Oct. 8, 1940. L. E. SHIRLEY 2,217,568

GRINDING MILL

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Fig. 1.

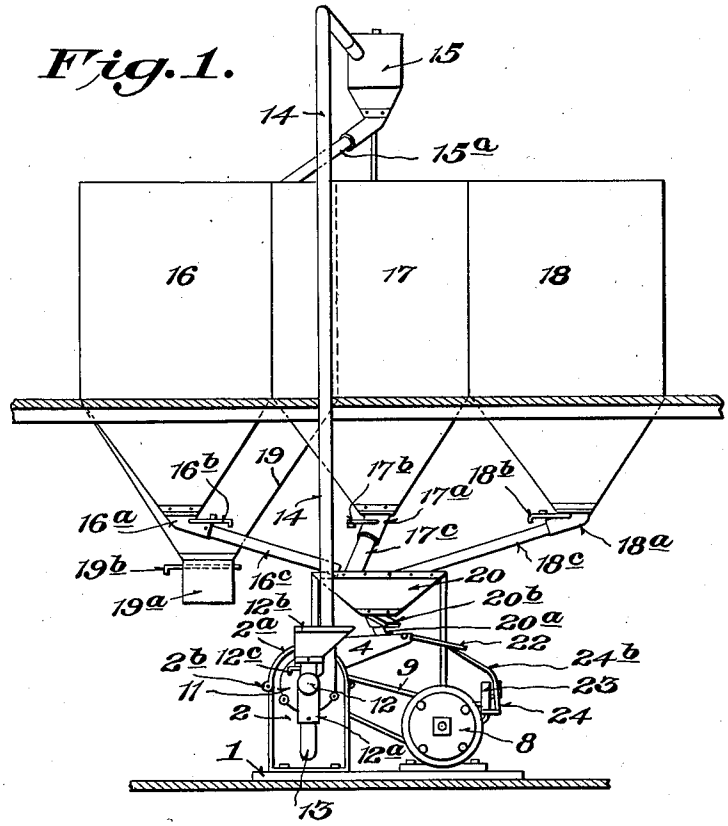


Fig. 2.

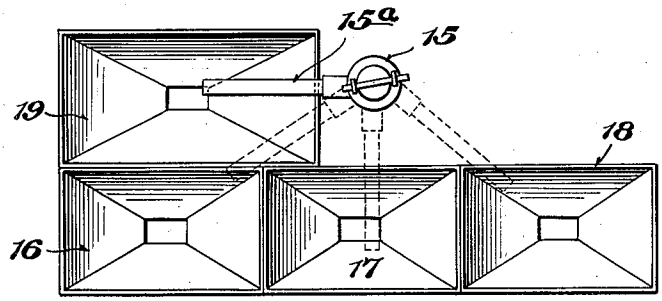
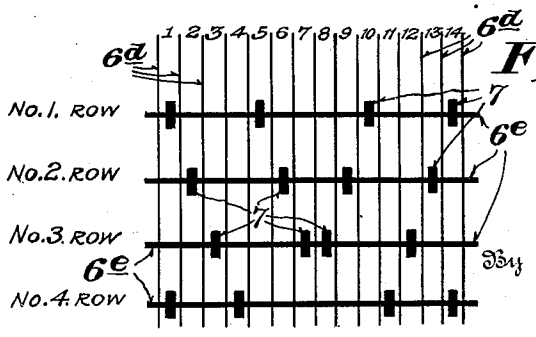


Fig. 4.



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Fig. 6.

