Jan. 23, 1951 F. H. NICKLE ET AL 2,539,317

TOOTHED ROLL CRUSHER-FEEDER

Filed Oct. 30, 1944 2 Sheets-Sheet 1

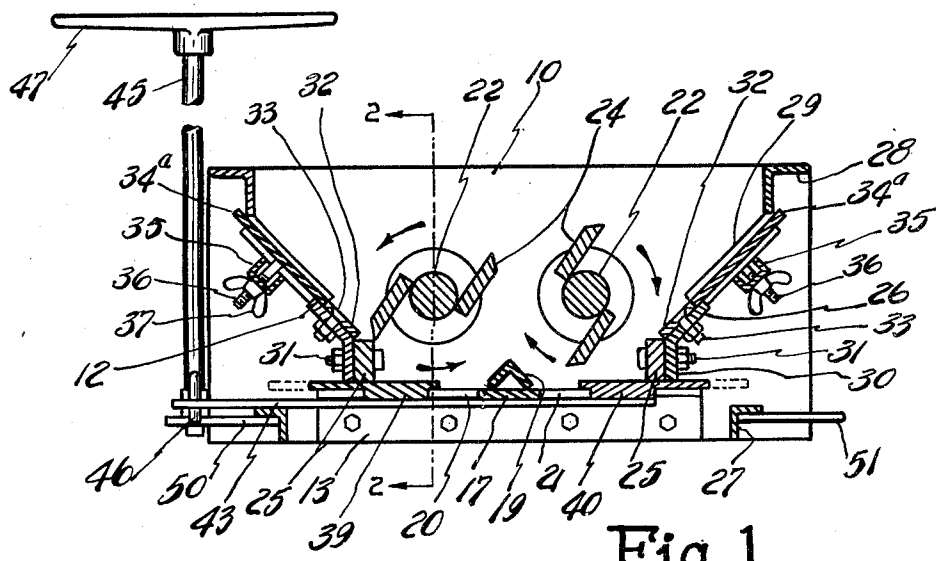

Fig. 1

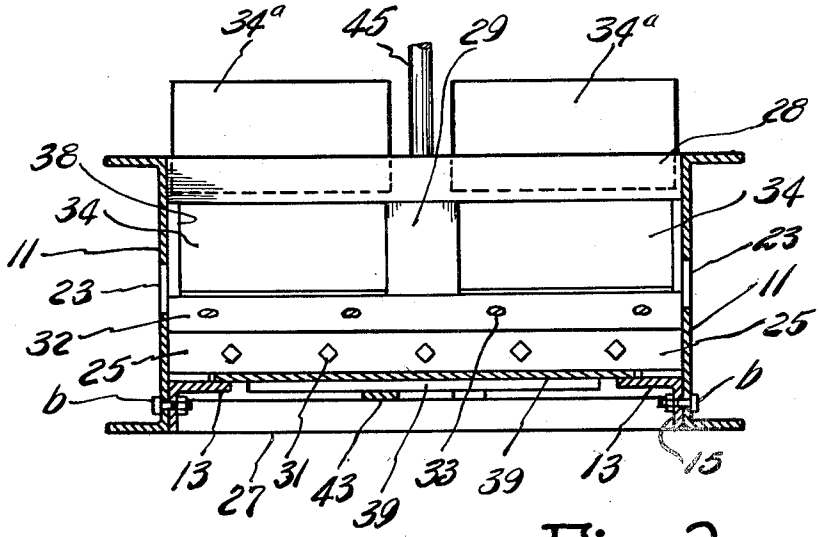

Fig. 2

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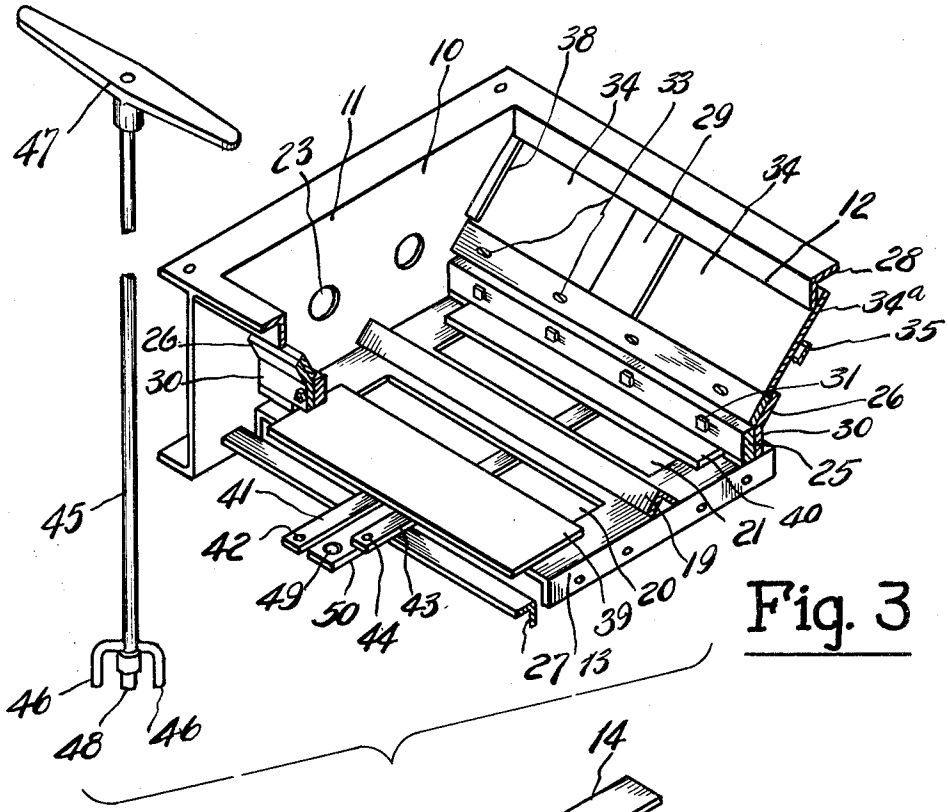

Fig. 3

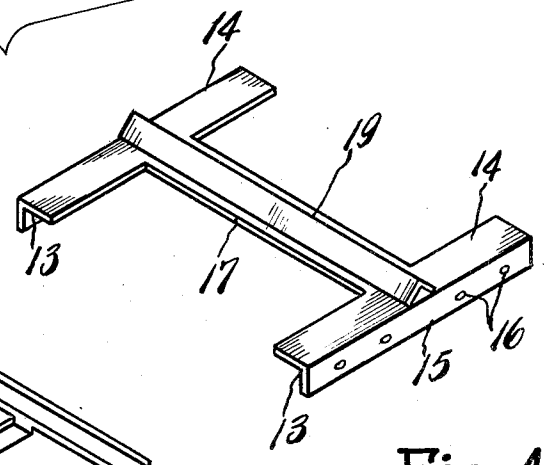

Fig. 4

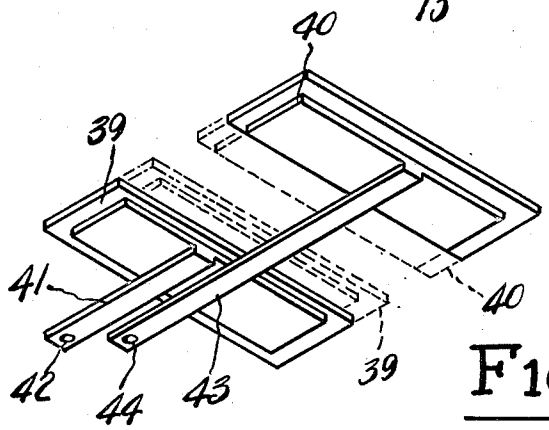

Fig. 5

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UNITED STATES PATENT OFFICE

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TOOTHED ROLL CRUSHER-FEEDER

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3 Claims. (Cl. 241—141)

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This invention relates to roll-type crusher-feeders adapted for pre-crushing bulk or lump materials and feeding the reduced product at any desired rate of flow to pulverizing mills or other processing equipment that requires a steady influx. A specific application is the crushing and feeding of ear corn, or a composite mixture of ear corn and small grain, to attrition or hammer type feed-grinding mills that produce dairy feeds containing cob meal.

The crushing and feeding of ear corn that is completely husked presents no difficulties for the conventional crusher-feeder, but when the husks are not removed, it becomes difficult to manually regulate the rate of efflux through the flow-controlling mechanism, because the bulky fibrous husks tend to clog the outlet ports. When this occurs the grinding mill runs empty, thereby wasting both power and time. To correct this difficulty, the operator must either open the flow control valve wider to permit the accumulation of husks to escape, or the machine must be stopped and the husks manually removed. If the operator opens the valve mechanism wide enough to permit the bulky husks to flow out freely with the reduced ear corn and small grain, then there is danger of the grinding mill becoming overloaded, especially so if the feed mixture contains small grain that tends to flow freely through the outlet ports leaving the more bulky cobs and husks behind.

In the conventional ear corn crusher, the outlet ports in the bottom of the housing are usually located so that the down-coming roll teeth exert a considerable amount of downward pressure that tends to force the materials through the outlet port openings. Inasmuch as the reduced material, under the influence of agitation effected by the roll teeth, flows through the openings in the same manner as a liquid, it will be apparent that the greater the pressure, the smaller the port opening must be for a given rate of flow. In other words, if the pressure resulting from the down-coming roll teeth becomes excessive over the port opening, the corresponding port opening will be so small that the bulky fibrous husks cannot escape with the finer material.

