April 24, 1951 E. S. SCOTT 2,550,301

DISK GRINDER AND MIXER

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Fig. 10.

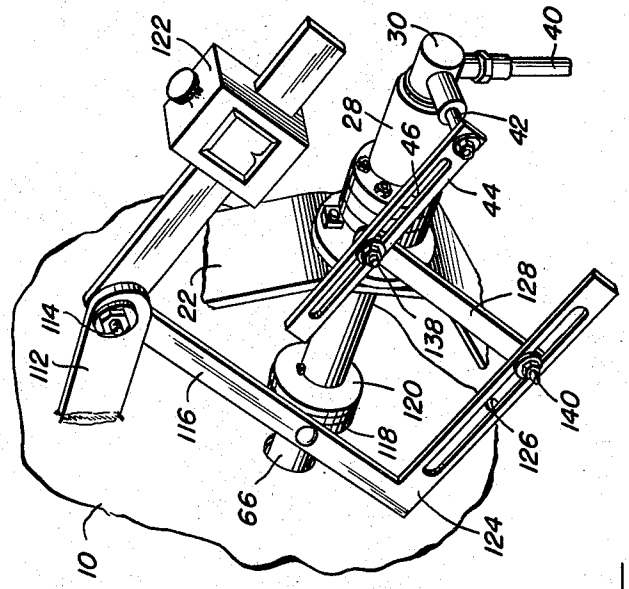
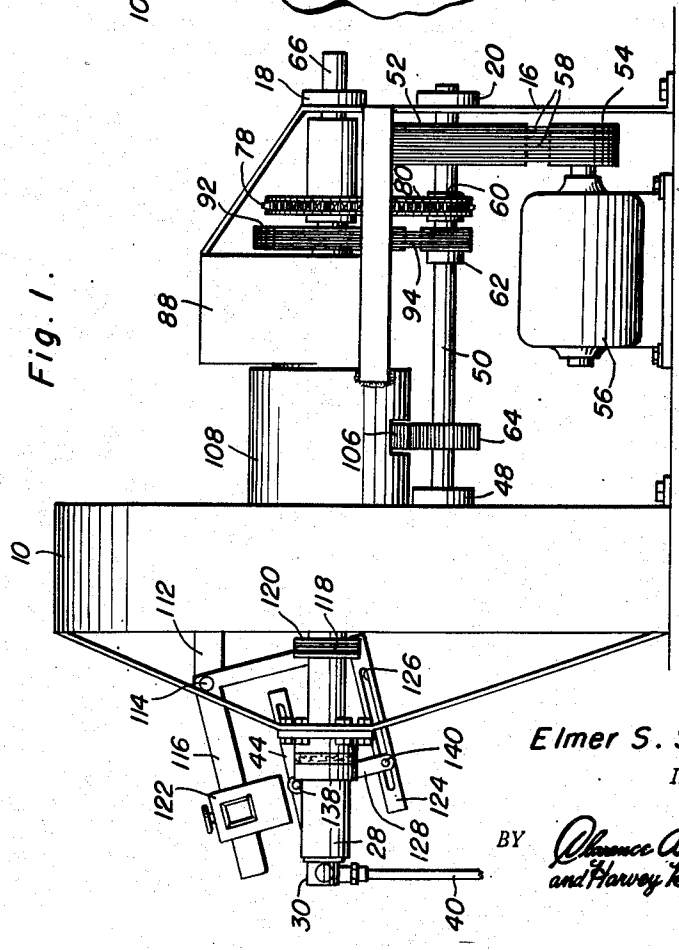



Fig. 1.




