

March 8, 1960

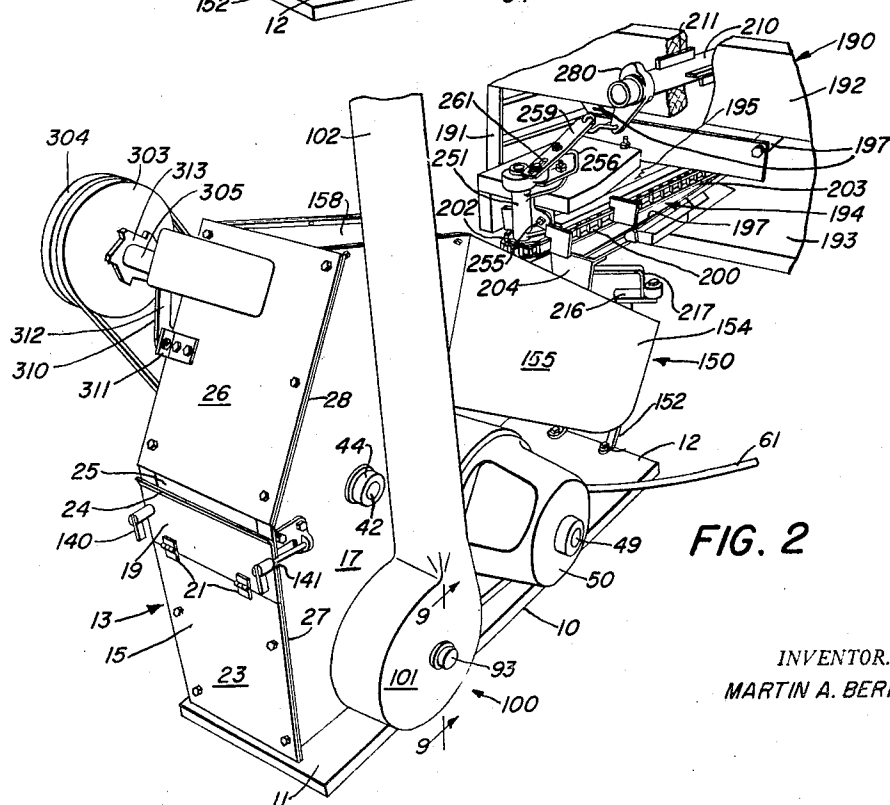
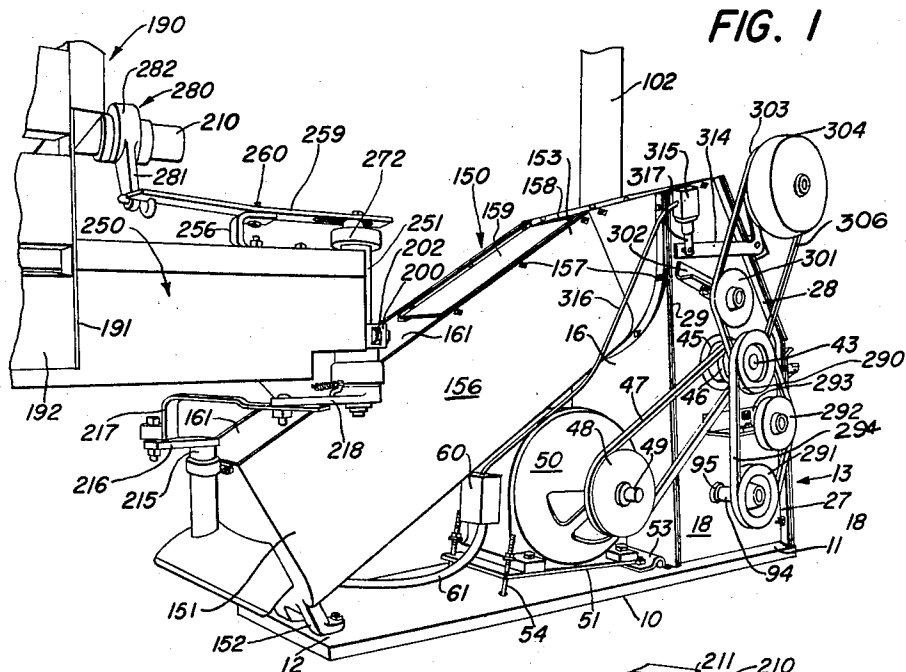
M. A. BERK

