May 9, 1933. O. N. GREDELL 1,907,791

GRINDING MILL

Filed Sept. 4, 1931

Fig. 1.

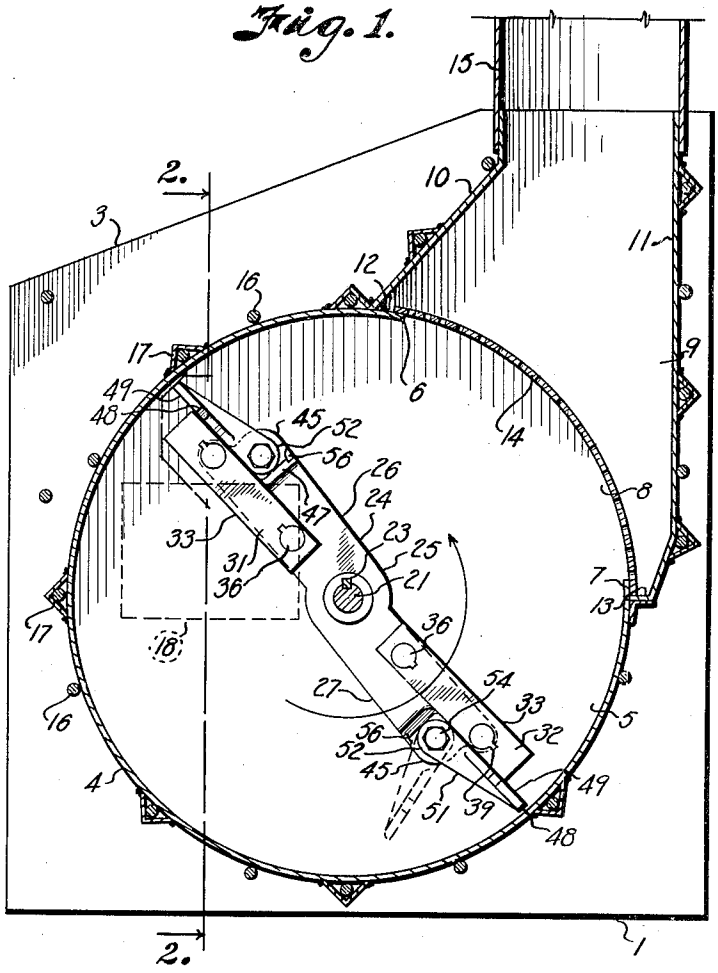


Fig. 4.

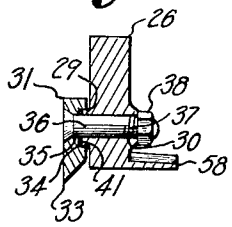


Fig. 5.

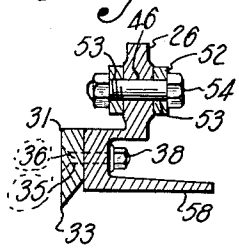


Fig. 2.

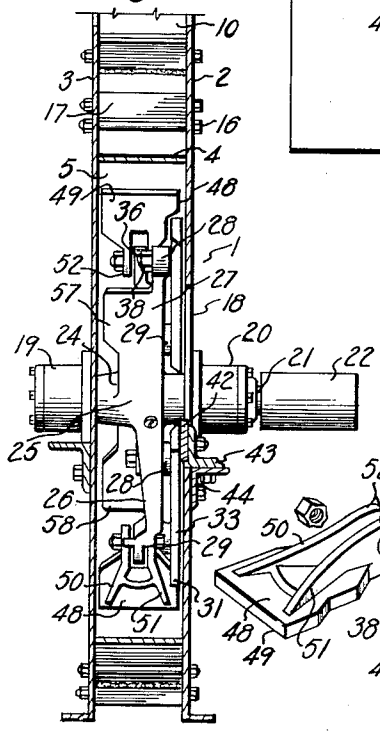
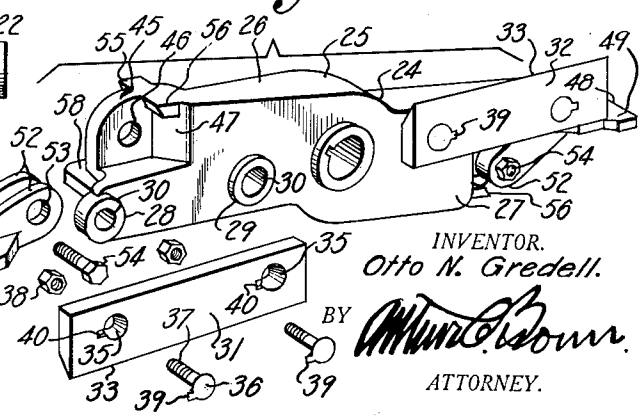


Fig. 3.



