as a result of which some of it gains access to the reverse side of the work plates, passing over the flange 17 into the recessed areas 18 and 19. There the material tends to move under the influence of centrifugal force radially outward toward the broad end of the plate. Flanges, lands and other projections on 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, movement of material within the recesses 18 and 19 is made relatively unimpeded and a free discharge of the material from the outer end of the plate is made possible. The marginal flange 17 is continuous over three edges of the plate but at the outer or broad end of the plate the flange is interrupted or in effect omitted. Thus, 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, however, with the result that the outer end of the plate provides a series of open exit passages 29, 31, 32 and 33. Thus, while a substantial part of the outer end of the work plate is in contacting relation to the disc another substantial thereof is left open for a free movement of material out of the enclosed areas 18 and 19. This movement is assisted or in the main induced by centrifugal force which by reason of the construction and arrangement of the work plate is applied in a manner to expel trapped material toward the outlets at the outer end of the plate.

Also in accordance with the invention the several lands and other projections on the reverse side of the work plate are constructed to facilitate movement of the material toward the escape passes at the outer end of the plate, as well as effectively to preclude a build up of material at the locations of the lands and other abutments. The lands 23 and 24 are given a diamond shape so as to present sharply angled tapering configurations to outwardly thrown material. Similarly the embossments 25 and 26 are formed with inwardly extending tapered extensions 34 and 35 which likewise offer minimum opportunity for out thrown material to be caught and held thereby. The rib 16 is joined to the widest part of support portion 22 by sloping surfaces 36 and 37 which present no abutments or crevices at which material may accumulate but rather deflect the out thrown material in gradual fashion toward the respective outlet passes 31 and 32. The described laterally projecting portions of the embossments 25 and 26 are in like manner joined to the sides of the embossments by tapering surfaces 38—39 and 41—42. Surfaces 38 and 42 are in approximately complementary relation to oppositely disposed tapers 43 and 44 on respective sides of the flange 17 and cooperate therewith to define the passes 29 and 33. The arrangement is one providing for a facilitated discharge of material from the reverse side of the plate without opportunity for accumulation on such underside, the process being a continuous one in which the reverse sides of the several work plates on the disc are in effect self-cleaning.

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 specfic features shown, but that the means and construction herein disclosed comprise but the best presently contemplated 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 removable work plate in a disc refiner or the like, said plate having on its reverse side a marginal flange and a longitudinally extending center rib, said rib merging at one end of the plate with said flange said reverse side being recessed relative to said flange and to said rib, and lands on said reverse side on opposite sides of said center rib, said flange, said ribs and said lands presenting surfaces in a common plane to seat on the disc and said flange being interrupted at the other end of the plate to define passages extending between said rib and spaced lands for the escape of material entering the recessed area of the reverse side of the plate.

2. A removable work plate according to claim 1, characterized in that said passages open through the end of said plate which in the installation of the plate is the outer end thereof in relation to the direction of travel of the refined material over the plate.

3. A removable work plate in a rotary disc refiner or the like, said plate having a fan-like shape with its narrower end disposed toward the center of the disc in the installation thereof so that the refined material travels longitudinally of the plate from the narrower end toward the broader end, the reverse side of said plate having a marginal flange and a longitudinally extending center rib said rib merging at the narrow end of the plate with said flange, said rib and said flange being adapted to seat on the disc while holding intermediate portions of the reverse side of the plate spaced from the disc, said marginal flange being interrupted at the broader end of the plate to define openings on opposite sides of said rib for escape of material gaining access over said marginal flange to intermediate portions of the reverse side of the plate.

4. A removable work plate according to claim 3, characterized in that the reverse side of said plate, including portions of said flange and of said center rib is formed with sloping configurations inhibiting a build up on plate surfaces encountered by the material as it moves toward said openings.

5. A work plate for installation on the work face of a disc in a rotary disc refiner, said plate having a fan-like shape with its narrower end disposed toward the center of the disc in the installation thereof so that the refined material travels 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 brooader end of the plate, said reverse side of the plate further having a longitudinally extending center rib terminating at its one end in a relatively broad support portion at the outer 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 being co-planar to define relatively 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, the spaces between said flange and the support portion of said center rib defining openings for escape of material gaining access over said marginal flange to intermediate portions of the reverse side of the plate.

6. A removable work plate in a disc refiner or the like,

said plate having inner and outer ends in relation to the direction of travel of refined material thereover, the reverse side of said plate being recessed to provide a marginal flange on all but the outer end thereof, passageways of longitudinal extent opening through the outer end of the plate, and lands in said passageway coextensive in height with said flange for simultaneous contact with the disc, said lands being shaped to present surfaces of minimum obstruction to the movement of material over the reverse side of the plate from the inner to the outer ends thereof.

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