June 20, 1967 D. E. JONES 3,326,480

DISK REFINER

Filed Jan. 21, 1965 3 Sheets-Sheet 1

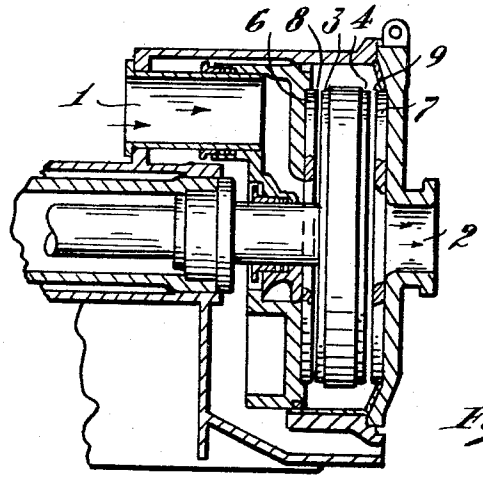


Fig. 1

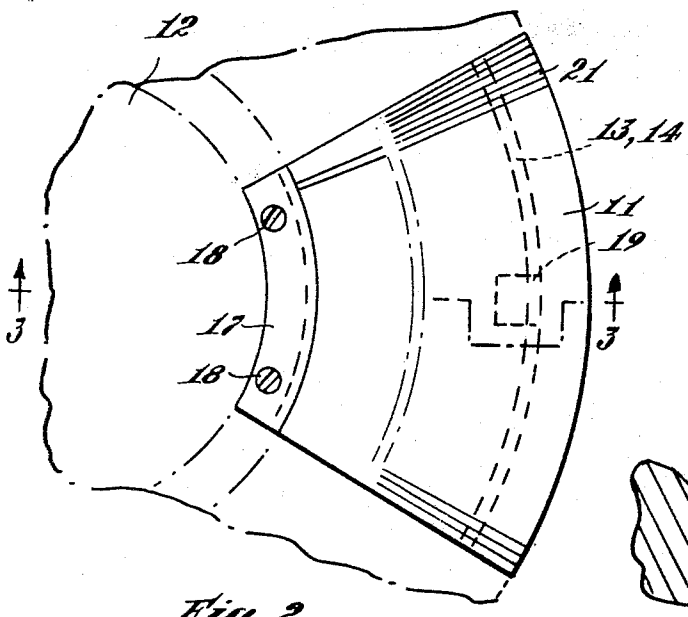


Fig. 2

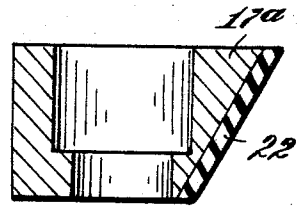


Fig. 4

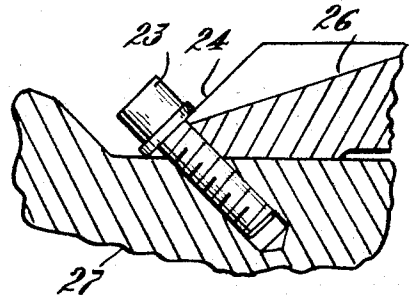


Fig. 5

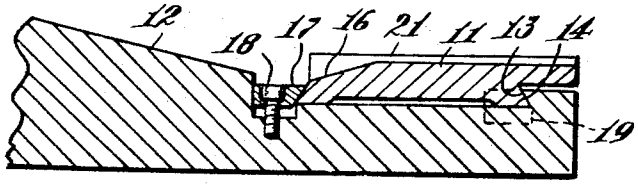


Fig. 3

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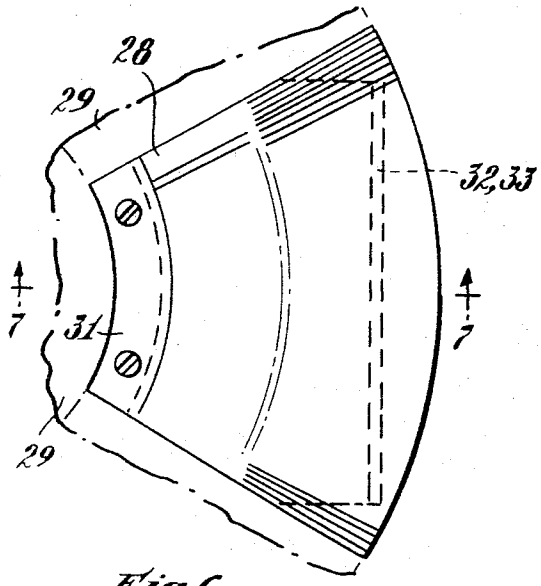