2,927,740

FEED GRINDER WITH WAGON UNLOADER

Filed Feb. 4, 1955

3 Sheets-Sheet 1



INVENTOR.
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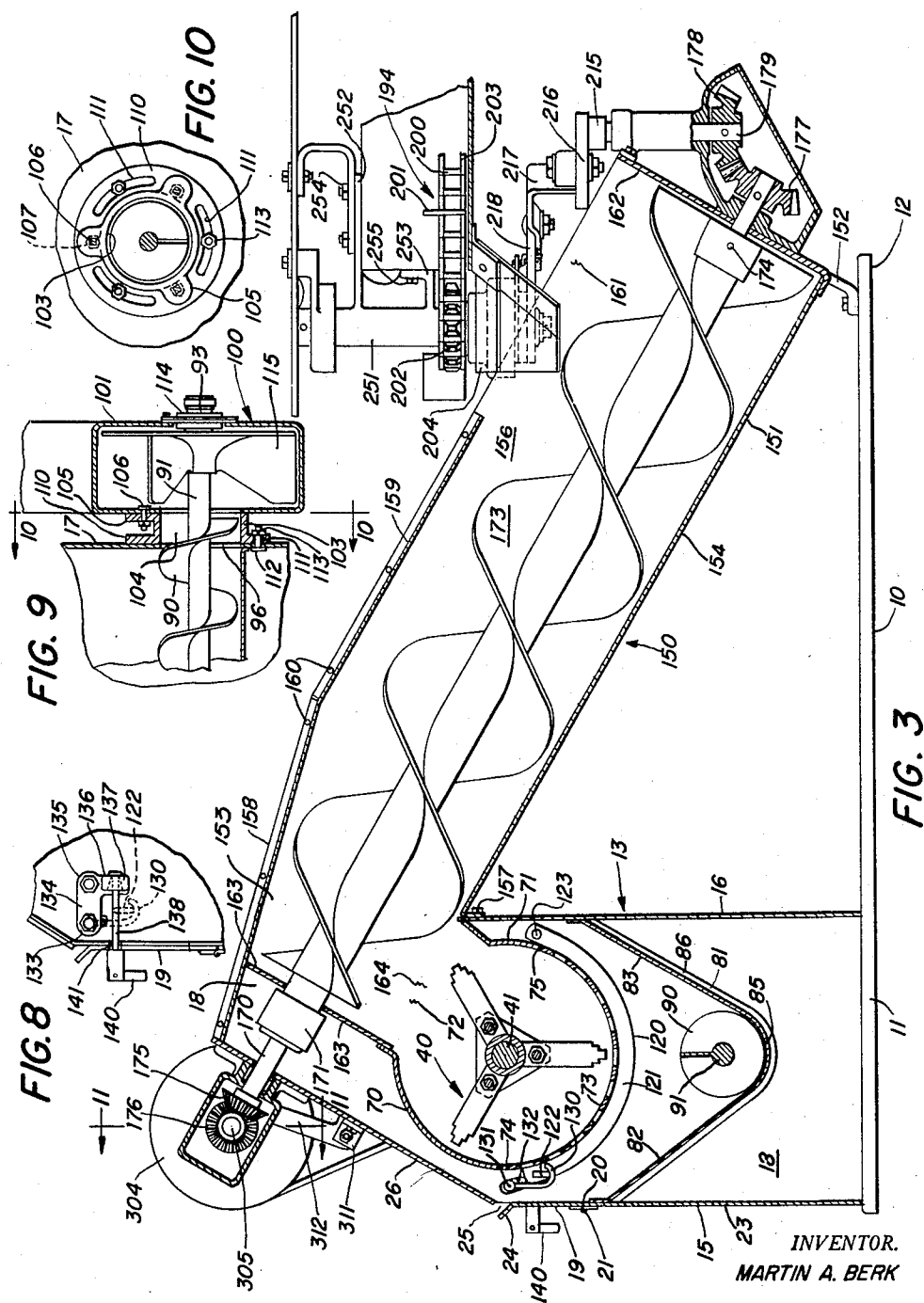
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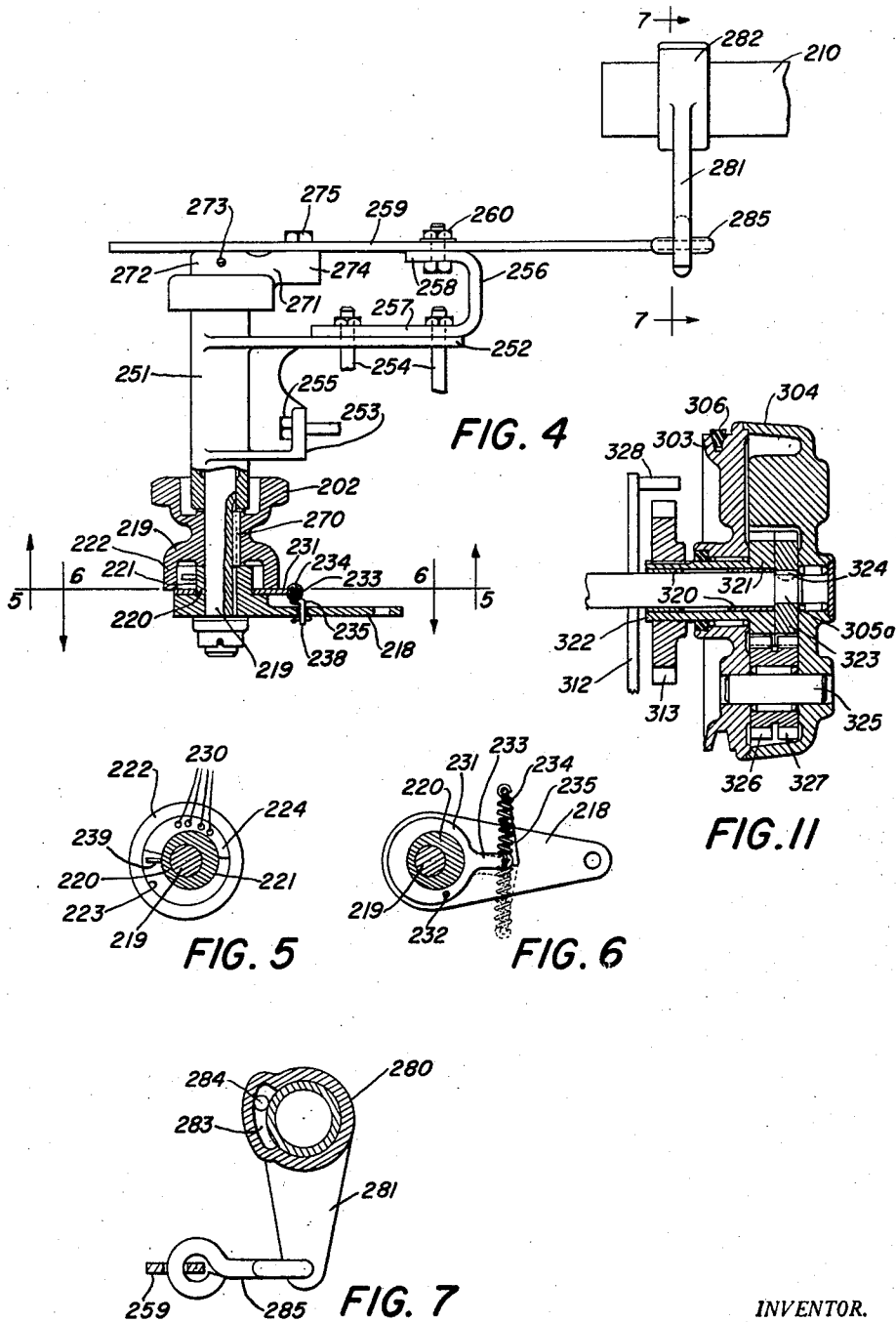
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3 Sheets-Sheet 3



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2,927,740

FEED GRINDER WITH WAGON UNLOADER

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12 Claims. (Cl. 241-186)

This invention relates to a material reducing assembly for reducing materials collected in a crib or similar container having a material unloading port, and includes both material reducing unit and a feeding means that extends through the material unloading port and delivers materials from inside the crib to the reducing unit.

The material reducing assembly is of the type having a material reducing unit mounted on the forward portion of a fore-and-aft extending frame and is of the self-contained variety having a drive unit, which will here be shown as an electric motor, mounted on the mid-portion of the frame and directly to the rear of the reducing unit. The reducing function is performed by a material reducing rotor fixed to a rotor drive shaft mounted in the reducing unit and driven by the electric motor through the media of a V-belt drive.