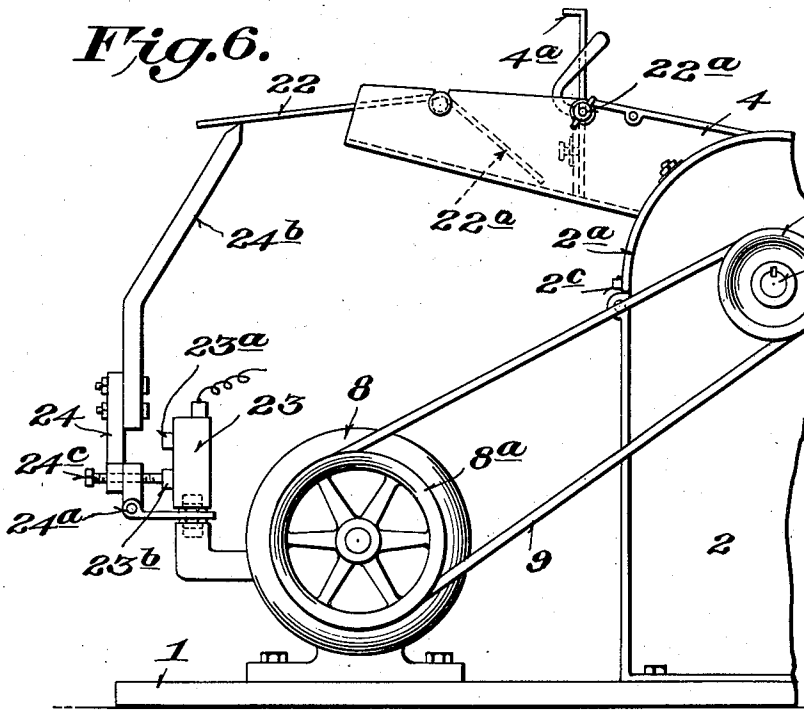


Fig. 3.

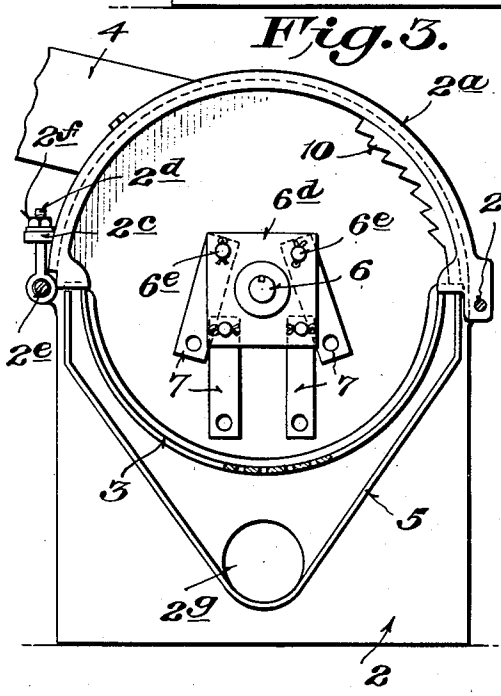
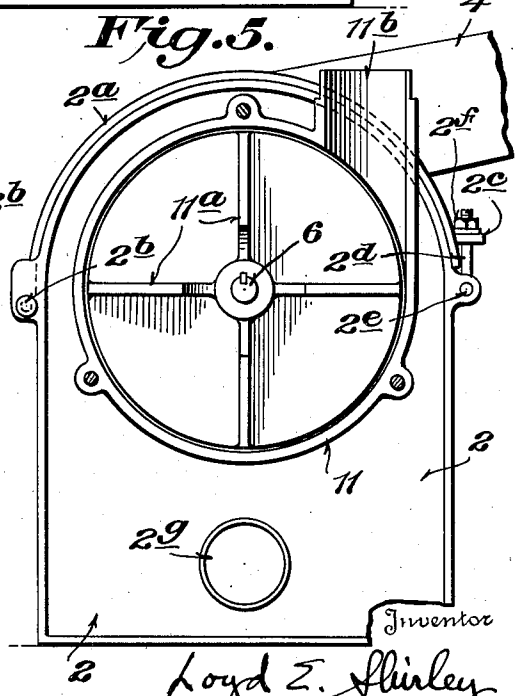


Fig. 5.



