March 27, 1951

F. RODGERS

CYLINDER AND CONCAVE MILL WITH MATERIAL RETURN PADDLE

2,546,679

Filed March 28, 1947

2 Sheets-Sheet 1

Fig. 2

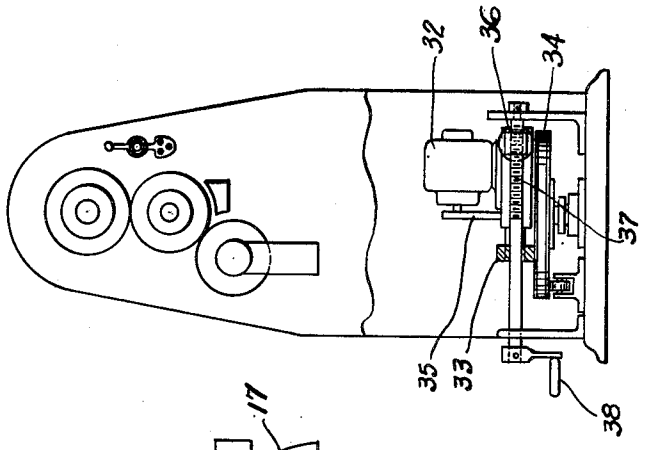
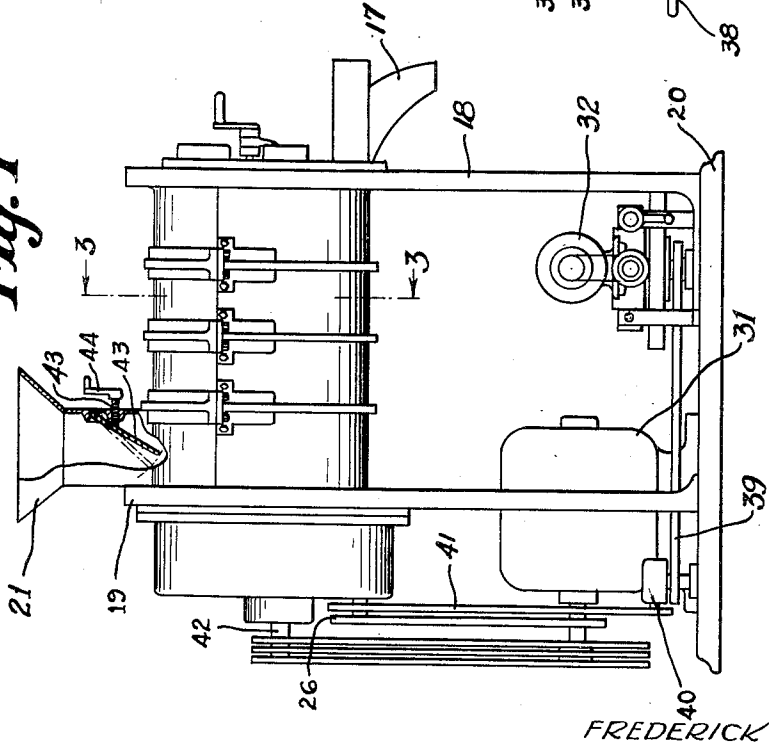


