Dec. 17, 1957 G. C. WEBB 2,816,716

ROTOR CONTAINING COMMINUTING MILL WITH FLOATING CHECK PLATES BETWEEN ROTOR ENDS AND MILL CASING

Filed May 25, 1953

Fig. 1

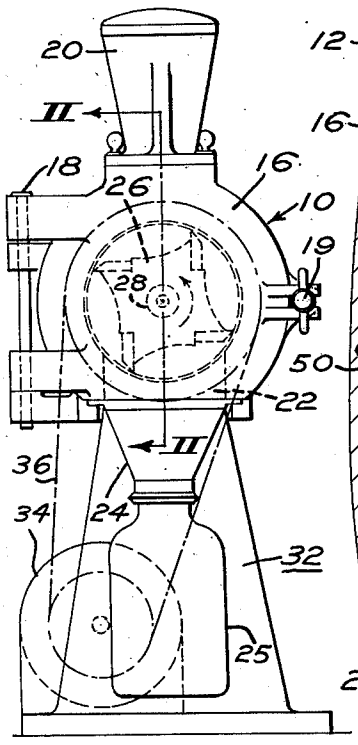


Fig. 2

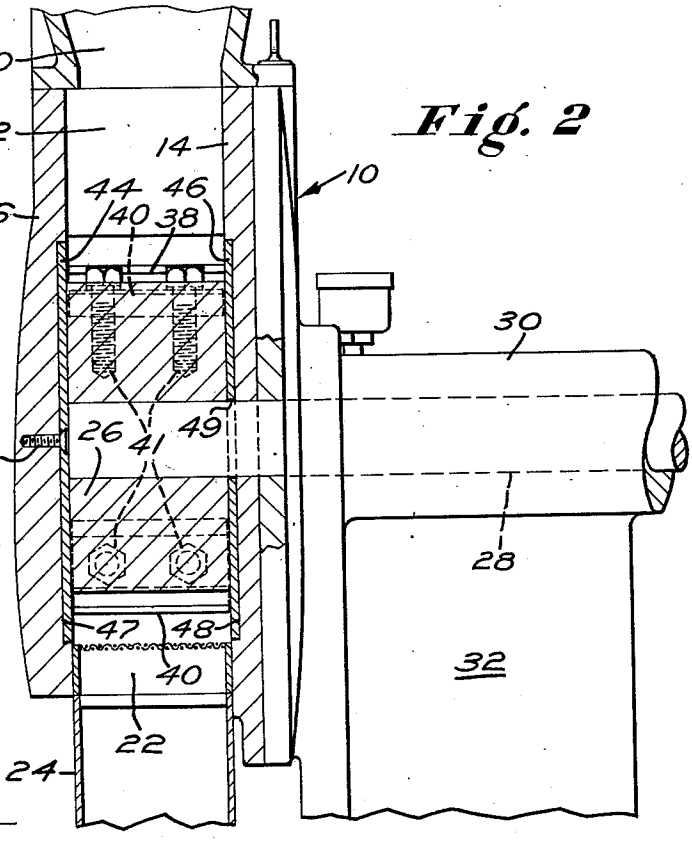


Fig. 3

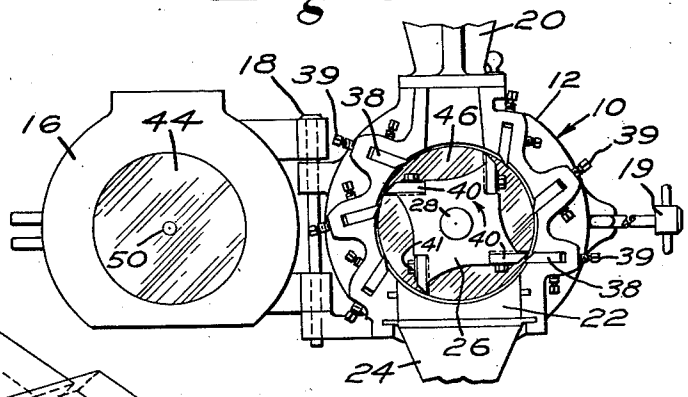
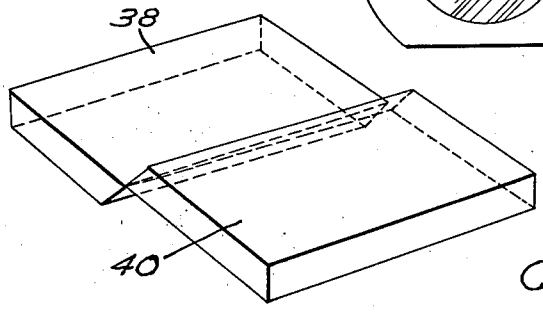