Heretofore, materials collected in a crib would be delivered to a grinding unit or material reducing unit in two steps, the first being one in which the material was removed from the crib either manually or by suitable power means, and the second being to deliver the material to a reducing unit conveyor, which in most cases was an inclined chute, passing the material into the reducing unit. This method of feeding, even if aided by power units, lacked the advantage of automatically feeding materials from the crib into the power unit.

It is therefore the main object of this invention to provide feeding means for delivering the material from the crib to the reducing unit that includes a fore-and-aft extending elevator having a lower intake end carried on the rear portion of the fore-and-aft extending frame and an upper discharge end carried by the reducing unit, and an unloading conveyor carried by the crib and extending through the material unloading port and having a material receiving portion within the crib and a material delivering portion outboard of the crib and above the intake end of the elevator for delivering materials to the latter. The conveyor is driven by a drive member that is operative from a moving part in the elevator. The elevator is driven by suitable drive means that extends from the rotor drive shaft.

It is also the object of this invention to provide in the aforesaid assembly suitable means for preventing overloading of the reducing unit by the feeding means which will in effect make the whole assembly fully automatic and eliminate the necessity of an operator except at the beginning and end of the operation. Specifically this is done by means of a clutch that is mounted in the drive means from the rotor drive shaft to the elevator which is operative by means of a solenoid to disengage the clutch upon overloading of material in the reducing unit, and to automatically reengage the clutch when the overloaded condition is removed.

Another main feature of the invention is to provide a new type one-way clutch that is operative between the previously mentioned moving part of the elevator and the drive member of the conveyor. The clutch will include means therein for cutting off operation of the

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conveyor. Thus the elevator and the reducing unit may be used either in unison with the conveyor or as a separate unit.

Another of the features of the invention is to provide a perforated member or screen that is mounted beneath the material reducing rotor to permit material that has been reduced by action of the rotor to pass downwardly to a material collecting hopper at the bottom of the material reducing unit, and that includes means for mounting the screen that will permit it to be removed and replaced through a small opening in the front of the reducing unit.

Also another feature of the invention is to provide a blower that is mounted on the side of the reducing unit and receives the material from the material collecting hopper and blows it out of an elongated blower discharge pipe that is fixed to and is a part of the blower. The blower is mounted on the reducing unit by means that will permit resetting of the blower relative to the reducing unit for adjusting the direction that the discharge pipe may be set relative to the reducing unit.

Other features, objects and advantages of the invention will become apparent to those skilled in the art after consideration of the following detailed description made in conjunction with the accompanying drawings in which:

Fig. 1 is a right rear perspective of the material reducing assembly and includes a portion of the crib or material container.

Fig. 2 is a left front perspective of the material reducing assembly also showing a portion of the crib or material container.

Fig. 3 is a longitudinal sectional view of the assembly, the motor being omitted for purposes of clarity.

Fig. 4 is a partial sectional view of the one-way clutch connection between the elevator and the conveyor.

Fig. 5 is a sectional view taken along the line 5-5 of Fig. 4.

Fig. 6 is a sectional view taken along the line 6-6 of Fig. 4.

Fig. 7 is a sectional view taken along the line 7-7 of Fig. 4.

Fig. 8 is a fragmentary side view of a portion of the means for securing the screen in the reducing unit.

Fig. 9 is a fragmentary sectional view taken substantially along the line 9-9 of Fig. 2.

Fig. 10 is a sectional view taken along the line 10-10 of Fig. 9.

Fig. 11 is a sectional view taken substantially along the line 11-11 of Fig. 8.

Referring now to the drawings, reference numeral 10 indicates a fore-and-aft extending frame having a forward portion 11 and a rearward portion 12. Mounted on the forward portion 11 of the frame 10 is a material reducing unit, indicated in its entirety by the reference numeral 13, having a vertically disposed housing with front and rear walls 15 and 16 and left- and right-hand walls 17 and 18 respectively that extend between the front and rear walls, left and right being determinable when viewing the assembly from the rear of the assembly. The front wall 15 is made up of an upper opening-covering section 19 that is hingedly connected at its lower portion by transversely spaced apart hinge members 21 to an upper portion of a wall section 23 that forms the lower portion of the front wall 15. The upper section 19 will swing forwardly and downwardly to a position adjacent to the upper portion of the lower section 23 to provide an opening in the front wall of the material reducing unit. The purpose of the opening will become apparent as the description progresses. The upper portion of the section 19 is bent outwardly and forwardly as at 24 to provide a vent 25 to the atmosphere for the reducing unit.

An inclined upper wall surface 26 extends from a lower edge, which serves as the upper edge of the vent 25, upwardly and rearwardly. The left- and right-hand wall sections 17 and 18 have transversely bent flanges as at 27 and 28 at their forward edges and as at 29 at their rear edges. Suitable bolt and nut combinations serve to secure the front and rear walls 15 and 16 and the inclined wall surface 26 to the flanges.

A material reducing rotor that is indicated in its entirety by the reference numeral 40 and of the type shown and described in detail in U.S. Patent No. 2,291,815 is mounted on a rotor drive shaft 41 having left- and right-hand ends 42, 43 mounted in the respective left- and right-hand wall sections 17 and 18 by bearing assemblies, not shown, having bearing housings 44 and 45. As shown in Fig. 1 the right-hand end 43 of the drive shaft 41 extends outwardly of the right-hand wall section 18 and has fixed to it a multi-groove belt sheave 46, one of the grooves of which receives a belt 47 driven from a drive pulley 48 keyed to a motor shaft 49 that is a part of the main power unit or electric motor 50. The motor 50 and the belt drive consisting of parts 46, 47, 48, as will later become clear, is the assembly drive means. The motor 50 is bolted to a motor frame 51. The motor frame is hinged at 53 and resiliently floated at 54 in a conventional manner. A relay box 60 is fixed to the rear portion of the motor and receives an electric power line 61. Mounted within the box 60 is a current sensitive relay, not shown but of conventional type, which operates the plunger of a solenoid 315 through a wire connection 316, the purpose of which will later be explained.

A transversely disposed imperforate arcuate member 70 is fixed to the reducing housing forwardly and above the reducing rotor 40. An arcuate imperforate member 71 is fixed to the reducing housing to the rear of the reducing rotor 40 and is spaced angularly from the imperforate member 70 to form a material receiving opening 72 above and slightly to the rear of the reducing rotor. Disposed beneath the reducing rotor 40 is an arcuate perforated or screen member 73 having front and rear edges 74 and 75 abutting the bottom edges of the imperforate members 70 and 71 which cooperate with them to form a material reducing chamber around the reducing rotor 40.