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DISK GRINDER AND MIXER

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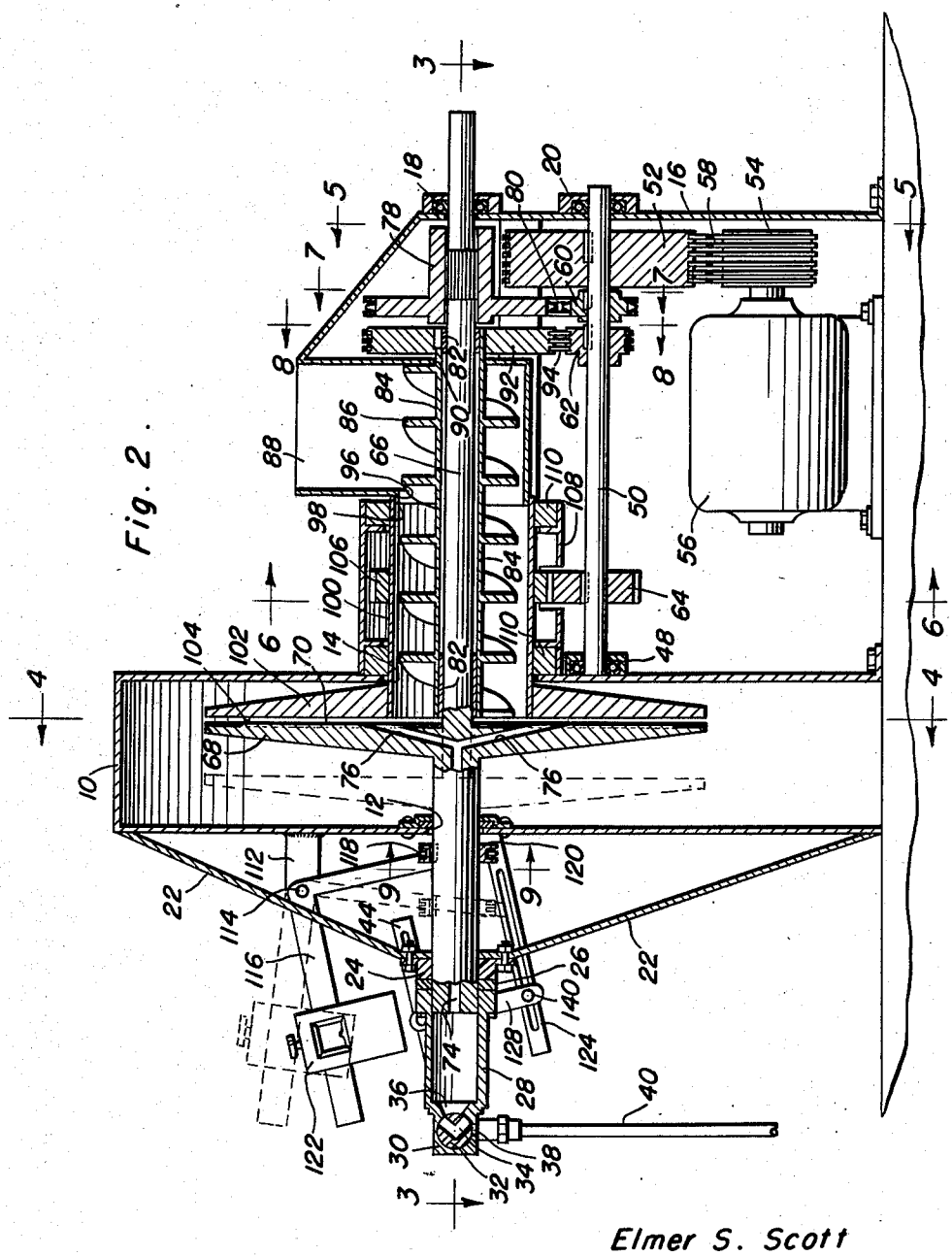


Fig. 2.