Fig. 6

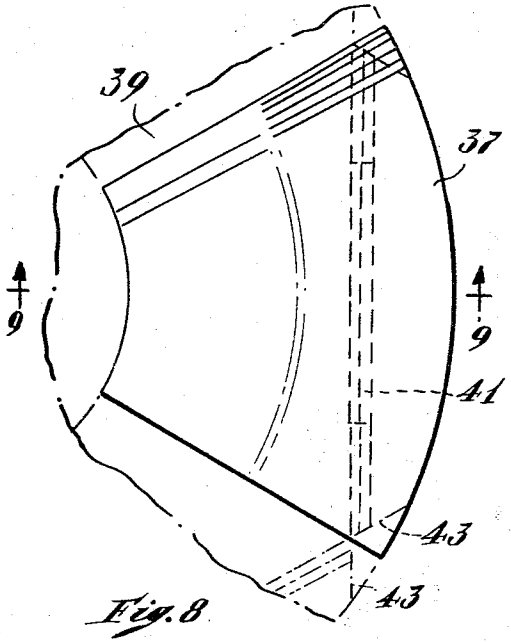


Fig. 8

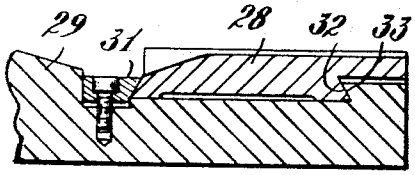


Fig. 7

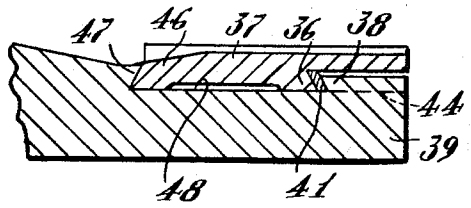


Fig. 9

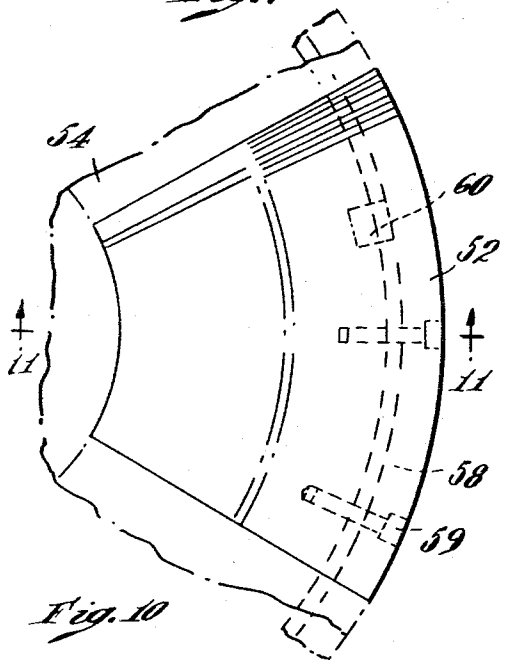


Fig. 10

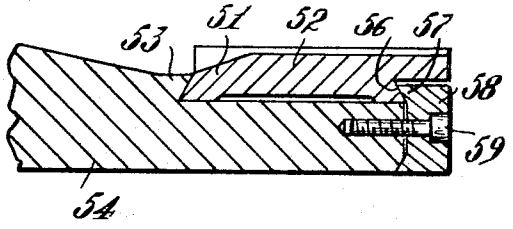


Fig. 11

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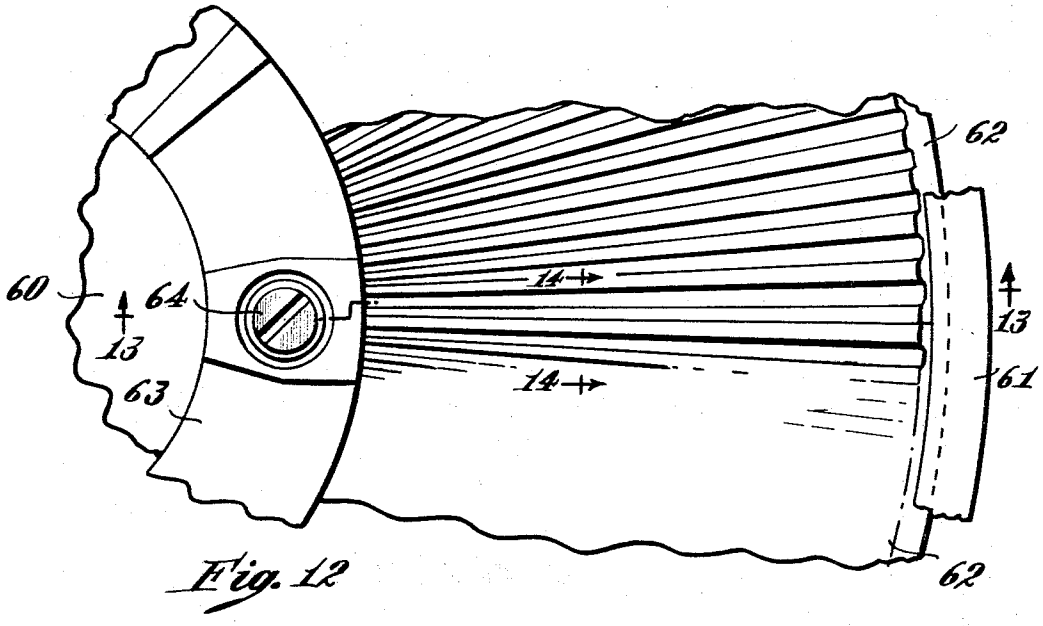


Fig. 12

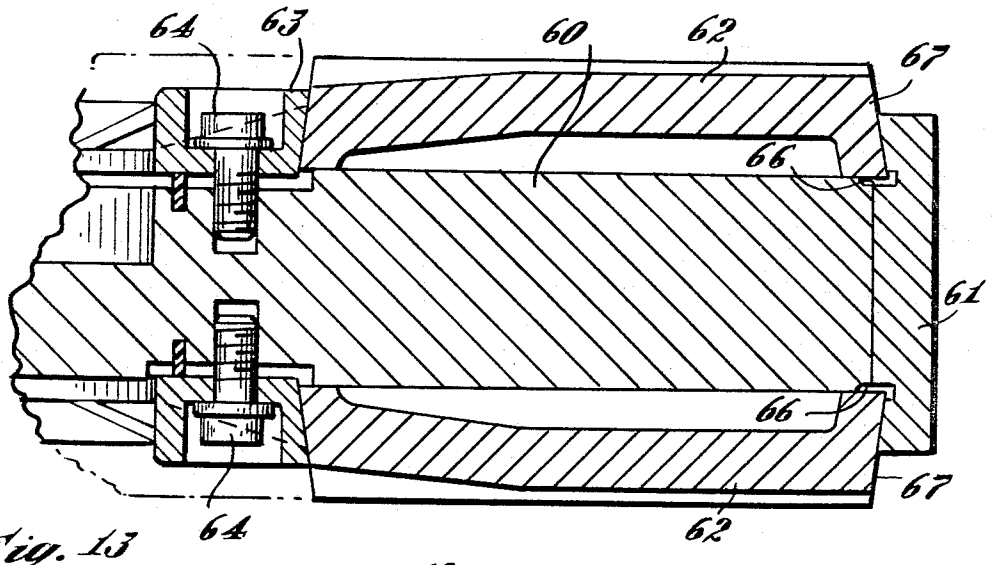


Fig. 13

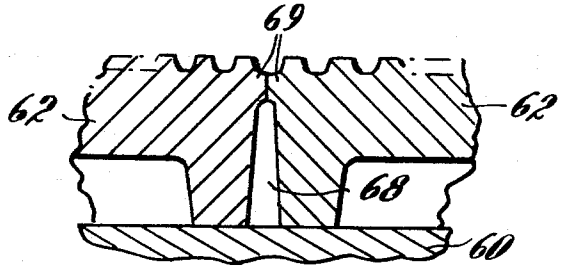


Fig. 14

United States Patent Office 3,326,480 Patented June 20, 1967

3,326,480

DISK REFINER

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Filed Jan. 21, 1965, Ser. No. 426,968
1 Claim. (Cl. 241—298)

This application is a continuation-in-part of application Ser. No. 352,496, filed March 17, 1964 now U.S. Patent No. 3,289,954.