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UNITED STATES PATENT OFFICE

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GRINDING MILL

Application filed September 4, 1931. Serial No. 561,172.

This invention relates to grinding mills and more particularly to those of that character wherein the material to be ground is initially cut and then reduced by action of revolving hammers or the like.

The principal objects of the invention are to provide a grinder of this character which has greater capacity, grinds faster and feeds freer than those now in use.

It is also an important object to provide a grinder particularly adapted to handle coarse commodities such as corn fodder, hay, alfalfa and the like.

In accomplishing these and other objects of the invention I have provided improved details of structure, the preferred form of which is illustrated in the accompanying drawing wherein:

Fig. 1 is a vertical sectional view of a grinder embodying the present invention.

Fig. 2 is a cross sectional view through the grinder on the line 2—2, Fig. 1.

Fig. 3 is a detail perspective view of the rotor showing the cutter knife and the hammer elements at one end of the rotor removed to better illustrate their mounting.

Fig. 4 is a sectional view through the rotor illustrating the method of securing the cutter knives, and

Fig. 5 is a similar view through the pivot mounting of one of the hammers.

Referring more in detail to the drawing:

1 designates the grinder casing which includes vertical side plates 2 and 3 spaced apart by an arcuate band 4 to form a substantially cylindrical rotor chamber 5. The ends 6 and 7 of the band terminate short of each other to form a radial discharge outlet 8 for the material reduced in the chamber 5 which is discharged therefrom into an exhaust chamber 9.

The exhaust chamber is defined by upward extensions of the side plates 2 and 3 and by spaced plates 10 and 11 positioned therebetween at adjacent ends of the discharge outlet. The lower ends of the plates 10 and 11 are preferably spaced from the ends of the band to form shoulders 12 and 13 to support a screen member 14 and their upper ends cooperate with the side plates to connect a discharge conduit 15 through which reduced material is conveyed from the exhaust chamber.

The screen 14 is preferably formed from a perforated plate curved to conform to the radius of the rotor chamber and is of sufficient length so that its ends will engage against the shoulders 12 and 13 as shown in Fig. 1.

The band 4, plates 10 and 11 and the screen 14 may be clamped between the side plates by suitable bolts 16 and selected bolts may pass through angle-shaped loops 17 welded to the outer faces of said members.

The side plate 2 is provided with a rectangular shaped inlet opening 18 preferably positioned between the axis of the rotor housing and its periphery through which material is fed into the rotor chamber as later described.

Rotatably mounted in suitable bearings 19 and 20 carried by the side plates is a shaft 21 adapted to be operated by a pulley 22 mounted on a projecting end thereof as shown in Fig. 2.

Keyed to the shaft within the chamber 5 by a spline 23 is a rotor 24 consisting of a hub portion 25 having radial arms 26 and 27 projecting from its end adjacent the plate 2 and from the opposite sides thereof to effect a balance.

Extending from the side faces of the arms adjacent the side plate 2 are pairs of preferably cylindrical bosses 28 and 29 having openings 30 extending axially therethrough and through the arms.

Supported by the bosses are cutter blades 31 and 32 comprising rectangular shaped steel bars having longitudinal cutting edges 33 on the sides of the bars in the direction of rotation of the rotor. The blades 31 and 32 are provided with sockets 34 of suitable size and shape to accommodate the ends of the bosses and have openings 35 aligning with the openings in the rotor arms. The ends of the openings 35 at the front face of the blades are preferably countersunk to accommodate the flat heads of bolts 36, the bolts having threaded shanks 37 which are projected through the openings 30 to mount

nuts 38 by which the blades are drawn tightly against the ends of the bosses. In order to prevent rotation of the bolts in manipulating the nuts, the heads are preferably provided with tongues 39 which engage in recesses 40 formed in the faces of the blades as best illustrated in Fig. 3.

It is apparent that by mounting the ends of the bosses in the sockets formed in the blades all shearing strains are relieved from the bolts 36 and are exerted against the bosses which are a permanent part of the rotor. This is also an important feature as it permits use of shims 41 between the bottoms of the sockets and the ends of the bosses to space the blades therefrom in compensating for wear of the blades with relation to a stationary blade 42 that is attached to an angle member 43 extending across the lower edge of the inlet opening 18, the angle being mounted on an angle 44 attached to the outer face of the plate 2 at a point below the bearing 20.