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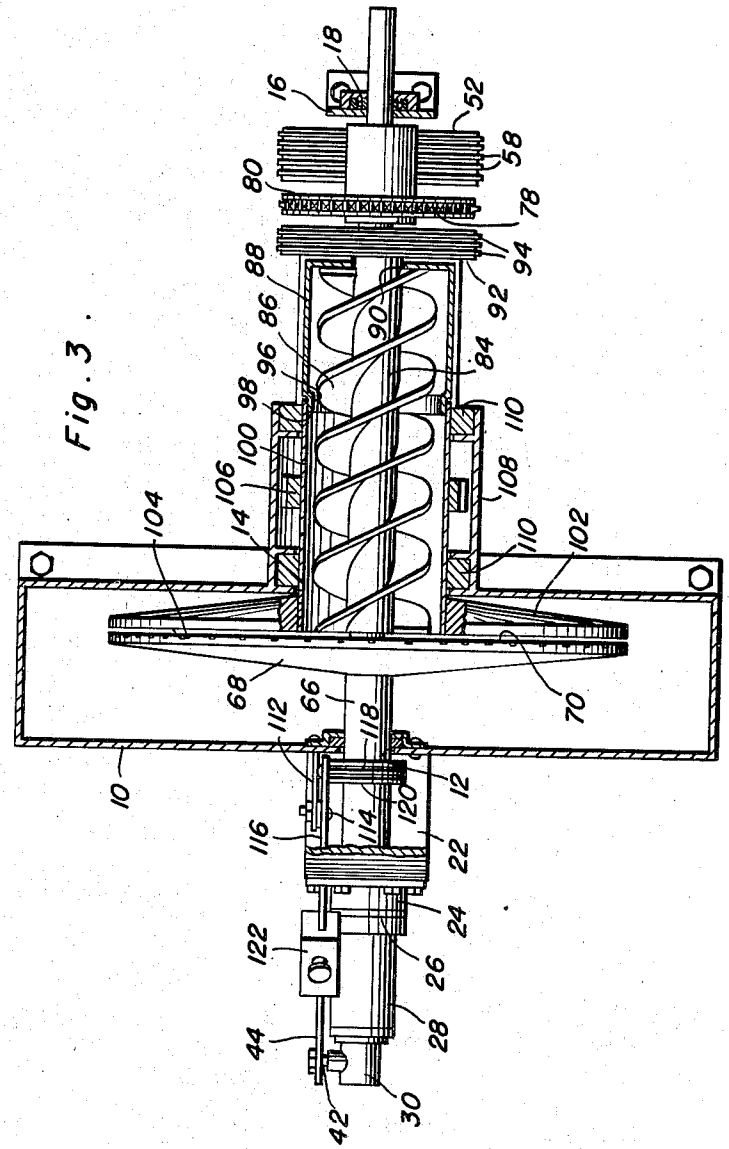
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DISK GRINDER AND MIXER

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Fig. 3.




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DISK GRINDER AND MIXER

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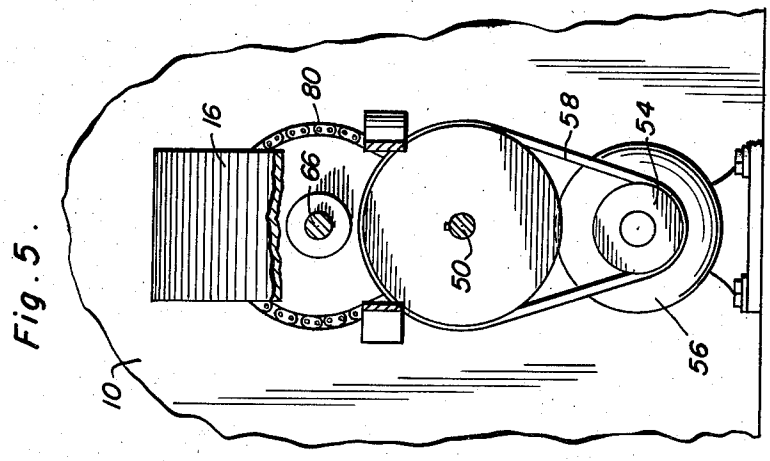



Fig. 5.