It therefore becomes a prime object of this invention to provide an efflux-controlling mechanism that reduces the build-up pressure over the port openings to a minimum, thereby making it practical to operate with relatively large port openings that permit the flow of the husks through the port openings without clogging.

Other objects and improvements will be set forth in the following description, drawings, and appended claims.

In the drawings:

Fig. 1 is a transverse sectional elevational view of a two-roll type crusher-feeder embodying our invention.

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Fig. 2 is a longitudinal sectional elevational view taken on the line 2—2 of Fig. 1, the solid lines showing the hand hole slides in raised position, the crushing rolls being omitted.

Fig. 3 is a fragmentary isometric assembly view of the housing, bottom structure, and the flow-controlling mechanism, one side and end wall being broken away to more clearly show the construction, the control stem being shown detached.

Fig. 4 is a detail isometric view of the bottom construction of the housing.

Fig. 5 is an isometric inverted plan view of valve plates used for controlling the flow of the reduced materials from the machine, the broken lines showing the range of movement of the valve plates.

Referring now more particularly to the drawings, in which we have shown a preferred form of our invention, 10 is a rectangular housing adapted to receive materials from any source of supply. This housing comprises flanged end walls 11, side walls 12, and a bottom structure, shown in Fig. 4, that is detachably secured to the end walls. This removable bottom structure comprises a pair of spaced-apart angles 13 having horizontal legs 14 that serve as supporting rails for a pair of sliding valve plates, to be subsequently described, and vertical legs 15 provided with openings 16 to accommodate bolts *b* or other means for fastening to the end walls 11.

The angles 13 are secured together by a centrally disposed flat bar 17 and an inverted V-shaped angle 19 as shown, the several elements being welded together to provide a rigid H-shaped bottom structure forming opposed U-shaped openings 20 and 21 that serve as outlet ports for the reduced material when the valves are assembled in working relation.

The end walls 11 are adapted to support flanged bearings (not shown), in which a pair of roll shafts 22 are journaled, the shafts projecting outwardly through the openings 23 to receive intermeshing spur gears (not shown) that make the roll shafts coacting when power is applied to either shaft, the rotation being in opposite directions as indicated by the arrows in Fig. 1. A series of axially spaced-apart teeth 24 are provided on the shafts 22 and these teeth rotate in close relation to the shear bars 25 for the purpose of reducing the material.

The side walls 12 comprise a pair of horizontally disposed angulated bars 26, a pair of angular members 27, top rails 28 and an inclined section 29 connecting the members 26 and 28, all of which are welded to the end walls 11 to provide a rigid structure. On the inside of the vertical leg 30 of the member 26, and detachably secured thereto by means of bolts 31, is the rigid stationary rectangular shear bar 25 that is positioned in close shearing relation to the peripheral cutting edges on the roll teeth 24, as above

mentioned. The openings for the bolts 31 are drilled on the neutral axis of the shear bar, so that the bar may be reversed end for end, or turned over to bring any one of the four shearing edges in working relation with the adjacent crushing roll.

A detachable wear plate 32 is secured to the inner face of the inclined leg of the member 26 by means of flat head screws 33. This wear plate 32 also receives impact from the descending roll teeth. Directly above this inclined wear plate are a pair of handholes 34 that provide access to the machine to facilitate removal of any tramp metal that may be caught between the rolls and the shear bar. These handholes are normally closed by means of inclined sliding doors 34a which are locked in place by the cross bar 35 pivoted on the stud 36 which carries a wing nut 37 that clamps the ends of the cross bar to the door jamb 38.

The flow-controlling mechanism for the outlets 20 and 21 include a pair of valve plates 39 and 40 respectively that are slidably mounted upon the upper faces of the horizontal leg 14 of the side rails 13. The valve plates operate in the same plane below shear bars 25, and the portion of each plate that extends inwardly beyond the shear bar has its upper face and three edges completely submerged in the material undergoing reduction when valves are either partially open or fully closed. Consequently, the valve plates move freely without any tendency to bind or become frozen in place, which difficulty is encountered when the valve plates are slidably mounted in grooves or slots that may become packed with accumulations of reduced material.

To effect reciprocal co-ordinated movement of the valve plates in a direction that is at right-angles to the rolls thereabove, the valve plates 39 and 40 are provided with rigid arms 41 and 43 that project horizontally in parallel relation beyond the housing, the arm 41 having an opening 42 at the outer end, and likewise a similar opening 44 in the end of arm 43. The valve plates are actuated by means of a vertical control stem 45 having a pair of downwardly projecting pintles 46 attached to the lower end thereof, and a handle 47 is provided on the upper end for manually rotating the stem about 90°, thereby imparting simultaneous movement to the valve plates in opposite directions, so that the area of the two valve openings are always equal regardless of how the efflux is varied.