Fig. 4



INVENTOR.
GEORGE C. WEBB
BY
Beau, Brooks, Buckley & Beau,
ATTORNEYS

United States Patent Office 2,816,716 Patented Dec. 17, 1957

2,816,716

ROTOR CONTAINING COMMINUTING MILL, WITH FLOATING CHECK PLATES BETWEEN ROTOR ENDS AND MILL CASING

George C. Webb, Tonawanda, N. Y., assignor to Arthur H. Thomas Company, Philadelphia, Pa.

Application May 25, 1953, Serial No. 357,043

4 Claims. (Cl. 241—73)

This invention relates to improvements in comminuting mills, and more particularly to improvements in mills employed for fine grinding various materials for laboratory testing and in the industries.

Whereas, a certain type mill known in the trade as the "Wiley mill" has for many years been a commercial success for relatively fine laboratory and industrial fine grinding of a wide variety of raw and processed materials such as chemicals, fertilizers, tankage, food stuffs, etc., the prior art mills of this general type when working upon oily, gummy or moist materials have shown tendencies to bind up and stall, with consequent power losses and reduction of output rate and spoilage by frictional heating of the material being processed. Such tendencies are due to the fact that such mills must necessarily be built with minimum clearances between the sides of the rotor and the side walls of the mill casing, and in fact such mills are usually designed so that there are no appreciable clearances between the rotor and the side walls of the mill casing. However, due to wearing of the adjacent side wall portions of the rotor and the casing incidental to operation of the mill, these surfaces wear away in time and thus openings develop therebetween. Such openings permit fine mill feed material to lodge between the relatively moving rotor and casing wall parts, and as these accumulations become subjected to frictional heating they often swell and "burn." This imposes substantial drag forces against the rotor operation with consequent loss of power and reduction of mill output, and also contaminates the mill parts so as to render them most difficult to clean.

Therefore, it is a primary object of the present invention to provide in a fine grinding mill of the character described means operating automatically to minimize the tendency of the feed material to work into the spaces between the side walls of the rotor and the casing, making it suitable for milling oily, gummy or moist materials.

Another object of the invention is to provide an improved mill of the type including means for preventing working of feed material into the spaces between the side walls of the rotor and the mill casing to undesirable degree, while being at the same time readily cleanable in improved manner.

Another object of the invention is to provide in a fine grinding mill of the type referred to, improved means operable to divert the mill feed material away from the spaces between the rotor and the stationary casing structures, whereby plugging of rotor clearance spaces and clogging of the mill is prevented.

Another object of the invention is to provide in a mill of the character described improved means automatically operable to prevent the development of clogging accumulations of mill feed material within the clearance spaces between the rotor and the stationary casing parts, while at the same time rendering the mill readily susceptible to quick disassembly and clean-out operations.

Other objects and advantages of the invention will appear from the specification hereinafter.

In the drawing:

Fig. 1 is a side elevational view of a mill embodying

the present invention, with the casing door shown in closed position;

Fig. 2 is a fragmentary section, on an enlarged scale, taken along line II—II of Fig. 1;

Fig. 3 is a view corresponding in part to Fig. 1, but showing the casing door in open position;

Fig. 4 is a detached perspective view on an enlarged scale, of a pair of the mill blades shown in a preferred setting relationship thereof.

As shown in the drawing, the "Wiley" type mill comprises generally a drum-shaped casing **10** having a cylindrically shaped peripheral wall portion **12**, a back wall **14**, and a front wall or cover plate **16**. The cover **16** is preferably hinged as indicated at **18** to the peripheral wall portion **12** so as to be openable to provide access to the interior of the mill, as illustrated by Fig. 3. A latch arrangement as indicated at **19** is provided for cooperation with the hinge device **18** for holding the cover member **16** firmly in operative position when closed. The mill casing **10** is apertured at the top portion thereof and fitted with a material feed hopper as indicated at **20**. At its bottom portion the casing **10** is cut away to accommodate in slip-fitted relation therein a screen box as indicated at **22**, and either a discharge hopper **24**, or a drawer (not illustrated), is disposed therebelow to receive the processed material filtering through the screen device **22** and to deliver it into the drawer or finished product receptacle, such as indicated at **25** (Fig. 1).