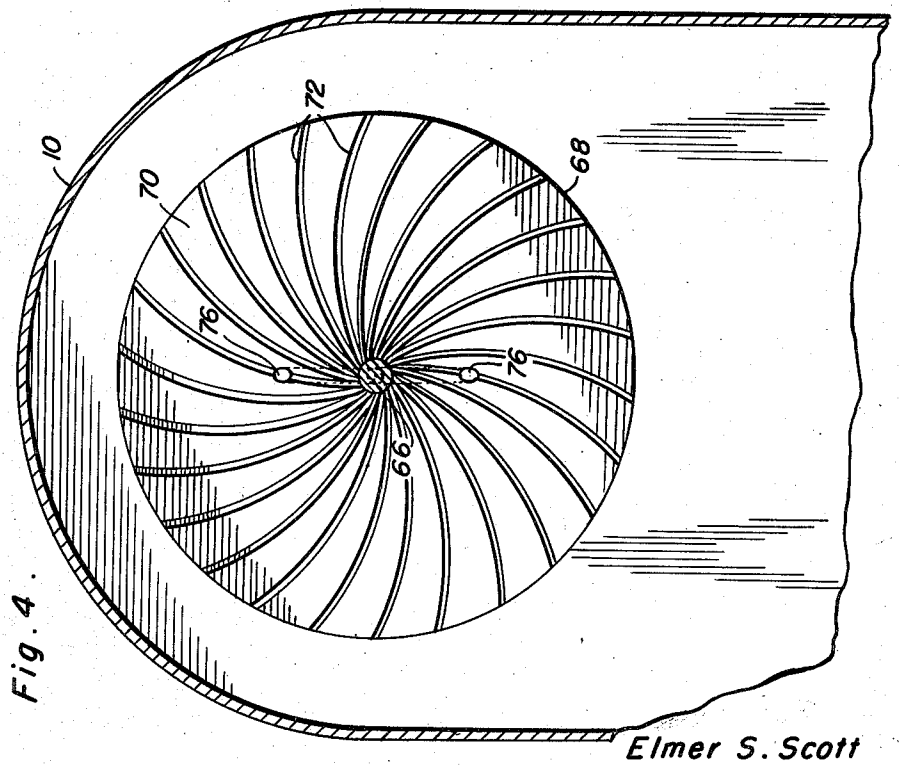



Fig. 4.

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DISK GRINDER AND MIXER

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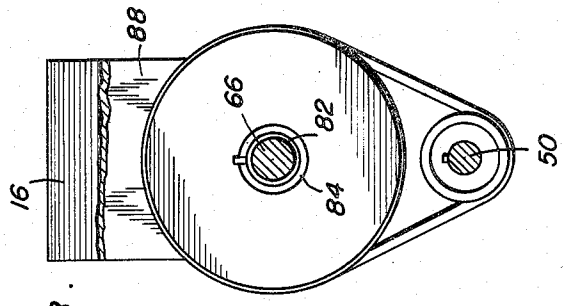



Fig. 8.

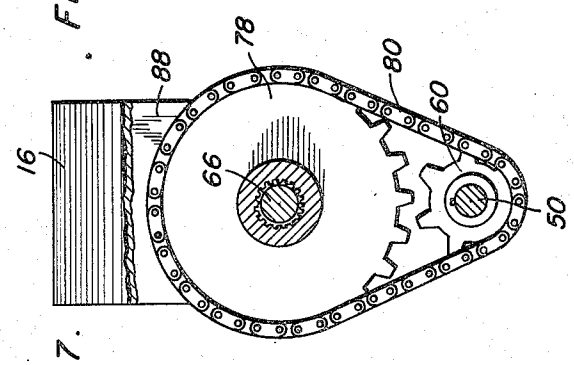



Fig. 7.

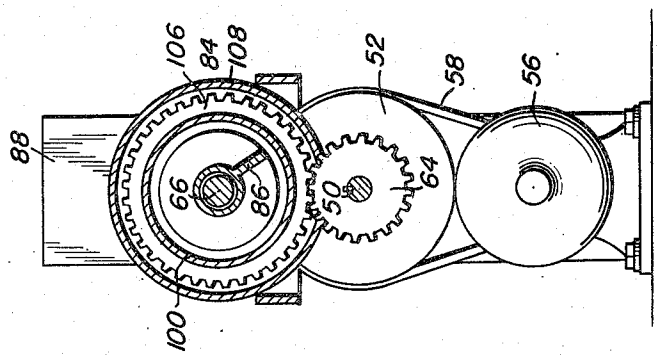



Fig. 6.