The perforated member 73 permits passage of reduced material downwardly into a material collecting hopper 80 mounted in the material reducing unit beneath the reducing chamber and formed by a V-shaped plate member 81 having front and rear leg sections 82, 83 extending upwardly from an arcuate-shaped bottom 85 of the hopper to positions proximate to the respective front and rear wall members 15 and 16. Opposite ends of the plate member 81 are flanged, as at 86, and are fixed to the left- and right-hand walls 17, 18 by welding or other suitable means. In the bottom 85 of the hopper 80 is means for delivering material from the hopper to blower means, which will later be explained, and is in the form of a transverse auger 90 fixedly mounted on an auger drive shaft 91 which has a left-hand end portion 93 extending outwardly from the respective left wall 17 of the housing 14 and which has a right end portion 94 extending through the respective right wall section 18 on the housing 14. The right end portion 94 is journaled at 95 in the right wall 18. The left wall 17 has a circular material discharge opening 96 concentric with the auger drive shaft 91 and sufficiently large to permit the auger 90 to extend therethrough.

The auger 90 provides means for delivering material from the hopper to blower means 100 mounted on and adjacent to the left wall 17 of the unit. The blower means 100 includes a substantially cylindrical blower housing 101 with a blower discharge outlet in its periphery and a blower discharge pipe 102 with a first or inner end fixed to the blower housing and registrable with the blower discharge outlet and extending outwardly from

the housing to a discharge outlet end remote from the material reducing unit. As shown clearly in Figs. 9 and 10, the blower housing 101 is adjustably mounted on the left wall 17 by means of a short cylindrical adapter 103 having an inner circular shaped opening 104 adjacent to and registrable with the material discharge opening 96 in the wall member 17. The adapter 103 is provided with three angularly spaced apart and radially extending flanges 105 that lie adjacent to a side of the blower housing 101, each of which is suitably apertured to receive one of three bolt members 106 extending axially from the housing 101, and is fixedly but removably secured to the blower housing 101 by the bolts 106 and associated nut members 107.

On the axially opposite end of the adapter 103 from the flanges 105 is a radial collar 110 that lies adjacent to the wall member 17. Three angularly spaced apart and arcuate-shaped slots 111 are provided in the collar 110 and receive three axially projecting bolts 112 projecting from the wall 17. The adapter 103 is held in a fixed position relative to the wall member 17 by associated nut members 113. Viewing Fig. 10 it becomes apparent that the discharge pipe 102 and blower housing 100 may be adjusted radially relative to the auger drive shaft 91 by loosening the nut members 113 and angularly resetting the blower means. Thus, the slots 111, bolts 112, and nut members 113 serve as adjustable connecting means between the blower housing and material reducing housing. The auger drive shaft 91 extends through the wall 17 and has its left end portion 93 journaled, as at 114, in the blower housing 101. Also mounted on the left end of the auger drive shaft 91 is a blower fan 115. The auger 90 is terminated substantially at the mouth of the blower housing 101.

The perforated member or screen 73 is held in position by means of a fore-and-aft extending race 120 here in the form of a pair of transversely spaced apart arcuate members 121 connected at their forward ends by means of a crossbar 122. The race 120 is pivotally mounted on a pivot bolt 123 that extends across the reducing unit and is anchored at opposite ends in the left and right walls 17 and 18 of the reducing unit housing 14. The race 120 carries the screen 73 for swinging vertically toward or away from the rotor 40. Upward movement of the screen 73 is limited to a position where the opposite ends 74 and 75 of the member 73 abuts the lower edges of the imperforate members 70 and 71. Thus, the imperforate members 70 and 71 serve also as stop means restricting upward movement of the screen 73.

The race and screen member 73 are held in operative position, which occurs when the opposite ends 74 and 75 of the screen 73 abuts the lower portions of the imperforate members 70 and 71, by a pair of transversely spaced apart hooks 130 that extend beneath the cross member 122 and are connected to a crossbar 131 opposite ends thereof projecting through vertically disposed slots 132 cut in the respective side walls 17 and 18 of the material reducing housing. The opposite ends of the crossbar 131 are pivotally mounted in the forward ends 133 of forwardly projecting legs 134 of bell cranks 135 which are pivotally mounted on respective side walls 17 and 18. Each of the bell cranks also has a depending leg 136 having a lower end in the form of a laterally projecting lug 137 suitably apertured to articulately hold a threaded member 138 that projects forwardly from the lug. When the screen 73 is in operative position, the threaded member 138 extends from the lug 137 to a position forwardly of the upper section 19 of the front wall 15 which is provided with open end slots 141 for receiving the shanks of the threaded members 138. Associated wing nuts 140 are provided with the threaded members 138 to both raise or lower the race and to secure the upper section 19 into overlying position with the flange 27 of the side walls 17 and 18. Therefore, the threaded members 138 and wing nuts 140 serve as

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adjustable means which secures the cover or upper section 19 over the opening when the perforated member is in operative position and releases the section 19 when the perforated member is permitted to drop from the operative position.

From an operative position, access to or removal or replacement of the screen 73 may be done in the following manner. The wing nuts 140 are loosened and the threaded members 138 moved laterally out of the open end slots 141 to permit the upper section 19 to swing forwardly and downwardly on its hinge members 21. Loosening the wing nuts 140 will also permit the bell cranks 135 to pivot, causing the crossbar 131 to drop in the slots 132. The cross member 122 of the bell member 120 may then be lifted manually and the hooks 130 to be drawn from under the cross member. This will permit the race and screen to drop permitting removal of the screen through the opening created when the upper section 19 is swung downwardly. Replacing the screen into its operative position is done in reverse order of removing the member.

A fore-and-aft extending elevator 150 has a relatively low intake end 151 carried on the rear portion 12 of the frame 10 and is inclined upwardly to a relatively high discharge end 153 carried by the reducing unit housing. The elevator has an elevator housing 154 of substantially a U-shaped cross section including vertical sides 155 and 156, and is closed at its lower end by an end plate 162 rigidly fixed to elevator brackets 152. The upper end is secured to the reducing unit housing 14 by bolts 157. Extending between the sides 155 and 156 of the elevator housing 154 are a pair of laterally disposed plate members 158 and 159 that are connected to the upper parts of the plates 155 and 156 by bolt and nut combinations 160. The forward edge of the plate member 158 abuts the upper wall surface 26 of the material reducing housing 14. The plate member 159 extends downwardly from the plate member 158 and encloses only partially the internal members of the elevator, leaving at the lower end of the elevator housing a material receiving opening 161. Mounted at the upper or discharge end of the elevator is an upper end plate member 163 that is fixed to a lip of the imperforated member 70 as by welding. As shown in Fig. 3 the plate member 163 is spaced from the lower portion of the elevator housing 154 to provide a material discharge opening 164 positioned adjacent to the opening 72 between the imperforated members 70 and 71.