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UNITED STATES PATENT OFFICE

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GRINDING MILL

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Application March 6, 1939, Serial No. 260,229

6 Claims. (Cl. 83—93)

This invention relates to grinding mills, and the principal object is to provide a unit particularly adapted for use in mixing and grinding various grains, beans, or other feed material on farms in districts equipped with the now fast-spreading rural electric lines, said unit consisting of a hammer-type mill driven by a small electric motor having an automatic cut-off, a pneumatic elevator operated from the mill shaft, and a novel arrangement of hoppers, pneumatic ducts, and storage bins, so that unground grain, beans, or other feed material may be initially elevated into certain of the bins, and then fed in regulated amounts and mixtures into the hammer mill, and the ground material elevated into another bin, whereby when in operation with the rate of feed from the first mentioned bins properly regulated, the farmer or operator may go about other work, leaving the mill unattended, but with assurance that the unit will shut down due to the automatic cut-off as soon as the flow of material to the hammer mill ceases.

Other minor objects of the invention will be hereinafter set forth.

I will explain the invention with reference to the accompanying drawings which illustrate one practical embodiment thereof to enable others to adopt and use the same; and will summarize in the claims, the novel features of construction, and novel combinations of parts, for which protection is desired.

In said drawings:

Fig. 1 is an elevation of the grinding mill unit.

Fig. 2 is a top plan view showing the arrangement of bins.

Fig. 3 is an enlarged elevation looking into the hammer mill, when the adjacent side face thereof is removed.

Fig. 4 is a diagrammatic view indicating the arrangement of hammers on the shaft of the hammer mill.

Fig. 5 is an enlarged elevation looking into the fan casing with the adjacent side face thereof removed.

Fig. 6 is an enlarged side elevation of the automatic cut-off applied to the motor and operated by the flow of material into the feed chute of the hammer mill.

As shown, the unit preferably comprises a base plate 1, on which is mounted a hammer-type mill consisting of a closed casing 2 having parallel side walls, and having a semi-cylindrical top plate 2*a* below which within the casing is mounted an opposed semi-cylindric screen 3, the plate 2*a* and screen 3 providing a cylindrical hammer chamber in the upper end of the casing as shown in Fig. 3. Preferably one end of top plate 2*a* is pivoted as at 2*b* to casing 2, while the other end has a pair of spaced locking lugs 2*c* to receive a bolt 2*d* which is pivoted on a rod 2*e* on casing 2, said bolt having a nut 2*f* whereby top plate 2*a* may be locked in closed position, or may be swung open to provide access to the hammer chamber. A downwardly inclined feed chute 4 is provided on and opening through top plate 2*a*, having a feed regulating damper 4*a* (Fig. 6). Within the lower part of casing 2, below screen 3, is a substantially V-shaped plate 5 for collecting the screenings adjacent the lower center of the casing, and in one side of the casing opposite the bottom of plate 5 is an outlet opening 2*g*.

Within the cylindrical hammer chamber of casing 2 is a shaft 6 journaled in suitable bearings mounted on the side walls of the casing coaxially of top plate 2*a*, said shaft 6 extending through the casing walls and being provided on one end with a belt pulley 6*a*. The opposite end of shaft 6 is provided with a keyway, for the purpose hereinafter described. Fixedly mounted on shaft 6 within the casing are a series of fifteen spaced square shaped plates 6*d* (Figs. 3–4) having their edges parallel, and through the four corners of the series of plates 6*d* extend pivot rods 6*e* on which hammers 7 are pivoted, said hammers consisting of short lengths of flat bars having perforations of each end, the bars being of length sufficient to extend almost to the top plate 2*a* of the casing and to the screen 3 when projected outwardly by centrifugal force. The hammers 7 normally hang freely from rods 6*e* when the shaft 6 is idle. Hammers 7 are of hard high carbon heat treated steel, and by providing holes at each end of the hammers, the same may be reversed four times to provide four wearing surfaces thereon before replacements are needed. The fifteen spaced plates 6*d* form fourteen spaces for the sixteen hammers 7 which are arranged on the four rods 6*e* as indicated in Fig. 4, whereby the rotating shaft unit including the plates and hammers will be in centrifugal balance, four hammers being pivoted on each rod 6*e*. In Fig. 4, the hammers 7 on one rod 6*e* are shown as being disposed within the first, fifth, tenth and fourteenth spaces between plates 6*d*; the hammers on the next rod 6*e* are disposed within spaces two, six, nine and thirteen; the hammers on the next rod 6*e* are disposed within spaces three, seven, eight and twelve; and the hammers on the last rod 6*e* are disposed within spaces one, four, eleven and fourteen. Shaft 6 is driven by