This invention relates to apparatus for refining fibrous material and more particularly to refiners of the type having juxtaposed disks with refining blades on their opposed faces, one disk rotating relatively to the other disk to work on pulp or other material therebetween. While this invention is applicable to various types of refiners, including single rotating disk refiners and counter rotating disk machines, a typical refiner of this type is disclosed in Patent 3,049,307, granted Aug. 14, 1962. Owing to the fact that the blades wear out and must be replaced, it is customary to form them on segments which are detachably mounted on the faces of the disks. Heretofore it has been proposed to mount the segments by bolts extending through the segments but this reduces the area of the bladed surfaces and reduces the efficiency of the apparatus. It has also been proposed to mount the segments by means of bayonet lugs on the back of the segments sliding into T-shaped slots in the disks but this construction involves considerable breakage.

The object of the present invention is to provide means for mounting the segments on the disks which do not reduce the bladed area of the segments, which are simple and economical to produce, which can be assembled and disassembled quickly and easily, and which are durable and reliable in use.

In one aspect the present invention involves a refiner comprising a backing disk, refining segments distributed around one side of the disk, and means to hold the segments on the disk, said means including pairs of interlocking dovetails on the disk and segments, one dovetail of each pair being on the disk and the cooperating dovetail of each pair being on a segment, the dovetails extending transversely of radii of the disk. Preferably the refiner has means to detachably fasten one dovetail of each pair to the disk, and dovetails on the disk face toward the center of the disk and dovetails on the segments face away from the center of the disk. In a more specific aspect the disk and segments have second sets of dovetails in which the dovetails on the disk face toward the periphery of the disk and the dovetails on the segments face toward the center of the disk. The dovetails may be concentric with the center of the disk or straight. Preferably the dovetails of one set are concentric with the center of the disk and the dovetails of the other set are perpendicular to radii of the disk. In the preferred embodiment the dovetails on the disk extend continuously around the disk in the form of rings and the outer ring is made integral with the disk either by forming it integrally or by joining it integrally as by shrinking or sweating.

To facilitate removal of the segments their opposing sides are spaced slightly, the space preferably flaring from front to back, and a circumferential release is provided in the outer dovetail at the rear edge of the outer peripheries of the segments so that the outer dovetails may be disengaged by lifting the inner ends of the segments away from the disk.

As a sub-combination the apparatus involves a segment comprising refining blades on one side and, on the other side, means for mounting the segment including a dovetail extending transversely of radii of the segment. Preferably the segment has a second dovetail, one dovetail facing inwardly and one dovetail facing outwardly. The dovetails may be concentric with the segment or straight, or one dovetail of each segment may be concentric with the segment and the other straight.

For the purpose of illustration typical embodiments of the invention are shown in the accompanying drawings in which

FIG. 1 is an axial section of a refiner such as described and claimed in the aforesaid patent;

FIG. 2 is a face view of a portion of a disk showing one segment mounted thereon;

FIG. 3 is a section on line 3—3 of FIG. 2;

FIG. 4 is a detail section like FIG. 3 showing a slight modification;

FIG. 5 is a similar section showing a modification;

FIG. 6 is a view like FIG. 2 showing a modification;

FIG. 7 is a section on line 7—7 of FIG. 6;

FIG. 8 is a face view like FIGS. 2 and 6 of another modification;

FIG. 9 is a section on line 9—9 of FIG. 8;

FIG. 10 is a face view of another modification;

FIG. 11 is a section on line 11—11 of FIG. 10;

FIG. 12 is a face view of another modification;

FIG. 13 is a section on line 13—13 of FIG. 12; and

FIG. 14 is a section on line 14—14 of FIG. 12.

The refiner shown in FIG. 1 comprises an inlet 1, an outlet 2, a rotor having refining blades 3 and 4 on its opposite faces and two stationary disks 6 and 7 having refining blades opposed to the rotor blades 3 and 4 across radial passageways 8 and 9. The material to be refined feeds outwardly through the passageway 8 and inwardly through the passageway 9. Details of the apparatus are more fully described in the aforesaid patent.