The mill rotor as indicated at **26** is mounted interiorly of the casing **10** and keyed upon one end of the drive shaft **28** which extends through a suitably apertured portion of the rear wall **14** of the mill casing and is journaled within a bearing block or the like as indicated at **30** (Fig. 2) supported by the mill base or pedestal structure as indicated at **32**. Power is applied to the outer end of the shaft **28** by any suitable means, as is well understood in the art, as for example by an electric motor **34** and drive belt **36** as shown in Fig. 1. As shown in Fig. 3, a series of stationary cutting blades **38** are mounted within slots formed at intervals around the inner peripheral surface of the mill casing **10**, and are arranged to be minutely positionally adjustable therein as by means of screw devices **39** so that the inner cutting edge portions of the blades **38** protrude into the interior compartment of the mill casing. Somewhat similar cutter blades **40** are carried by the rotor **26** at intervals therearound and are positionally fixed thereon as by means of cap screws **41** so that the cutting edge portions of the blades **40** follow an orbit of rotation having minimum clearances with the cutting edges of the stationary blades **38**.

Thus, it will be appreciated that whenever feed material to be processed is delivered through the feed hopper **20** into the interior of the mill, while the rotor is being driven to revolve in counterclockwise direction as viewed in Figs. 1 and 3, the feed material will be scissored between the rotating and the stationary blades of the mill while being carried around with the rotor interiorly of the casing at high speed. As the material becomes comminuted to sufficiently fine degree it filters downwardly through the screen device **22**, and is thus discharged into the finished product receptacle.

As shown more clearly in Fig. 4, it is preferred that the blades **38–40** be mounted in slightly non-parallel relation so that when a rotor blade **40** passes a fixed blade **38** it "scissors" the feed material therebetween. Thus, either blade may be set in a canted mounting instead of horizontal, so that as shown in Fig. 4, when the blades pass the scissoring contact is progressive from one end of the blade to the other. This action seems to give an improved "slicing" type cutting action instead of a "chopping" type action on the feed material.

As stated hereinabove, in mills of this type it is essential

that the clearance spaces between the sides of the rotor **26** and the side walls of the casing be minimum, so as to prevent accumulations of feed material therein, such as would otherwise cause frictional heating and burning of the material with consequent stalling of the mill and contamination of parts thereof. In the case of the present invention, such leakage of feed material into the spaces alongside the rotor **26** is prevented by novel means comprising a pair of "floating" cheek plates as indicated at **44—46**. These cheek plates are of disk form and are dimensioned to fit freely within circularly recessed portions **47—48** of the casing wall portions **16—14**, respectively. Preferably the cheek plates are of slightly larger diameter than the largest diameter of the rotor-blade unit, and their inner faces are flush with or slightly inside the planes of the inner surfaces of the mill casing side walls.

To accommodate the drive shaft **28** therethrough, the rear cheek plate **46** is centrally apertured as indicated at **49**, and in order to keep the front cheek plate **44** from falling away from the cover **16** whenever the latter is opened, it is preferably pivotally hung upon the cover plate **16** as by means of a flatheaded screw **50** engaging a centrally countersunk bore through the cheek plate **44**. However, it is a particular feature of the present invention that both cheek plates **44—46** are mounted to freely rotate or "float" relative to the casing wall portions **14—16** and relative to the rotor **26** and the rotor shaft **28**. Hence, the cheek plates are free to respond to any unbalanced drag forces at opposite sides thereof.

Thus, for example when processing moist or otherwise naturally gummy material, as soon as any feed material tends to creep into the spaces between the rotor and the adjacent cheek plates, the consequent drag imposed thereby upon the cheek plates will cause the latter to rotate with the rotor. Hence, relative movement between the rotor and the cheek plates ceases, and opportunity for further creepage of feed material into these spaces is thereby minimized. At the same time, as the rotor-cheek plate unit revolves, the feed material in contact with the cheek plates tends to be thrown in response to centrifugal action thereon radially from the peripheries of the cheek plates back into the feed material compartment of the mill, thereby cutting off any attempted feed material flow laterally around the cheek plate edges and thence into the recessed side wall portions **47—48** of the mill casing. Similarly, if the mill is processing material of dry or powdery nature, the feed material coming in contact with the cheek plates **44—46** is baffled thereby to be diverted radially back into the milling compartment. If and when, however, any feed material enters the perimeter of the space between either cheek plate and the rotor, the cheek plate is then immediately "picked up" by the rotor to prevent any accumulation of material therebetween, as explained hereinabove.