a small electric motor 8 mounted on base 1 having a drive pulley 8a, and a belt 9 preferably of V-type runs around the pulleys 8a and 6a.

When used for grinding ear-corn, a breaker plate 10 may be provided within the hammer chamber of casing 2, said plate consisting of a hardened ribbed plate of arcuate shape adapted to be mounted on top plate 2a at the forward end of screen 3 in the direction of rotation of shaft 6, whereby the ears will be thrown by hammers 7 against plate 10 to strip the corn therefrom.

The pneumatic elevating means is preferably mounted directly on the hammer mill casing coaxially of shaft 6, and consists of a circular fan casing 11 into which the keyed end of shaft 6 enters, a fan 11a being mounted on said shaft within the fan casing. The inlet to fan casing 11 is coaxial with the shaft, and consists of a lateral housing 12 (Fig. 1) communicating with fan casing 11 opposite the shaft 6, said casing 12 having a depending duct 12a provided with an elbow 13 extending into the outlet 2g of casing 2 above the V-shaped plate 5, whereby the ground material may be drawn upwardly from the mill into the fan casing. On the top of the lateral housing 12 is a grain hopper 12b provided with a slide valve 12c, whereby hopper 12b may be closed. The outlet 11b of fan casing 11 connects with a duct 14 which extends upwardly and over a series of storage bins 16, 17, 18, 19 arranged on an upper level, as shown in Figs. 1 and 2, duct 14 terminating in a dust arrester 15 having a swivel spout 15a adapted to swing over each of the bins 16, 17, 18, 19 which are shown arranged in L-shaped formation with the spout pivoted substantially at the axis of the arrangement. Preferably the three bins 16, 17, 18, which form the long leg of the L are for receiving raw or untreaded grain, beans, or other feed material, while the single bin 19 at the short leg of the L is for ground feed or other material. Preferably the bins are mounted in an upper level from base 1 which level may conveniently be an upper floor of a building, and the lower ends of bins 16, 17, 18 extend down through the upper floor to points somewhat above that of the feed chute 4 of hammer mill 2.

The ground feed bin 19 is contracted at its lower end and provided with a discharge casing 19a disposed a convenient level above base 1, said casing 19a having slide valve 19b therein for opening or closing same. The three grain bins 16, 17 and 18 are similarly provided with discharge casings 16a, 17a, 18a having valves 16b, 17b, 18b, and swivel spouts 16c, 17c, 18c which lead from the discharge casings and may be swung directly over a mixing bin 20 having a swivel spout 20a adapted to be swung so as to overlie the feed chute 4 of hammer mill 2, the swivel spout being provided with a slide valve 20b to regulate the flow of material into the feed chute.

By the above arrangement, unground grain, beans or other feed material, may be poured into the hopper 12b of the pneumatic elevator housing 12, and when valve 12c is open, same may be carried pneumatically under action of the fan 11a into any of the storage bins 16, 17, or 18 disposed above the mill 2, the swivel spout 15a of the dust collector being adjusted to allow the grain to be deposited into the desired grain bins which may thus be filled with the same or with different kinds of feed material. When it is desired to grind the material, the discharge valves 16b, 17b, 18b of any of the said bins may be adjusted to cause a proper amount of material therefrom to flow into the mixing bin 20, and its slide valve 20b adjusted to permit the proper flow therefrom into the hammer mill feed chute 4. The mixed feed will then be ground by mill 2, and after falling through the screen 3, will thereafter be elevated through the elbow 13 by the pneumatic fan 11a (when valve 12c is closed) and will be blown upwardly through flue 14 and dust arrester 15 into the ground feed bin 19, the swivel spout 15a being swung thereover. Thus the valves 16b, 17b, 18b, 20b may be regulated and the mill operated to supply ground feed in desired quantities to the ground feed bin 19, without requiring attendance on the part of the operator.