Fig. 1



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Fig. 3

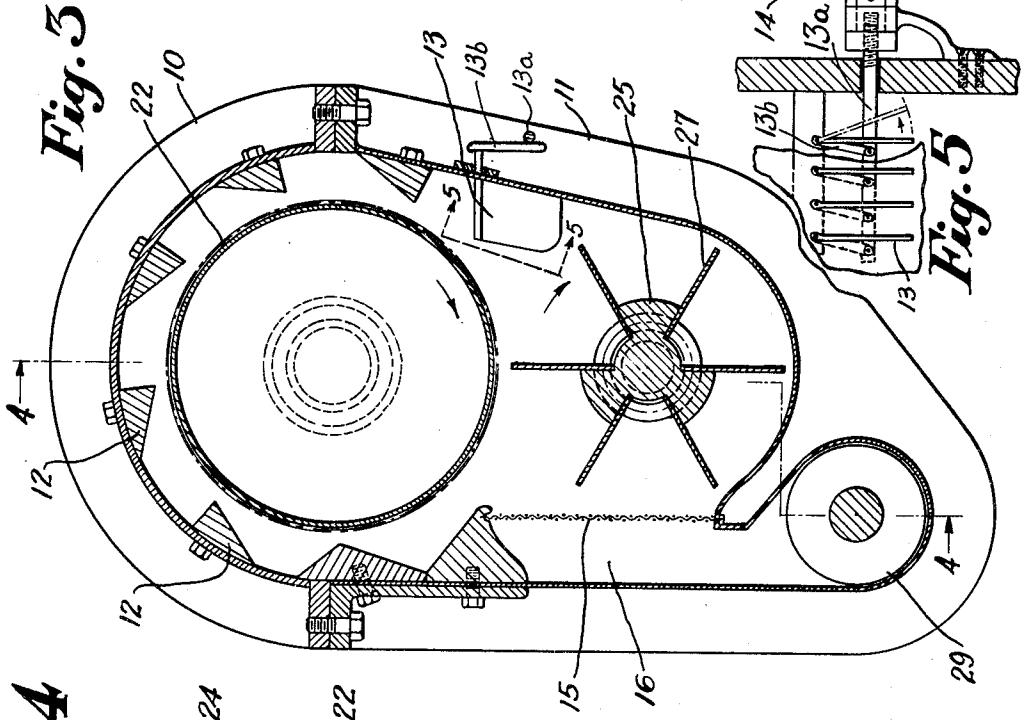
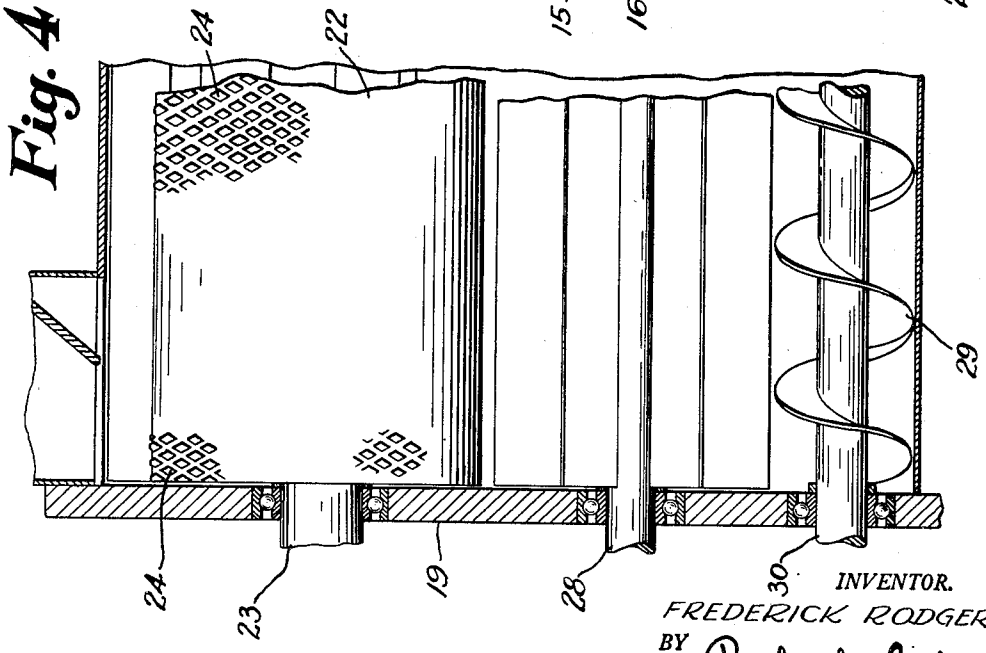


Fig. 5

Fig. 4



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CYLINDER AND CONCAVE MILL WITH MATERIAL RETURN PADDLE

Frederick Rodgers, St. James, N. Y.

Application March 28, 1947, Serial No. 737,831

3 Claims. (Cl. 241—80)

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This invention relates to improvements in hammer mills, or cylinder and concave mills, comminuting or grinding machines for granulating, milling, mixing, or otherwise processing grain and the like.