Extending the length of the elevator housing 154 and through the lower end plate 162 of the housing and the inclined wall surface 26 of the material reducing housing 14 is a fore-and-aft extending auger drive shaft 170. The shaft 170 is journaled in a thrust bearing 171 that is suitably fixed to the reducing unit housing. An elevator auger 173 is pinned at 174 to the shaft. The auger 173 operates in cooperation with the elevator housing 154 to move materials from the material receiving opening 161 to the material discharge opening 164 where the material is permitted to gravitate into the reducing chamber. Fixed to the forward end of the drive shaft 170 is a bevel gear 175 driven by a bevel pinion 176, and at the opposite or lower end of the auger drive shaft 170 is a bevel pinion 177 which is operative to drive a bevel gear 178 mounted on a vertical shaft 179.

Positioned to the rear of the elevator 150 is a crib or material container 190. The crib 190 in its present form comprises a main frame 191 supporting vertically spaced apart board members 192 that permit ventilation of the material within the crib as well as enclosing the material. The crib 190 also includes a floor 193 that serves in conjunction with the main frame 191 to support a material conveyor 194. At the end of the crib proximate to the elevator 150 is a material delivering port 195 that is formed by the ends of a hopper made up of diverging side members 197.

The material conveyor 194 acts in conjunction with the

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elevator to form feeding means for transferring material from the crib to the material reducing unit and is of the endless chain type comprising a chain 200 having outwardly directed flights 201 and mounted over a drive sprocket 202 which is positioned outboard of the crib 190 and a driven sprocket, not shown, mounted on the inside of the crib. The drive sprocket, viewing the conveyor as shown in Fig. 2, is driven in a clockwise direction. A material collecting or receiving run 203 of the chain 200 extends in the bottom of the hopper and moves material outwardly of the crib. The material receiving run has a portion inboard the crib for collecting the materials and for moving them to a material discharge portion outboard of the crib which in turn discharges the material into the material receiving opening 161 at the lower end of the elevator housing 154. A spout 204 directs the material from the discharge portion of the conveyor to the intake end of the elevator. A tubular agitating shaft 210 is mounted in the crib in a position above and substantially parallel to the material collecting run 203 of the chain 200. Radially extending lugs 211 are fixed as by welding or other suitable means to the tubular shaft 210 and are spaced intermittently and in a spiraling disposition on the shaft. The agitating means, as represented by the shaft 210 and lugs 211, serves to prevent clogging of the material in the crib or container and to provide a more even flow of material to the chain 200.

The drive sprocket or drive member 202 is driven by force transmitting means received from the auger drive shaft 170. As previously mentioned the vertical shaft 179 is rotated by means of the oblique bevel gear 178 that is driven by the bevel pinion 177 mounted on the auger drive shaft 170. On the upper end of the vertical shaft 179 is a hub 215 keyed to the shaft and having a radially extending arm 216. Pivotaly connected to the outer end of the arm 216 is a link 217 that extends from the arm 216 to the outer end of a lever arm 218 mounted on the sprocket shaft 219, the purpose of the entire linkage being to serve as means for changing the rotating motion of the shaft 179 to an oscillating motion in the lever arm 218. The lever arm 218 has a hub 220 that is pivotally mounted on the sprocket shaft 219. The hub 220 is characterized by having an outer cylindrical surface 221 eccentric to the axis of the shaft 219. The driven member or sprocket 202 has a flanged portion 222 axially spaced from the teeth of the sprocket and is positioned to overlies axially the outer surface 221 of the hub 220. The flange portion 222 has an inner cylindrical surface 223 that is concentric with the sprocket shaft 219 and is spaced radially from the outer surface 221 of the hub to form a channel between the hub and the flange. A crescent shaped shoe 224 is disposed in the channel and has an inner surface of substantially the same curvature as the surface 221 of the hub and has an outer surface of substantially the same curvature as the inner surface 223 of the flange. As indicated in Fig. 5 four small axial holes 230 are drilled in the shoe 224. A clutch lever 231, having one end positioned adjacent to and beneath the shoe 224, has an axial projecting pin 232 that is received in one of the holes 230 to cause the shoe and lever to move in unison. The lever 231 has an opening for pivotally receiving the hub 220 and an outwardly projecting portion or end 233 that is connected to one end of a spring 234 that has its other end connected to a toggle link 235 which is pivoted about a downwardly projecting leg 238 extending through the lever arm 218.

The one-way clutch means, as described and shown in Figs. 4, 5 and 6, serves as drive means between the auger drive shaft 170 and the conveyor drive sprocket or member 202 and operates in the following manner. As the lever arm 218 oscillates, alternate strokes thereof in one direction will cause the shoe 224 to wedge between the hub 220 and flange 222 which will result in the hub and flange moving in unison, and alternate strokes in

opposite directions will release the wedging action of the shoe 224 between the hub surface 221 and the flange surface 223 which will result in no movement of the flange or sprocket until the following cycle. The clutch lever 231 and toggle and spring attachment serve two purposes. The toggle in the position shown in Fig. 6 will aid in releasing the shoe and will cause a quick return of the shoe 230 to a non-engaging position when the lever arm 218 moves in the aforesaid opposite direction. When the toggle link 235 is moved in the position indicated in dotted representation in Fig. 7, the clutch lever 231, being fixed to the shoe 224 by the pin 232, will force the shoe angularly until it engages a stop 239 extending from the hub. In this latter position, the width of the channel between the hub surface 221 and the flange surface 223 is sufficient that wedging will not take place throughout the length of the stroke of the lever arm 218. Thus, in this latter condition, the conveyor drive means becomes disengaged from the remainder of the material-reducing assembly. When the shoe becomes worn adjustment for wear may be made by moving the pin 232 to the next hole 230.