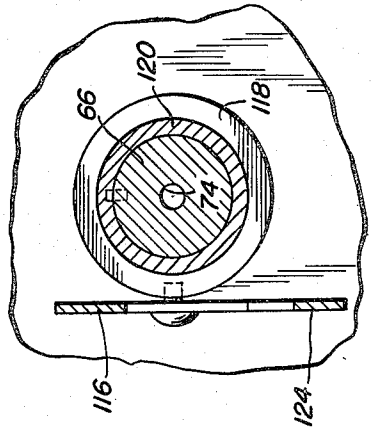



Fig. 9.

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2,550,301

# UNITED STATES PATENT OFFICE

2,550,301

## DISK GRINDER AND MIXER

Elmer S. Scott, Dallas, Tex.

Application July 6, 1948, Serial No. 37,213

3 Claims. (Cl. 241—34)

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This invention relates to a disk grinder of the type disclosed in U. S. Patent 2,316,982 issued April 20, 1943, to L. A. Wilson. The invention also includes the mixing of a liquid such as molasses with animal feeds as exemplified in Patent No. 1,914,459 issued June 20, 1933, to F. J. Reider et al., and also a grinding machine having separable grinding disks which are yieldingly urged into grinding relation with one another as illustrated in U. S. Patent 302,826 issued July 29, 1884, to J. J. and B. Clark and U. S. Patent 1,135,313 issued April 13, 1915, to W. F. and G. J. Moore.

The primary object of the invention is to regulate the rapidity of the feed of the liquid in direct proportion to the rapidity with which the dry material is advanced into grinding position between a pair of rotating grinding disks or heads.

Another object is yieldingly to urge one grinding disk into contact with the other grinding disk or head and simultaneously actuate a liquid valve which increases the flow of liquid, and the distribution thereof as the grinding disks or heads are moved away from one another according to the volume of the feed or other material to be ground that is confined between the grinding disks.

The above and other objects may be attained by employing this invention which embodies among its features a shaft mounted to rotate about a horizontal axis and to move longitudinally along said axis, a grinding head intermediate the ends of the shaft and rotatable therewith, a tubular material conduit mounted to rotate in spaced concentric relation about said shaft between one end of said shaft and the grinding head, a grinding head on the tubular conduit adjacent the first mentioned grinding head and common drive means to drive both the shaft and the conduit in opposite directions.

Other features include a conveyor screw encircling the shaft and operable within the tubular conduit to advance material therein toward the grinding heads and means engaging the shaft yieldingly to hold the grinding head carried thereby in contact with the grinding head carried by the conduit.

Still other features include means entering the shaft from the end remote from the tubular conduit for conveying liquid to the space between the grinding heads, and means automatically to increase the flow of liquid as the grinding heads are separated by increased volume of dry material entering the space therebetween through the tubular conduit.

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Other features include adjustable means to resist the effort of the feed advanced through the tubular conduit into the space between the grinding heads to separate said grinding heads.

In the drawings:

Figure 1 is a side view in elevation of a grinder and mixer embodying the features of this invention;

Figure 2 is a longitudinal sectional view taken in a vertical plane through the grinder and mixer illustrated in Figure 1 and being on a slightly enlarged scale;

Figure 3 is a horizontal sectional view taken substantially along the line 3—3 of Figure 2;

Figure 4 is a vertical sectional view taken substantially along the line 4—4 of Figure 2;

Figure 5 is a vertical sectional view taken substantially along the line 5—5 of Figure 2;

Figure 6 is a vertical sectional view taken substantially along the line 6—6 of Figure 2;

Figure 7 is a vertical sectional view taken substantially along the line 7—7 of Figure 2;

Figure 8 is a vertical sectional view taken substantially along the line 8—8 of Figure 2;

Figure 9 is a fragmentary enlarged vertical sectional view taken substantially along the line 9—9 of Figure 2; and

Figure 10 is an enlarged perspective view of the means for regulating the pressure exerted by the disks on the material being ground and also for regulating the rapidity with which liquid is admitted to the space between the grinding disks or heads.