The lower end 48 of the stem seats pivotally in opening 49 of the outwardly extending bracket 50 that is rigidly attached to cross member 27. A similar bracket 51 is attached to member 27 on opposite side of the housing, so that the stem may be assembled on this side. When so assembled, the valve plates 39 and 40 operate over outlet openings 21 and 20 respectively.

In operation, the two streams of material flowing through the valve openings are symmetrical with respect to the roll shafts, regardless of the rate of output. The valve plates move towards each other when the flow is interrupted, the travel of the valve plates being concurrent with the travel of the lowermost roll teeth thereabove. The valve openings are normally under the ascending roll teeth, hence, the downward pressure resulting from the descending roll teeth reacts upon the valve plates rather than downwardly over the port openings. In other words, the roll teeth sweep the material over the valve openings rather than through the valve openings. Hence, it will be apparent that there can be

little, if any, build-up pressure over the valve openings. Therefore, it becomes practical to operate this machine with relatively large valve openings for a given rate of output. Such large valve openings promote the outward flow of the bulky ear corn husks that otherwise may accumulate in the machine and curtail operations.

This type of flow-controlling mechanism also eliminates another difficulty that is common to two-roll type crusher-feeders that have one or both valve openings under the descending roll teeth, this difficulty being the tendency for the outgoing material, under pressure due to the descending roll teeth, to crowd the valve or valves open and destroy the predetermined adjustment. This cannot happen in the instant construction, because there is little or no build-up pressure above the valve openings.

In other words, the maximum build-up pressure of the descending material is over the valve plate rather than over the valve opening. This downward pressure upon the valve plate increases the friction between sliding surfaces to the extent that the valve plate is securely held against any unwarranted movement due to pressure of the outflowing material upon the leading edge of the plate.

What we claim is:

1. In a machine for reducing and feeding material, the combination that includes a housing, a roll having a series of teeth for reducing the material in which it is submerged, a stationary shear bar positioned to receive impact from the descending roll teeth, a bottom structure having a rectangular outlet to permit passage of the reduced material underlying the roll, said outlet being defined on one side by the shear bar and on three sides by coplanar elements which include a pair of spaced-apart horizontal side rails having upper faces submerged in the material, a valve plate slidably mounted upon the upper faces of the side rails for controlling the rate of efflux through outlet, said plate having three sides submerged in the material when the efflux is completely cut off, and means supported by the housing for moving the valve plate at rightangles to the shear bar to control the area of said outlet.

2. In a machine for reducing and feeding material, the combination that includes a housing, a roll having a series of teeth for reducing the material in which it is submerged, a stationary shear bar positioned to receive impact from the descending roll teeth, a bottom structure having a rectangular outlet to permit passage of reduced material underlying the roll, said outlet being defined on one side by the shear bar, on two opposite sides by side rails mounted below and at rightangles to the shear bar, and on the remaining side by a cross-bar which is coplanar with the side rails, a valve plate slidably mounted upon the upper faces of the side rails for interrupting the efflux, said interruption being complete when the plate is positioned in overlapping relation with the coplanar cross bar, and means supported by the housing for moving the valve plate at rightangles to its span, said means including a rotatable vertical stem that projects above the machine.

3. In a machine for reducing and feeding material, the combination that includes a housing that receives the material, a pair of rolls having teeth submerged in the material undergoing reduction, a bottom structure having a rectangular outlet underlying each roll, each of the said outlets being defined on two opposite edges by hori-

zontal side rails underlying ends of rolls and at rightangles thereto, a pair of rectangular valve plates slidably mounted upon the upper faces of the side rails and overlapping the marginal edges thereof within the confines of the housing, and means in common for imparting reciprocal coordinated movement to the valve plates for simultaneously interrupting the two streams of reduced material flowing through the outlets, said means including a rotatable stem supported by the housing.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
122,877	Brown	Jan. 23, 1872
380,245	Creager	Mar. 27, 1888
385,342	Creager	July 3, 1888
402,289	Woodward et al.	Apr. 30, 1889
461,789	Winchell	Oct. 20, 1891
751,488	Engel	Feb. 9, 1904
1,334,223	Byrd	Mar. 16, 1920
1,864,973	Buchanan	June 28, 1932
2,261,090	Lind	Oct. 28, 1941
2,284,781	Ward	June 2, 1942
2,330,139	Nickle	Sept. 21, 1943

FOREIGN PATENTS

Number	Country	Date
86,416	Germany	Apr. 16, 1896