The main frame 191 has a forwardly projecting portion 250 which serves to support a conveyor shaft housing 251 having an upper bracket or flange 252 that overlies the upper surface of the forwardly projecting portion 250 and has a lower flange 253 abutting a vertically disposed end surface of the forwardly projecting portion. The upper flange is secured to the forwardly projecting portion 250 by bolt members 254 and correspondingly the lower flange is secured to the forwardly projecting portion by bolt member 255. A U-shaped bracket 256 is positioned above the forwardly projecting portion 250 and has a lower leg portion 257 overlying the upper flange 252 and is suitably apertured to receive the aforementioned bolts 254 which also secure the U-shaped bracket 256 to the forwardly projecting portion 250 of the frame. An upper leg 258 of the U-shaped bracket is connected to an agitator drive lever 259 by means of a bolt and nut combination 260 that extends through the upper leg 258 and an aperture in an agitator drive lever 259 to provide pivotal movement of the drive lever 259 relative to the upper leg 258 of the bracket.

The conveyor drive member or sprocket 202 is keyed to the sprocket shaft 219, as at 270, to cause the sprocket and shaft to rotate in unison. Mounted on the upper end of the shaft 219 is a radially extending arm 271. A hub 272 of the arm 271 is mounted on the shaft 219 and held against axial and radial movement by means of a pin 273 extending diametrically through the two. The outer end 274 of the arm 271 is connected to the lever 259 by a bolt 275 that extends through a slot 261 in the drive lever 259 and is threaded into the arm 271. Viewing Figs. 1 and 4 it becomes apparent that as the arm 271 rotates, it will cause the drive lever 259 to oscillate or rock about the bolt and nut combination 260.

The agitator shaft 210 is driven by means of a one-way clutch 280, shown in section in Fig. 7, that includes a clutch arm 281 integral with a hub 282 that fits over the shaft 210 and that has a wedge-shaped pocket 283 at one side of the shaft 210. A metallic ball 284 placed in the pocket 283 will, upon movement of the clutch arm 281 in one direction, cause a wedging of the ball between the hub and the shaft 210 which will result in a movement of the shaft 210 in unison with the arm and hub. Movement of the arm in the opposite direction will, of course, release the wedging action and no movement of the shaft 210 will occur. The lower end, as viewed in Figs. 4 and 7 of the clutch arm 281, is connected to the agitator drive lever 259 by a link 285.

Viewing Fig. 1, it becomes apparent that the blower means and the material reducing unit feeding means, which for purposes of this invention will include both the conveyor 194 and elevator 150, are driven by force-transmitting means, which as shown here are in the form

of belt drives driven by the rotor shaft 41 and as such will operate in unison with the material reducing rotor 40. Specifically, the blower drive means or force-transmitting means includes a belt groove 290 in the sheave 46, a driven pulley 291 mounted on the right end 94 of the drive shaft 91, and an idler pulley 292 that is adjustably mounted for movement fore-and-aft on a bracket 283 mounted on the right wall 18 of the material-reducing housing 14 and serves to provide adjustment in the tension or take-up on a V-belt 294 mounted over the pulleys. The force-transmitting or drive means that operates to drive the elevator or feeding means is also in the form of a V-belt drive and includes a groove, not shown, in the sheave 46, an idler pulley 301 that is mounted on a bracket 302 which is fixed to the wall member 18 and which permits movement fore-and-aft of the idler pulley, and a driven pulley 303 that is operative to drive a speed reducing gear train positioned in a gear housing 304 and which in turn drives a transverse shaft 305 on which is mounted the bevel pinion 176 that as previously mentioned drives the auger drive shaft 170. Also included is a V-belt 306 that is suitably mounted on the pulleys 301, 303, and the groove in the sheave 46.

In the force-transmitting means that extends from the rotor drive shaft 41 to the transverse shaft 305 is overload responsive means for automatically stopping and starting the feeding means to limit the quantity of material delivered to the material-reducing means. The overload responsive means comprises a bell crank member 310 that is pivotally mounted on a bracket 311 which projects forwardly from the material reducing housing 14. The bell crank member 310 has an upwardly extending leg 312 engageable with a clutch ratchet 313 mounted on the shaft 305. The bell crank member 310 also includes a rearwardly extending leg 314 which has its rear end connected to a solenoid 315 mounted on the right wall 18 of the material-reducing housing. The solenoid 315 is connected to the box 60 by means of a wire 316 and is responsive to increased current created by a power overload on the motor to drop a plunger 317 thereby causing the rearwardly projecting leg 314 to be driven downwardly resulting in the leg 312 disengaging the ratchet 313. The type of solenoid here used is conventional and hence, details are not shown. However, should a more elaborate description be desired, such may be had by reference to U.S. Patent 2,239,267.

The gear train enclosed within the housing 304 is basically a sun and planetary type gear arrangement. Journalled, as at 320, to the shaft 305 is a first sun gear 321. The gear 321 has a relatively long axially extending hub portion 322, the outer periphery of which has the ratchet 313 keyed thereto and the pulley 303 journalled thereon. A second sun gear 323 is keyed as at 324 to an outer reduced end 305a of the shaft 305. The housing 304 and pulley 303 are fixed to rotate in unison by means of a stub shaft 325 which also carries a pair of integral planetary gears 326, 327 which mesh with the sun gears 321 and 323 respectively. As may be seen in Fig. 11, there is provided on the upper end of the arm 312 a transversely extending pawl or arm which is engageable with the teeth on the ratchet 313. As previously mentioned, the arm 312 and pawl 328 are controlled by the solenoid plunger 317 to engage or disengage the teeth on the ratchet 313.

Assuming that there is normal load on the grinding or milling unit, the pawl 328 will be in engagement with the teeth of the ratchet 313 thereby causing the first sun gear 321 to be locked against rotation. Upon rotation of the pulley 303, the planetary gears 326, 327 will be caused to rotate thereby causing the second sun gear 323 to rotate the shaft 305. This will cause the shaft 170 and its associated auger 173 to drive the material into the milling chamber. However, should for some reason, a large load occur within the milling chamber, the power required will be increased which would effect an increased

quantity of current to flow to the motor 50. The increase quantity of current will cause reaction by the current sensitive relay in the box 60 to drive the plunger 317 and arm 314 of the bell crank member 310 downwardly so as to effect disengagement of the pawl 328 from the ratchet wheel 313 or substantially in the position as shown in Fig. 11. Since there is resistance to rotation in the shaft 305, the sun gear 323 will be held against movement. Rotation of the pulley 303 will cause the planetary gear 326 to drive the first sun gear 321. Since the gear 321 is not held against rotation, the gear 321 will be free to rotate on the shaft 305. Therefore, no power will be delivered to the shaft 305 and the auger 173 will cease feeding material to the milling chamber. This condition will remain until the current required to drive the motor 50 is sufficiently reduced to effect retarding of the plunger 317 in the solenoid and the bell crank 310 is moved to cause the pawl 328 to again engage the ratchet wheel 313. Therefore, should the reducing unit receive excess material, the power required to operate the unit would be drawn by the motor which in turn would cause the solenoid to react to disengage the material-reducing feeding means. The reducing unit, including the blower means, would continue to operate and upon the amount of material being reduced to a normal power-consuming amount the solenoid would react to cause the feeding means to again operate to feed materials to the unit.