Referring to the drawings in detail this improved feed grinding and mixing mill comprises a housing 10 in which the grinding disks operate. The lower end of the housing is open and may discharge into a mixed feed bin or the like according to the requirements of the user. One side wall of the housing 10 is provided with an opening 12 of relatively small diameter, and aligning axially with the opening 12 in the opposite wall of the housing is an opening 14 of considerably larger diameter. A suitable standard 16 extends upwardly in spaced parallel relation to the housing 10 on the side thereof containing the opening 14 and carried by the standard 16 are vertically spaced anti-friction bearings 18 and 20, the former of which aligns axially with the openings 12 and 14. Fixed to the housing 10 on the side remote from the standard 16 are suitable supports 22 carrying in alignment with the openings 12 and 14 a suitable bearing member 24 which is equipped with a conventional end packing 26 against which a fitting 28 abuts. This

fitting is provided at the end remote from the bearing 24 with a valve 30 containing a turning plug 32 having an L-shaped port 34, one leg of which is adapted to register with a port 36 which opens into the interior of the fitting 28, when the opposite leg registers with a port 38 through which liquid, such as molasses enters the valve from a suitable supply pipe 40 which is connected with any source of supply (not shown). The turning plug 32 of the valve is provided with a stem 42 to the outer end of which is fixed an actuating lever 44 by which the turning plug may be rotated within the body of the valve 30. The lever 44 is provided with a longitudinally extending elongated slot 46 for a purpose to be more fully hereinafter described. Fixed to the housing 10 on the side thereof having the opening 14 therein is a suitable anti-friction bearing 48 which aligns axially with the bearing 20 previously referred to.

Mounted for rotation in the bearings 20 and 48 is a transmission shaft 50 carrying a drive pulley 52 which is coupled to the drive pulley 54 of a suitable prime mover 56, such as an electric motor, through the medium of a plurality of endless drive belts 58. As illustrated in Figure 2 the drive pulley 52 is keyed to the shaft 50 so that when the prime mover is set into operation, the shaft 50 will be rotated. Fixed to the transmission shaft 50 adjacent the drive pulley 52 is a sprocket 60, and keyed or otherwise fixed to the shaft 50 adjacent the sprocket 60 is a drive pulley 62. A drive pinion 64 is keyed or otherwise fixed to the shaft 50 to rotate therewith near the end of the shaft which rotates in the bearing 48 for meshing engagement with the drive gear driving one of the grinding heads or discs to be more fully hereinafter described.

Mounted for rotation in the anti-friction bearing 18 is one end of a shaft 66, the opposite end of which rotates in the bearing member 24, and projects into the fitting 28. This shaft 66 is arranged to not only rotate in the bearing members above referred to, but also to slide longitudinally therein along a horizontal axis which lies parallel to the axis of the shaft 50 as will be readily understood upon reference to Figure 2. Fixed to the shaft 66 intermediate the ends thereof and within the housing 10 is a grinding head or disk 68 having a flat grinding face 70 which is provided at spaced intervals with arcuate grooves 72 (Fig. 4) which converge toward the shaft 66. Entering the end of the shaft 66 which is contained within the fitting 28 is a passage 74 which extends into the back of the disk 68 and opens into divergent passages 76. The ends of the passages 76 open through the flat face 70 of the grinding disk or head 68 as will be readily understood upon reference to Figures 2 and 4. It will thus be seen that liquid entering the fitting 28 through the valve 30 will be conducted through the shaft 66 and passages 76 to the face 70 of the disk 68. Splined or otherwise fixed to the shaft 66 adjacent the end remote from the fitting 28, for longitudinal sliding movement relative to said shaft, but for rotation therewith is a sprocket 78 which is coupled to the drive sprocket 60 by an endless chain 80. It will thus be seen that when the shaft 50 is driven, the shaft 66 will be rotated in unison therewith.