Formed in the trailing edge of each arm 26 and 27 of the rotor is an ear 45 having an aperture 46 to mount hammer elements later described. The ears 45 are positioned substantially midway of the depth of the rotor chamber and are therefore offset from the arms by angle-shaped web portions 47 extending laterally to the faces of the arms opposite to the cutter knives.

The hammer elements preferably comprise flat paddle-like blades 48 of sufficient width to extend across the depth of the rotor chamber and have flat forward faces 49 for engaging the material to be reduced. The ends of the blades terminate in close proximity with the inner peripheral surfaces of the rotor chamber and cooperate therewith in crushing the material being reduced and for propelling it through the perforated screen. The rear faces of the hammers have spaced ribs 50 and 51 terminating in ears 52 having aligned openings 53 by which the hammers are pivotally mounted on bolts 54 extending through the openings 46 formed in the ears 45 above described.

By thus pivotally mounting the hammers they are adapted to swing radially at the ends of the arms to permit passage of solid objects such as pieces of metal and the like between them and the screen, thereby preventing damage to the grinder as would be the case if the hammers were rigidly mounted on the rotor.

The pivotal movement of the hammers, however, is limited by the front edges of the arms striking on the webs 47 and their rear edges against lugs 55 and 56 projecting laterally from opposite sides of the ears.

It is apparent that rotation of the hammers will create a blast of air in the rotor chamber that will tend to draw material through the inlet opening and discharge the reduced material through the screen for elevating it through the stack so that no blower is required to move the material through the grinder. However, it may be desirable to supplement the fanning action of the hammers by blades 57 and 58 which may be formed integrally with the rotor and project laterally from the sides of the arms opposite to the cutter blades.

To operate the grinder constructed and assembled as described, the pulley is belted to a suitable source of power so that the rotor is operated at the proper speed. The material to be reduced is fed through the inlet opening and is cut into small pieces which are sucked into the rotor chamber and reduced by impact and grinding action of the hammers until the particles are of sufficient size to be blown through the screen. The grain on passing through the screen is delivered through the conduit 15 by the fanning action of the hammers supplemented by the fan blades 57 and 58.

What I claim and desire to secure by Letters Patent is:

1. In a grinding mill including a casing forming a cylindrical rotor chamber having a side inlet, a knife bar extending across the lower edge of the inlet, a rotor in the chamber comprising radially opposed arms operable in close relation to said knife bar and of a length to extend substantially across the width of said opening, knife blades having their opposite ends fixed to the side faces of said arms and provided with cutting edges projecting below the advance edges of the arms to cooperate with the knife bar, ears formed on said arms and offset laterally from the side of the arms opposite to said knife blades and arranged to move in a circular path substantially midway of the width of said chamber, and hammer members pivotally connected with said ears to reduce material cut by said knives.

2. In a grinding mill including a casing forming a cylindrical rotor chamber having a side inlet, a knife bar extending across the lower edge of the inlet, a rotor in the chamber comprising radially opposed arms operable in close relation to said knife bar and of a length to extend substantially across the width of said opening, knife blades having their opposite ends fixed to the side faces of said arms and provided with cutting edges projecting below the advance edges of the arms to cooperate with the knife bar, ears formed on said arms and offset laterally from the side of the arms opposite to said knife blades and arranged to move in a circular path substantially midway of the width of said chamber, hammer members pivotally connected with said ears to reduce material cut by said knives, and fan blades projecting radially and laterally from said

arms opposite to said knives for supplementing a fanning action of the hammer members and to reinforce said arms against strains produced by offsetting said pivotal mounting of the hammer members.

3. In a grinding mill including a casing forming a rotor chamber and having a side inlet, a fixed knife bar extending across the lower edge of the inlet, a rotor in the chamber comprising radially opposed arms operable in close relation to said knife bar and of a length to extend substantially across the width of said opening, knife blades having their opposite ends fixed to the side faces of said arms and provided with cutting edges located adjacent the advance edges of the arms to cooperate with the fixed knife bar, ears formed on said arms and offset laterally from the side thereof opposite to said knife blade, hammer members pivotally connected with said ears to reduce material cut by said knives, lugs projecting from opposite sides of the ears to limit pivotal movement of the hammer members, and fan blades projecting radially and laterally from said arms opposite to said knives for supplementing fanning action of the hammer members and to reinforce said arms against strains produced by offsetting said pivotal mounting of the hammer members.

In testimony whereof I affix my signature.

OTTO N. GREDELL.