It should be noted that descriptive words such as "front" and "rear," "left" and "right," etc. are herein used only for means of explanation and are not intended to imply limitations on the invention, and it is desired not to be limited to the precise construction herein disclosed. Obviously, those skilled in the art could make various changes in the details and arrangements of parts without departing from the spirit and scope of the invention.

What is claimed is:

1. A material reducing assembly for reducing materials collected in a crib or similar container having a material unloading port comprising: a fore-and-aft extending frame having front and rear portions; a material reducing unit including a vertically disposed material reducing housing carried on the front portion of the frame and having therein a material reducing rotor mounted on a rotor drive shaft journaled to the housing, a perforated member mounted beneath the reducing rotor and on the housing to permit passage of reduced material to a material collecting hopper mounted in the housing beneath the member; assembly drive means for driving the rotor shaft and including a main power unit mounted on the frame proximate to and to the rear of the material reducing housing, blower means contained in a blower housing adjacent to the material reducing housing including a blower discharge pipe having a first end fixed to the blower housing and extending to a remote discharge outlet end, adjustable connecting means between the material reducing housing and blower housing whereby the direction of the discharge pipe relative to the material reducing housing may be regulated; means delivering material from the hopper to the blower means; feeding means for transferring materials from the crib to the material reducing unit including a fore-and-aft extending elevator having a relatively low intake end carried on the rear portion of the frame to the rear of the power unit and inclined upwardly and forwardly above the power unit to a relatively high discharge end carried by the material reducing housing, and elevator drive means for moving materials from the intake end to the discharge end and into the material reducing unit, an unloading conveyor supported by the crib and extending through the material unloading port and having a material receiving portion within the crib and a material delivering portion outboard of the crib above and proximate to the intake end of the elevator for delivering materials to the latter, and conveyor drive means extending from the elevator drive means to cause the elevator and conveyor to operate

in unison, and material agitating means mounted in the crib for feeding material to the conveyor and including means operative from the conveyor drive means for operating the agitating means upon operation of the conveyor; and power transmitting means extending from the rotor shaft to the blower means and elevator drive means to cause the blower and feeding means to operate in unison with the material reducing rotor and including therein overload responsive means for automatically starting and stopping the feeding means to prevent an overload of material delivered to the material reducing unit.

2. A material reducing assembly for reducing materials collected in a crib or similar container having a material unloading port comprising: a main supporting frame; a material reducing unit carried on the frame; a power unit mounted on the frame; drive means extending from the power unit to the reducing unit for operating the latter; feeding means for transferring materials from the crib to the reducing unit including an elevator having a relatively low intake end carried on the frame and inclined upwardly to a relatively high discharge end opening into the material reducing unit, and elevator drive means for moving materials from the intake end to the discharge end and into the reducing unit and including therein an elevator drive shaft, and an unloading conveyor supported by the crib extending through the material unloading port and having a material receiving portion within the crib and a material delivering portion outboard of the crib above and proximate to the intake end of the elevator for delivering materials to the latter, a conveyor drive member for operating the conveyor, one-way clutch means extending from the elevator drive shaft to the conveyor drive member to cause the elevator and conveyor to operate in unison; and power transmitting means extending from the material reducing unit to the elevator drive means to cause the feeding means to operate in unison with the material reducing unit and including therein overload responsive means for automatically starting and stopping the feeding means to prevent an overload of material delivered to the material reducing unit.

3. A material reducing assembly for reducing materials collected in a crib or similar container having a material unloading port comprising: a main supporting frame; a material reducing unit carried on the frame; a power unit mounted on the frame; drive means extending from the power unit to the reducing unit for operating the latter; feeding means for transferring materials from the crib to the reducing unit including an elevator having a relatively low intake end carried on the frame and inclined upwardly to a relatively high discharge end carried by the material reducing unit, and elevator drive means for moving materials from the intake end to the discharge end and into the reducing unit and including therein an elevator drive shaft, and an unloading conveyor supported by the crib extending through the material unloading port and having a material receiving portion within the crib and a material delivering portion outboard of the crib above and proximate to the intake end of the elevator for delivering materials to the latter, a conveyor drive member for operating the conveyor, one-way clutch means extending from the elevator drive shaft to the conveyor drive member to cause the elevator and conveyor to operate in unison; and power transmitting means extending from the material reducing unit to the elevator drive means to cause the feeding means to operate in unison with the material reducing unit.

4. The invention defined in claim 3, in which the one-way clutch is characterized by a shaft mounted on the crib, an oscillating arm extending radially from the shaft and having an axially projecting hub integral with the arm and rotatably mounted thereon, the hub having an outer cylindrical surface; the conveyor drive member being mounted on the shaft and having a flange overlying

the hub axially, and having an inner cylindrical surface spaced radially from the outer surface of the hub to provide a channel between the hub and the flange, one of said inner and outer surfaces being concentric with the shaft and the other eccentric to the shaft, an arcuate shaped shoe disposed in the channel having a first surface of substantially the same curvature as the outer surface of the hub and a second surface of substantially the same curvature as the inner surface of the flange whereby movement of the arm in one direction shall cause the shoe to wedge between the hub and the flange resulting in rotation of the driven member and movement of the arm in the opposite direction will release the shoe from wedging between the hub and flange, biasing means connected to the arcuate shaped shoe including a toggle link for moving the biasing means to a first position to cause the shoe to remain in contact with the hub and flange as the arm moves in said opposite direction, and in a second position whereby the arcuate member will be moved angularly about the hub to prevent wedging of the shoe as the arm oscillates and means extending from the elevator drive shaft to cause the arm to oscillate.

5. The invention defined in claim 4, further characterized by said biasing means comprising: a lever having an end adjacent to the arcuate shoe and with an opening for pivotally receiving the hub and extending radially from the hub to an outer end, means fixing the shoe to the lever to cause the shoe and lever to move in unison about the hub, the outer end of the lever being connected to one end of a pre-loaded spring that has its opposite end connected to the toggle means.