Mounted for rotation on suitable bearings 82 about the shaft 66 between the grinding head or disk 68 and the sprocket 78 is a tubular shaft 84 carrying on its periphery a spiral flange 86 which cooperates with the tubular conduit and hopper



to be more fully hereinafter described in forming a material conveyor screw by which the material to be ground and mixed is advanced toward the grinding head or disk 68.

Supported on the standard 16 is a hopper 88 which is provided in one end wall with an opening 90 through which the tubular shaft 84 extends, and fixed to the end of the tubular shaft which projects through the opening 90 is a pulley 92 which has driving connection with the pulley 62 through the medium of endless belts 94. The opposite end of the hopper is provided with an opening 96 of a size sufficient to accommodate the spiral flange 86 of the tubular shaft 84 and surrounding the opening 96 is an annular flange 98 which forms the support for one end of a tubular conduit 100, the opposite end of which projects through the opening 14 of the casing 10 and has fixed thereto a grinding disk or head 102 having a flat face 104 which opposes the flat face of the grinding head or disk 70, and cooperates therewith in grinding the feed which is fed through the hopper and the tubular conduit. Encircling the tubular conduit 100 substantially midway between its ends, and in meshing relation with the drive pinion 64 is a gear 106 which has driving connection with the tubular conduit so that when the shaft 50 is rotated the tubular conduit and grinding head or disk 102 will be driven. A suitable tubular guard 108 encloses the tubular conduit 100 and is fixed at one end to the casing 10, while the opposite end projects toward the hopper 88 as will be readily understood upon reference to Figures 2 and 3. Suitable bearings 110 are arranged at opposite ends of the guard 108 to support the tubular conduit 100 for concentric rotation therein.

Fixed to the side of the housing 10 remote from the tubular conduit 100 is a bracket arm 112 to which is pivotally coupled as at 114 the knee of a bell crank lever 116, one leg of which projects donwwardly and is coupled intermediate its ends to a suitable fork or ring 118 which operates in a grooved ring 120 which is fixed to the shaft 66 near the wall of the housing 10 to which the bracket 12 is fixed. A suitable weight 122 is adjustably mounted for longitudinal movement along the opposite arm of the bell crank lever 16, yieldingly to rock the bell crank lever 116 about its pivot 114 and cause the ring or fork 118 to advance the shaft 66 longitudinally and yieldingly hold the grinding face 70 of the grinding head 68 against the grinding face 104 of the grinding head or disk 102. The lower end of the depending arm of the bell crank lever 116 is provided with an arm 124 which lies parallel with the arm along which the weight 122 slides, and formed in the arm 124 is an elongated longitudinally extending slot 126. A link 128 is coupled as by a bolt 138, at one end to the valve actuating lever arm 44 for longitudinal adjustment in the slot 46, and the opposite end of the link 128 is coupled as by a bolt 140 to the arm 124 for longitudinal adjustment in the slot 126. It will thus be seen that as the bell crank lever 116 moves about its pivot 114, the lever arm 44 will be moved to rotate the turning plug 32 in the valve 30.

In operation the feed or grain to be ground is introduced into the hopper 88, and with the prime mover 56 set into operation it will be obvious that the transmission shaft 50 will be rotated to drive the pulley 62 and through the medium of the belts 94 will cause the pulley 92 to rotate and transmit rotary motion to the tubular shaft 84