In the embodiment shown in FIGS. 2 and 3 segments 11 are mounted around the face of a disk 12 which may be either a rotary or a stationary disk of FIG. 1. Near its periphery each segment has a dovetail 13 engaging under a dovetail 14 on the disk. At its inner periphery each segment has a dovetail 16 engaging under a dovetail 17 mounted on the disk by means of screws 18. Relative movement of each segment relative to the disk is prevented not only by the screws 18 but also by a cubical key 19 fitting into recesses in the opposed faces of the segment and disk. On the face of each segment are integral refining blades 21 of suitable configuration, as for example as disclosed in the aforesaid patent. To assemble the parts the dovetail 13 is slipped outwardly under the dovetail 14 and the dovetail 17 is then secured in position by means of the screws 18. In the modification shown in FIG. 4 the dovetail 17*a*, corresponding to 17 of FIGS. 2 and 3, is provided with a resilient facing 22 to permit expansion of the segment as it heats up in use.

The modification shown in FIG. 5 is like that of FIGS. 2 and 3 except in that the dovetail 17 is replaced by screws 23 which have heads bearing on the dovetail face 24 of the segment 26, the screws treading into the disk 27.

The modification shown in FIGS. 6 and 7 is like that shown in FIGS. 2 and 3 in that the segment 28 is secured on the disk 29 by a dovetail 31 which is concentric with the axis of the disk. However, instead of being concentric with the axis of the disk, the outer dovetails 32 and 33 are straight as shown in FIG. 6. To assemble the parts the dovetail 32 is slipped under the dovetail 33 and the dovetail 31 is then applied. In this embodiment of the invention the dovetail serves not only to hold the segments on the disks but also to prevent relative rotation of the segments relative to the disk.

The modification shown in FIGS. 8 and 9 is like that shown in FIGS. 6 and 7 in that the outer dovetails are straight. However the dovetail 36 on the segment 37 is spaced from the dovetail 38 on the disk 39 and a key 41

is slipped endwise into the space between the two dovetails. To permit access to the ends of the key space the disk **39** is cut away at the outer corners of the segments back to the lines **43** in FIG. 8 and down to the line **44** in FIG. 9. The inner dovetail **46** of each segment seats under the dovetail **47** on the disk. To assemble the parts each segment is seated in the recess **48** in the disk and then moved inwardly until the dovetail **46** seat under the dovetail **47**. Then the key **41** is driven in lengthwise as aforesaid.

The modification shown in FIGS. 10 and 11 is like that shown in FIGS. 8 and 9 in that the dovetail **51** on the inner edge of each segment **52** seats under a dovetail **53** on the disk **54**. However the outer dovetail **56** of each segment seats under a dovetail **57** on a ring **58** secured in position by means of screws **59**. In each embodiment each ring may extend any desired distance around the periphery of the disk but as shown in the drawings it preferably extends 60° so that the six segments fill a disk. In the embodiment shown in FIGS. 10 and 11 each of the retaining rings **58** preferably extends through 180° around the periphery of the disk and are keyed to the disk by keys **60**.

In the modification shown in FIGS. 12 to 14 both of the disk dovetails are continuous rings, the outer ring **61** being shrunk on the disk **60** and the inner ring **63** being fastened by screws **64**. The outer ring **61** has a release **66** so that, when the inner ring **63** is removed and the inner end of a segment is lifted away the disk, the outer dovetail **67** of the segment may disengage the ring **61** freely without binding, thereby facilitating removal of the segments. This removal is also facilitated by providing a space **68** between each juxtaposed pair of segments, and as shown in FIG. 14 this space preferably flares from front to back. Near the front end of the space the segments have projections **69** which are accurately ground to abut tightly so as to leave no crack at the front, thereby fitting the segments firmly together and preventing wear by keeping material out of the space **68**.

From the foregoing it will be evident that according to the present invention the blades are not interrupted by the fastening means but cover the entire area of the segment. Moreover the novel mounting means are simple and economical to produce, they can be assembled and disassembled quickly and easily and they are durable and reliable in use.

It should be understood that the present disclosure is for the purpose of illustration only and that this invention includes all modifications and equivalents which fall within the scope of the appended claim.

I claim:

A refiner comprising backing disk, refining segments distributed around one side of the disk, inner and outer retaining rings engaging the inner and outer ends of said segments, the abutting surfaces of the rings and segments comprising dovetail surfaces, said inner ring being removable, an annular release at the rear edge of the outer periphery of the segments to permit the inner ends of the segments to be lifted away from the disk, the opposing surfaces of the segments having a space therebetween but having annular abutting projections at the front to exclude material from said space.

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