6. Feeding means for delivering material from a crib or like container having a material delivering port to a material treating unit mounted on a front portion of a frame having front and rear portions and including drive means for operating the treating unit, said feeding means comprising: a fore-and-aft extending elevator including an elevator housing having a relatively low rear end carried on the rear portion of the frame and inclined upwardly and forwardly to a relatively high forward end supported by the material treating unit, a material intake opening in the housing proximate to the rear end, a material discharge opening proximate to the forward end and adjacent to the material treating unit to permit material to pass into the material treating unit, an auger cooperative with the elevator housing to move material from the intake opening to the discharge opening and concentric with and fixed to an auger drive shaft having front and rear end portions journaled to respective front and rear ends of the housing; elevator drive means operative from the material treating unit drive means for rotating the auger drive shaft in unison with the material treating unit and including therein overload responsive means for automatically starting and stopping rotation of the auger drive shaft to prevent an overload of material delivered to the material treating unit; an unloading conveyor supported by the crib and extending through the material unloading port and having a material receiving portion within the crib and a material delivery portion outboard of the crib and above and proximate to the intake opening of the elevator housing for delivering material to the elevator and including material advancing means operative from a conveyor drive member for moving materials from inside to outside the crib; and force transmitting means extending from the auger drive shaft to the conveyor drive member to cause the elevator and conveyor to operate substantially in unison.

7. Feeding means for delivering material from a crib or like container to a material treating unit mounted on a frame and including drive means for operating the treating unit, said feeding means comprising: an elevator including an elevator housing having a lower end carried on the frame and inclined upwardly to an upper

end supported by the material treating unit, a material intake opening in the housing proximate to the lower end, a material discharge opening proximate to the upper end and adjacent to the material treating unit to permit material to pass into the material treating unit, an auger cooperative with the elevator housing to move material from the intake opening to the discharge opening and concentric with and fixed to an auger drive shaft having upper and lower end portions journaled to respective ends of the housing; elevator drive means operative from the material treating unit drive means for rotating the auger drive shaft in unison with the material treating unit; an unloading conveyor supported by the crib and having a material receiving portion within the crib and a material delivery portion above and proximate to the intake opening of the elevator housing for delivering material to the elevator and including material advancing means operative from a conveyor drive member for moving materials from inside to outside the crib; and force transmitting means extending from the auger drive shaft to the conveyor drive member to cause the elevator and conveyor to operate substantially in unison.

8. Feeding means for delivering material from a crib or like container having a material delivering port to a grinding unit mounted on a front portion of a frame having front and rear portions and including a grinding unit drive means, said feeding means comprising: a fore-and-aft extending elevator including an elevator housing having a relatively low rear end carried on the rear portion of the frame and inclined upwardly and forwardly to a relatively high forward end supported by the grinding unit, a material intake opening in the housing proximate to the rear end, a material discharge opening proximate to the forward end and adjacent to the grinding unit to permit material to pass into the grinding unit, an auger cooperative with the elevator housing to move material from the intake opening to the discharge opening and concentric with and fixed to an auger drive shaft having front and rear end portions journaled to respective front and rear ends of the housing; elevator drive means operative from the grinding unit drive means for rotating the auger drive shaft in unison with the grinding unit and including therein overload responsive means for automatically starting and stopping rotation of the auger drive shaft to prevent an overload of material delivered to the grinding unit; and an unloading conveyor operative to be driven by the elevator drive means supported by the crib and extending through the material unloading port for delivering material from the crib into the intake opening of the elevator housing.

9. Feeding means for delivering material from a crib or like container comprising: a frame; an elevator carried on the frame having a material intake end and a material discharge end; elevator drive means mounted on the frame including an elevator drive shaft for moving material from the intake end to the discharge end; an unloading conveyor supported by the crib and having a material receiving portion within the crib and a material delivery portion proximate to the intake end of the elevator for delivering material to the elevator and including material advancing means operative from a conveyor drive member for moving materials from inside to outside the crib; a shaft mounted on the crib, an oscillating arm extending radially from the shaft and having an axially projecting hub integral with the arm and rotatably mounted thereon, the hub having an outer cylindrical surface; the conveyor drive member being mounted on the shaft and having a flange overlying the hub axially, and having an inner cylindrical surface spaced radially from the outer surface of the hub to provide a channel between the hub and the flange, one of said inner and outer surfaces being concentric with the shaft and the other eccentric to the shaft, an arcuate shaped shoe disposed in the channel having a first surface of substantially

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the same curvature as the outer surface of the hub and a second surface of substantially the same curvature as the inner surface of the flange whereby movement of the arm in one direction shall cause the shoe to wedge between the hub and the flange resulting in rotation of the driven member and movement of the arm in the opposite direction will release the shoe from wedging between the hub and flange, biasing means connected to the arcuate shaped shoe including a toggle link for moving the biasing means to a first position to cause the shoe to remain in contact with the hub and flange as the arm moves in said opposite direction, and in a second position whereby the arcuate member will be moved angularly about the hub to prevent wedging of the shoe as the arm oscillates and means extending from the elevator drive shaft to cause the arm to oscillate.

10. The invention defined in claim 9, further characterized by said biasing means comprising: a lever having an end adjacent to the arcuate shoe and with an opening for pivotally receiving the hub and extending radially from the hub to an outer end, means fixing the shoe to the lever to cause the shoe and lever to move in unison about the hub, the outer end of the lever being connected to one end of a pre-loaded spring that has its opposite end connected to the toggle means.

11. The invention defined in claim 10, in which the means fixing the shoe to the lever includes therein means for adjusting the shoe angularly to provide takeup when the shoe wears.

12. A material reducing assembly for reducing materials collected in a crib or similar container having a material unloading port comprising: a frame having front and rear portions; a material reducing unit carried on the frame for reducing materials received from the crib; assembly drive means for operating the reducing unit and including a main electrical motor mounted on the frame proximate to the reducing unit; feeding means transferring materials from the crib to the material reducing unit including a feed conveyor carried on the frame and having an intake end and a discharge end opening into the material reducing unit, and drive means

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for moving materials from the intake end to the discharge end and into the material reducing unit, and an unloading conveyor extending through the material unloading port and having a material receiving portion within the crib and a material delivering portion outboard of the crib proximate to the intake end of the feed conveyor for delivering materials to the latter, and conveyor drive means for the unloading conveyor extending from the feed conveyor drive means to cause both conveyors to operate in unison; and power transmitting means including a clutch extending from the material reducing unit to the feed conveyor drive means to cause the feeding means to operate in unison with the material reducing unit and further including therein overload responsive means having a part thereof responsive to electrical power input to the motor to disengage the clutch upon an excessive load of materials being in the reducing unit and to reengage the clutch upon a normal load of materials being in the reducing unit.

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