In connection with motor 8, an automatic shut-off is provided, consisting of a plate 22 pivoted intermediate its ends to the sides of the feed chute, said plate projecting beyond the end of the chute, but having a portion 22a (Fig. 6) extending downwardly at an incline into the feed chute 4 onto which the flow of feed from the mixing bin 20 is directed. The outer end of plate 22 is heavier than the portion 22a upon which the grain drops, so that if the flow from mixing bin 20 should cease, the plate 22 will fall. A motor starter switch 23 is provided having a starter button 23a and a stopping button 23b; and adjacent starter switch 23 is a vertical lever 24 pivoted as at 24a on a fixed support, said lever having an upper adjustable member 24b thereon which underlies the plate 22. Lever 24 carries an adjustable pin 24c normally just contacting the stopping button 23b of starter 23. By the above arrangement the weight of the grain flowing upon the inner end 22a of plate 22, next to the feed regulating slide 4a, is sufficient to hold that end of the plate down. As soon however as the grain is emptied from mixing bin 20, the loss of weight at the inner end 22a of the plate will cause the outer end thereof to drop, and by means of the adjustable levers 24—24b, pin 24c will press the stopping button 23b and stop the motor. The automatic shut-off will permit the mill operator or farmer to start the unit and go about other work with perfect confidence that the unit will continue to operate to fill the storage bin 19 with selected ground feed material, and that the unit will shut down when the flow of unground grain from the mixing bin 20 ceases.

I claim:

1. A grinding mill unit, comprising a mill having a downwardly inclined feed chute; a motor for driving said mill; a series of storage bins disposed above the level of the mill; a fan casing having a fan operated by the motor and having an inlet and outlet; a flue for directing material ground by the mill into said fan inlet; a hopper having a valved connection with the said fan inlet; a second flue extending from the fan outlet to a swivel spout adapted to be swung over the said bins; a mixing bin having a valved spout discharging into the feed chute; means for directing material from certain of the storage bins in regulated amounts into the mixing bin; and means controlled by the flow of material from the mixing bin into the feed chute for stopping the motor when the flow of material ceases.

2. In a unit as set forth in claim 1, certain of said storage bins having discharge casings disposed above the level of the mixing bin; and said material directing means comprising valved swivel spouts extending from the related dis-

charge casings and adapted to be swung to overlie the mixing bin.

3. In a unit as set forth in claim 1, a dust separator in the second flue, and said swivel spout being mounted on the dust separator.

4. A grinding mill unit, comprising a base; a mill mounted thereon having a shaft and having a downwardly inclined feed chute; a motor on said base for driving said shaft; a series of storage bins disposed above the level of the mill; a fan casing having a fan operated by the shaft and having an inlet and outlet; a flue for directing material ground by the mill into said fan inlet; a hopper having a valved connection with the said fan inlet; a second flue extending from the fan outlet to a swivel spout adapted to be swung over each of the bins; a mixing bin having a valved spout discharging into the feed chute; means for directing material from certain of the storage bins in regulated amounts into the mixing bin; and means controlled by the flow of material from the mixing bin into the feed chute for stopping the motor when the flow of material ceases.

5. In a unit as set forth in claim 4, certain of said storage bins having discharge casing disposed above the level of the mixing bin; and said material directing means comprising valved swivel spouts extending from the related discharge casings and adapted to be swung to overlie the mixing bin.

6. In a unit as set forth in claim 4, a dust separator in the second flue, and said swivel spout being mounted on the dust separator.

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