Nature surrounds oil globules in grain kernels with non-oxidizing agents. Breaking the film of the non-oxidizing agents during milling subjects the split oil globules to rapid oxidization turning the ground grain quickly rancid. Machines for processing grain up to the present frequently have combined the grain shattering and sieving operations thereby producing an undesirable separation of the oil globules.

It is an object of the present invention to provide a cylinder and concave mill which produces a grain flour of greatly improved resistance to decomposition, and which is economic in construction and most efficient in operation.

Other objects of the present invention will become apparent in the course of the following specification.

These objectives have been attained in the present invention by providing a device having a multiplicity of hammers disposed on a cylinder which, rotating at high speed, ricochets the grain kernels and their fragments back and forth between the inner surface of the container in which the cylinder rotates. Screening out the cracked particles of desired size is a separate and distinct operation in this machine. After a grain kernel has passed once through the cracking cycle, particles of predetermined size or less pass through a screen and fragments too large to pass there through are automatically returned for reprocessing. A conveyor removes the finished product.

The invention will appear more clearly from the following detailed description when taken in connection with the accompanying drawings showing, by way of example, a preferred embodiment of the inventive idea.

In the drawing:

Figure 1 shows a side elevation of a device constructed in accordance with the principles of the present invention.

Figure 2 shows an end elevation of the same device.

Figure 3 is a vertical sectional view through the line 3—3 of Figure 1, on an enlarged scale.

Figure 4 is a fragmentary view showing the front elevation of Figure 1, also on an enlarged scale.

Figure 5 is a front elevational view of the adjustable breaking mechanism, enlarged.

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Like reference numerals indicate like parts throughout the several views.

Referring now in greater detail to the drawings, the housing is formed of the semi-cylindrical upper portion 10 (Fig. 3) mounted on and secured to the lower portion 11 supported by the end plates 18 and 19 (Fig. 1) mounted on the base 20. The inlet hopper 21 is mounted on the top of the upper portion 10 and the outlet 17 at the back of the lower portion. Baffle bars 12 (Fig. 3) are inserted along the interior of the upper portion 10 and at the top of the lower portion 11, perpendicular to the end plates 18 and 19 (Fig. 1). Adjustable plates 13 (Fig. 3), shown enlarged in Figure 5, are placed along the interior of the lower section, below the end baffle. A tie rod 13*a* extends perpendicularly to the plates 13 and through the end plate 18 of the housing or container. Lever bars 13*b* are hingedly spaced along the tie rod 13*a* and are fixedly connected at their ends to the plates 13. The projecting end of the tie rod 13*a* is threaded and is connected to a handle 14. Thus, the position of these plates is controlled by the handle 14 (Fig. 5) and, being disposed in the channel of grain flow serve to accelerate to the rate of flow. The screen 15 is inserted over the passageway 16 leading to the subsequently described spiral conveyor 29.

The grinding cylinder 22 (Figs. 3 and 4) is rotatably mounted in the upper part of the housing, and is designated to rotate clockwise as shown by the arrow in Figure 3 on the shaft 23 (Fig. 4) journaled in the end plates 18 and 19 (Fig. 1). The outside surface portion of the cylinder 22 is notched by left and right hand parallel helical threads the protuberances formed thereby hereinafter designated hammers 24 (Fig. 4).

The return paddle indicated by numeral 25 (Fig. 3) consists of the blades or fins 27 attached to the shaft 28 (Fig. 4) disposed to rotate clockwise below the cylinder 22 and is likewise supported by the end plates 18 and 19 (Fig. 1). A covered opening 18*a* (Fig. 2) in the end plate 18 (Fig. 1) may be provided for cleaning the paddle chamber, substantially aligned with the base of the rotor return paddle 25.

The spiral conveyor 29 (Figs. 3 and 4) is mounted at the base of the passageway 16 (Fig. 3). The shaft 30 (Fig. 4) of the conveyor is also supported by the end plates 18 and 19 (Fig. 1).

Rotation for the grinding cylinder 22 and return paddle 25 is furnished by the main drive motor 31 (Fig. 1) mounted on the base 20. A pulley attached to the grinding cylinder driving gear shaft 42 (Fig. 1) actuates a driving gear

mounted thereon and meshes with a gear attached to the shaft 23 (Fig. 4) of the grinding cylinder 22. The grinding cylinder driving gear shaft pulley is connected by a belt with a pulley on the main drive motor 31 (Fig. 1).