It is a particular feature of the arrangement of the invention that the provision of the cheek plates in the manner described introduces no hindrance to easy cleaning of the mill parts such as may be required incidental to change overs from one mill feed material to another. It has always been a feature of the "Wiley" mill that it is easily cleanable when switching from one mill feed material to another, and the provision of the cheek plates as contemplated by the present invention does not detract from that facility.

I claim:

1. In a rotary grinder of the type comprising a casing which is generally cylindrical in shape with a feed material receiving opening in its upper portion and a screen device in its lower portion for discharge of processed material therethrough, a rotor arranged to rotate within said casing and having means disposed at the periphery thereof for cooperation with cutter means mounted within the cylindrical wall portion of said casing for shearing the feed material therebetween upon rotation of said rotor, there being minimum clearance between said rotor and the side walls of said casing, portions of said casing side walls being circularly recessed concentrically of the axis of rotation of said rotor, and a disk shaped cheek plate of an outside diameter larger than said rotor mounted in freely rotatable relation with respect to both said casing and said rotor within each of said recessed side wall casing portions, said cheek plates being disposed in contiguous relation with the corresponding end wall portions of said rotor and serving to prevent passage of feed material between said rotor and said casing side walls.

2. In a comminuting mill of the type comprising a casing and a rotor arranged to rotate within said casing, wherein minimum clearance is provided between said rotor and the opposite side walls of said casing, portions of said casing side walls being recessed concentrically of the axis of rotation of said rotor, and a circular cheek plate mounted in freely rotatable relation with respect to both said casing and said rotor within each of said recessed casing side wall portions, said cheek plates being disposed in contiguous relation with the corresponding end wall portions of said rotor and minimizing the tendency of material being comminuted in said mill to work between said rotor and said casing side walls.

3. In a comminuting mill of the type comprising a casing with a feed material receiving opening and a screen device for discharge of processed material therethrough, and a rotor arranged to rotate within said casing with no appreciable clearance being provided between said rotor and the side walls of said casing, a disk shaped cheek plate mounted in freely rotatable relation with respect to both said casing and said rotor between each side wall of said casing and said rotor contiguous to the corresponding end wall portion of said rotor, said cheek plates being dimensioned so as to be of larger outside diameter than said rotor and minimizing the tendency of feed material to pass between said rotor and said casing side walls.

4. In a rotary mill of the type comprising a casing having a feed material inlet and a processed material outlet opening and a comminuting rotor mounted to rotate within said casing, there being minimum clearance between said rotor and the side walls of said casing, cutter blades mounted at intervals about the periphery of said rotor projecting forwardly from the body thereof with respect to the direction of rotor operation and extending generally axially therealong, cutter baldes mounted to extend into the interior of said casing at intervals therearound in mutually edgewise opposition to the cutter blades carried by said rotor, said rotor blades being mounted in such manner that as each rotor-carried blade moves into cutting position relative to each casing-carried cutter blade it approaches in a canted attitude thereto so that the feed material is sheared therebetween progressively from one end of said rotor toward the other end thereof portions of said casing side walls being recessed concentrically of the axis of rotation of said rotor, and a disk shaped cheek plate having an outside diameter greater than that of said rotor mounted in each of said recessed side wall portions in freely rotatable relation to both said casing and said rotor, said cheek plates being disposed in continguous relation to the corresponding ends of said rotor and minimizing the tendency of feed material to pass between said rotor and said casing side walls.

References Cited in the file of this patent

UNITED STATES PATENTS

424,602	Engelberg	Apr. 1, 1880
1,706,643	Wiley	Mar. 26, 1929
1,721,183	McKain	July 16, 1929
2,054,239	Brigel	Sept. 15, 1936
2,058,869	Hazle	Oct. 27, 1936
2,145,177	Hauge	Jan. 24, 1939
2,192,382	Koch	Mar. 5, 1940
2,212,883	Meeker	Aug. 27, 1940
2,360,357	Marshall	Oct. 17, 1944
2,440,051	Lind	Apr. 20, 1948