which is turned in a direction to cause the feed screw 86 to advance the material to be grounded toward the grinding head or disk 68. Simultaneously with the rotation of the tubular shaft 84, the chain and sprocket connection between the sprockets 60, chain 80 and sprocket 78 will cause the shaft 66 to rotate, and hence drive the grinding disk or head in the same direction as the tubular shaft 84 rotates. Through the medium of the pinion 64 and gear 106, the tubular conduit 100 will be rotated in a direction reverse to the direction of rotation of the shaft 66, and since the head or grinding disk 102 is rotatable with the tubular conduit 100, it will be obvious that the head 102 will rotate in a direction opposite the direction of rotation of the head 68. As the feed or grain, or other material to be ground is fed by the screw 86 against the head 68, it will be obvious that the two heads 68 and 102 will be under pressure so that the head 68 will tend to move away from the head 102, thus causing the shaft 66 to move longitudinally along its longitudinal axis against the effort of the weight 122 which acts through the medium of the bell crank 116, fork or ring 118 and the grooved ring 120 to urge the face 70 of the disk 68 against the face 104 of the disk or head 102. In this way the space between the disks or heads 68 and 102 will vary according to the rapidity with which the material to be ground is fed through the tubular conduit 100. Simultaneously with the movement of the grinding head 68 away from the head 102, the arm 124 on the bell crank lever 116 will move to cause the link 128 to actuate the lever arm 44 of the valve 30 and move the turning plug 32 within the valve body in a direction to increase the flow of liquid from the pipe 40 into the fitting 28. Liquid flowing through the pipe 40, valve 30 and fitting 28 will enter the passage 74 in the shaft 66 to be discharged through the passages 76 which open through the face 70 of the grinding head or disk 68 so as to cause it to be thoroughly intermingled with the material entering the space between the grinding disks or heads 68 and 102 through the tubular conduit 100. It will be apparent from the foregoing that the volume of liquid admitted to the space between the grinding heads or disks will automatically be governed in accordance with the volume of feed or other material introduced between the grinding disks by the worm or screw conveyor 86 and hence the machine may be set to grind or mix feed and the like with any suitable liquid. By adjusting the weight 122 along the uppermost arm of the bell crank 116, it will be obvious that the pressure required to move the grinding head or disk 68 under the influence of the feed travelling through the tubular conduit 100 under the influence of the conveyor screw 86 may be varied according to the desires of the user, and hence the volume of liquid mixed with the feed or the like may be automatically controlled.

While in the foregoing there has been shown and described the preferred embodiment of this invention it is to be understood that minor changes in the details of construction and arrangement of parts may be resorted to without departing from the spirit and scope of the invention as claimed.

Having described the invention what is claimed as new is:

1. In a feed grinder and mixer, a shaft mounted to rotate about a horizontal axis and to move longitudinally along said axis, a grinding head intermediate the ends of and rotatable with the shaft, said head having diverging passages therethrough, a tubular material conduit mounted to rotate in spaced concentric relation about the shaft between one end thereof and the grinding head, a second grinding head mounted on the tubular conduit adjacent the first mentioned grinding head, said shaft having an axial passage entering the end thereof remote from the tubular conduit and opening into said divergent passages for distributing liquid between the grinding heads common drive means to drive both the shaft and the conduit in opposite directions, yieldable means engaging the shaft to advance the grinding head carried by said shaft toward the grinding head carried by the conduit, and valve means carried by the last named end of said shaft and operated by the yielding means to increase and decrease the volume of liquid admitted to said axial passage in accordance with increase and decrease in the volume of material fed to the grinding heads for being ground and mixed.

2. The construction defined in claim 1, wherein said yieldable means comprises a lever coupled to the shaft to shift said shaft longitudinally along the horizontal axis, a weight shiftable along said lever to yieldingly hold the grinding head carried by the shaft in contact with the second grinding head, said valve means including a rotatable valve member having an actuating lever coupled to the first named lever.

3. In a grinder, a shaft mounted to rotate about a horizontal axis and to move longitudinally along said axis, a grinding head intermediate the ends of the shaft and rotatable therewith, a tubular material conduit mounted to rotate in spaced concentric relation about said shaft between one end of said shaft and the grinding head, a second grinding head on the inner end of the tubular conduit and adjacent the first mentioned grinding head, a conveyor screw having a tubular shaft encircling the first named shaft and operable within the tubular conduit to advance material therein toward the grinding heads, and common drive means connected to adjacent ends of said shafts and to the conduit for driving both of the shafts in one direction and the conduit in the opposite direction.

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