Likewise, a pulley attached to the return paddle driving gear shaft 26 (Fig. 1) rotates a driving gear attached thereto and meshes with a gear attached to the shaft 28 (Fig. 4) of the paddle. The pulley of the return paddle is also belt connected to a pulley on the main drive motor 31.

Rotation for the spiral conveyor 29 (Figs. 3 and 4) is furnished by the motor 32 (Figs. 1 and 2) supported at the front by the friction wheel 33 (Fig. 2) in contact with the friction plate 34 and rotated by said motor by the belt 35 passing over pulleys on said motor and friction wheel shafts. At the back, the motor is supported by two castings, one of which is shown by reference numeral 36 (Fig. 2). One of these castings slides freely along a fixed rod, the other is threaded onto the revolving rod 37. By rotating the crank 38 attached to the rod 37, the friction wheel 33 may be moved back and forth on the plate 34 thereby varying the speed of rotation as desired. The adjustable speed so developed is transmitted by the belt 39 over a pulley on the shaft of the friction plate, thence to the right angle drive 40, and finally by the belt 41 to a pulley in the shaft of the conveyor. Obviously, other means of rotating the cylinder, return paddle, and conveyor could be adopted.

The operation of the machine is as follows:

Grain inserted in the intake hopper 21 (Fig. 1) is fed by gravity over the grinding cylinder 22. The rate of flow of the grain from the hopper is regulated by the hinged valve 43 (Fig. 1), the position of which is controlled by the handle 44 on the threaded shaft 45 connected by any suitable means therewith.

A grain kernel after passing through the hopper 21 falls against a hammer 24 (Fig. 4) of the cylinder 22 revolving at high speed. The impact of the grain kernel with the hammer ricochets the grain kernel or the already broken fragments thereof against the interior wall of the housing or one of the baffles 12 or both from which it is reflected back against the hammer of the revolving cylinder. This process is continued until the fragments of the kernel have passed the last baffle plate and brought in contact with the plates of the speed regulator 13 (Fig. 3).

After passing the speed regulator 13, the kernel fragments are picked up by the blades of the return paddle 25, whirled around the axis thereof and thrown against the screen 15. Kernel fragments sufficiently small to pass through the screen 15 fall on the spiral conveyor 29 to be moved out of the housing through the outlet 17 (Fig. 1). Kernel fragments too large to pass through the screen are deflected therefrom toward the grinding cylinder 22 where the cracking process is repeated until all the kernel fragments are of sufficient size to pass through the screen.

It is apparent that the specific illustrations shown have been given by way of illustration and not by way of limitation and that the structure above described is subject to a wide variation and modification without departing from the scope or intent of the invention, all of which variations and modifications are to be included within the scope of the present invention.

What is claimed is:

1. In a cylinder and concave mill, a container comprising end and side plates, a rotor, a rotor return paddle, and conveyor means disposed therein, intake opening through said container above said rotor, said rotor having left and right hand helical thread cut on the outside surface portion thereof, said container further comprising baffle bars disposed at the inside surface portion thereof, spaced substantially around the top of said rotor, said rotor return paddle comprising a shaft, a plurality of fan blades disposed around said shaft, means for supporting said rotor return paddle substantially below said rotor in said container with substantially parallel axes, said container further comprising plates disposed on the inside surface portion thereof between said rotor and rotor return paddle in the path of material forced around said rotor and directed toward said rotor return paddle, passageway leading from vicinity of said rotor return paddle substantially opposite said plates to said conveyor means, outlet means disposed at egress end of said conveyor, concave surface portion disposed substantially around the bottom of said rotor return paddle between said plates and said passageway cooperating with said rotor return paddle, means for revolving said rotor and rotor return paddle toward said plates, and means for actuating said conveyor.

2. In a cylinder and concave mill according to claim 1, in which at least one end plate is characterized by having a covered aperture formed therein substantially aligned with the base of said rotor return paddle.

3. In a cylinder and concave mill according to claim 1, in which said passageway is characterized by having a screen disposed across the entrance thereto, said screen being so positioned as to deflect particles of material too large to pass therethrough toward said rotor.

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