

UNITED STATES PATENT OFFICE

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GRINDING MACHINE

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My invention relates to improvements in grinding machines and more particularly to improvements in grinders of the revolving knife or hammer type, in which the grinding action is secured by the impact of revolving knives against the material to be ground.

An object of my invention is to provide a grinder of the class described which provides a maximum ease of assembly and repair and includes a novel means for mounting the knives, spacers, bearing and pulley upon the shaft so that the entire assembly is clamped together by means of one set of lock nuts.

Another object of my invention is to provide, in a grinder of the class described, a cutting knife or hammer which is double ended and reversible and which is so constructed as to present a plurality of cutting edges at each end of the knife or hammer.

Another object of my invention is to provide, in a grinder of the class described, a novel bearing assembly which is simple and economical to construct and which provides for maximum ease of aligning the shaft, as well as to insure the permanent alignment of shaft, bearing assemblies and the frame.

Further objects and advantages of my invention will appear from the drawings and the following description thereof.

Although my invention consists largely in the construction and arrangement of parts hereinafter described and particularly pointed out in the claims, yet I do not limit my invention to the precise form or construction of parts shown or the several parts thereof, inasmuch as various alterations may be made without changing the scope of my invention.

In the drawings Fig. 1 is a side elevation, partially in section, of an approved form of my device; Fig. 2 is a sectional view taken along the line 2—2 in Fig. 1; Fig. 3 is a plan view of an approved form of hammer or cutting knife; Fig. 4 is an elevational view of Fig. 3; and Fig. 5 is a plan view of one of my spacers.

Referring by numerals to the drawings, 10 represents an approved form of shaft for my device on which are mounted the hammers or cutting knives 11. Hammers 11 are preferably loosely mounted on shaft 10 and sepa-

rated from each other by means of spacers 12 preferably keyed to shaft 10. 13 designates the bearings for the shaft preferably separated from the hammer and spacer assembly by means of end-spacers or separators 14 which are preferably adapted to fit over shoulder 15 on shaft 10. Separators 16 in contact with bearings 13 at their outer end serve to separate the bearings from the pulley 17 at one end of the shaft and end-piece 18 at the other end of the shaft. Nuts 19 preferably serve to clamp the whole assembly together. It will be seen that in my assembly, the hammers or knives 11 are caused to rotate with shaft 10 by means of the friction between the spacers which are keyed to the shaft, and the hammers, so that while the hammers are normally rigid with respect to the shaft for grinding purposes, they may be capable of a certain amount of movement with respect to the shaft should they come into contact with foreign obstacles introduced with the material to be ground, such as pieces of metal, rocks and the like. Such a means of mounting the hammers adds greatly to their life. It will also be seen that the hammers, spacers, bearings, pulley and end blocks are all held onto the shaft by a single set of right and left-handed nuts at either end of the shaft. Such a construction requires a minimum number of parts, is quick and easy to assemble, shortens the over-all length of the machine, and makes it possible to employ a shaft which is heavier at the ends than those heretofore employed, since the diameter of the shaft does not have to be reduced in order to give clearance to extra clamping nuts or the like.

Hammers 11 are preferably constituted with split ends so as to form a plurality of cutting ends 20 at each end of the hammer, thereby providing a plurality of cutting edges 21 in either direction. It will be seen that with my construction the hammers are readily reversible, thereby giving double life to the hammer, and that with my split-end construction the cutting area is greatly increased.

As a means for mounting my shaft and assembly I prefer to employ lower bearing

halves 22 resting in bearing plates 23 of supporting frame 24, and upper bearing halves 25 attached to the lower halves in any suitable manner, such as by straps 26 and bolts 27. It will be seen that by my construction
 5 it is only necessary to remove straps 26 and upper bearing halves 25 to make the complete shaft assembly removable in one piece. I prefer to employ spherical surfaces for the
 10 bearing halves 22 and 25 and the bearing plates 23, since with this construction these various members may be cast so as not to require machining. By employing self-aligning ball-bearings 13 resting within the bearing
 15 halves 22 and 25 the proper alignment of the shaft and assembly is always assured.

I prefer to employ a screen 27' partially surrounding the knives 11 and removably positioned below them with the necessary
 20 clearance. This screen 27' may be attached to frame 24 in any suitable manner such as by means of ledges 28. The perforations in this screen may be of any suitable size to accommodate the size of material to be ground
 25 and the size of the finished product desired. Below screen 27' and attached to frame 24 in any suitable manner, I prefer to employ an outlet chute or hopper 29. A preferred form of upper housing or cover portion is shown
 30 at 30 and is preferably pivoted to frame 24 by means of bolt 31. Lugs 32 on housing 30 and bolts 33 on frame 24 preferably serve to hold housing 30 in place over the knives and it is evident that by removing nuts 34 on bolts
 35 33 the whole cover portion 30 may be swung about pivot 31 to render the entire inner mechanism accessible. An adjustable inlet chute is shown at 34' which leads into opening 35 in housing 30. As a means for adjusting the slope of chute 34 I prefer to employ
 40 props 36 carried by pivot bolt 31 and having a cross bar 37 adapted to fit in notched member 38.

It will be seen that the machine above described by way of example, affords a substantial construction, is composed of few
 45 parts and will require a minimum of adjustment and attention; if repairs become necessary all moving parts may be removed from the frame as a unit.

I claim:

1. In a device of the class described, a rotatable shaft, a pulley therefor, a grinding member on said shaft, a spacer on said shaft, and
 55 a means on said shaft adapted to retain said grinding member adjacent said spacer, said means being adapted to attach said pulley to said shaft.

2. In a device of the class described, a grinding assembly comprising a shaft, a pulley therefor, a bearing member, a grinding member, a spacer between said members and
 60 a means adapted to effect a frictional driving relation between said spacer and said driving member and to secure said pulley, bearing member, grinding member and spacer
 65 on said shaft.

ing member, grinding member and spacer on said shaft.

3. In a device of the class described, a rotatable shaft, a cutting knife on said shaft, a spacer carried by said shaft on each side of
 70 said knife, a pulley, means for clamping said knife between said spacers whereby the knife will rotate with the shaft, said means being adapted to attach said pulley on said shaft.

4. In a device of the class described, a rotatable shaft, a cutting knife mounted on
 75 said shaft, spacers attached to said shaft for rotation therewith, and disposed on each side of said knife, means for clamping said knife between said spacers whereby said knife will
 80 be rotated by frictional engagement with said spacers.

5. In a device of the class described, a removable grinding assembly comprising a
 85 rotatable shaft, a bearing therefor, a cutting member on said shaft, means for frictionally and yieldably driving said cutting member, said means including spacers attached to said
 90 shaft on each side of said cutting member and bearing, and means for clamping said member between said spacers whereby said bearing is axially positioned on, and said
 95 member will rotate with, the shaft.

6. In a device of the class described, a demountable grinding assembly including a
 100 shaft, a cutting knife on said shaft, a spacer attached to said shaft on each side of said cutting knife, a bearing on said shaft on each side of the cutting knife, a separator between each of said bearings and the adjacent spacer,
 105 a pulley on said shaft, means for clamping said knife between said spacers, whereby the knife will rotate with the shaft, said means being adapted to attach said bearing, said pulley and said knife to the shaft.

7. In a device of the class described, a demountable and removable assembly of operating parts including a shaft, bearings for
 110 said shaft, a plurality of cutting elements, means for yieldingly positioning and frictionally rotating said elements, said means including spacers keyed to the shaft adjacent said elements and threaded means adapted to position said bearings, cutting elements
 115 and spacers on said shaft.

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