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C. C. TROWBRIDGE

PULVERIZING MACHINE

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2 Sheets-Sheet 1

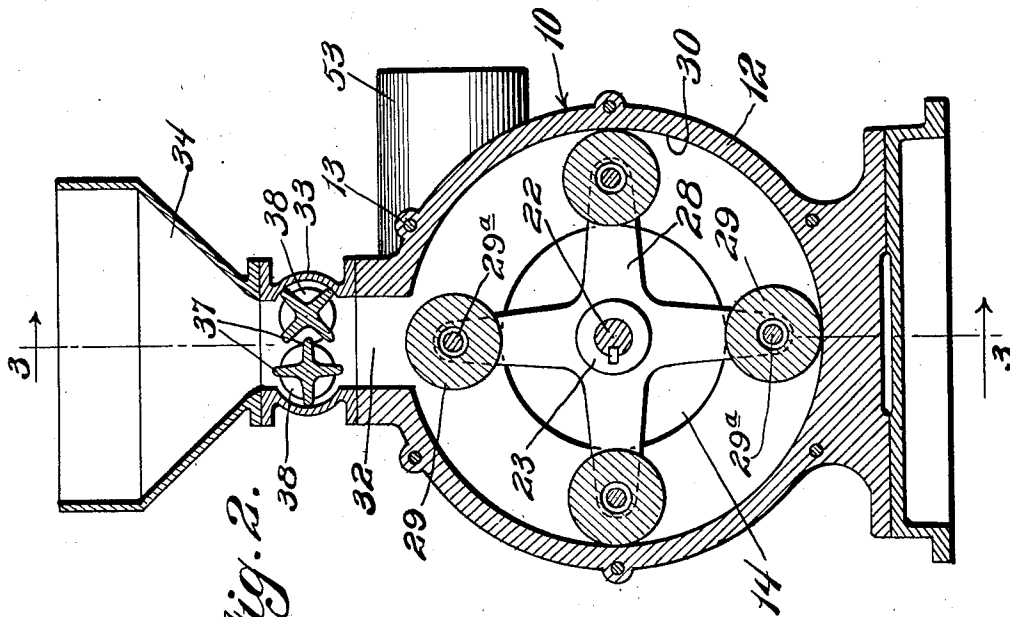


Fig. 2.

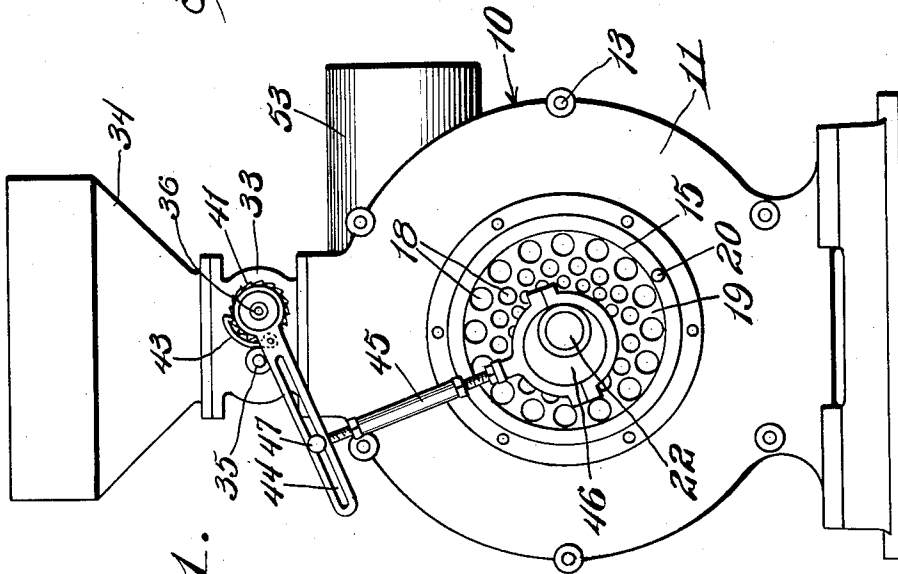


Fig. 1.

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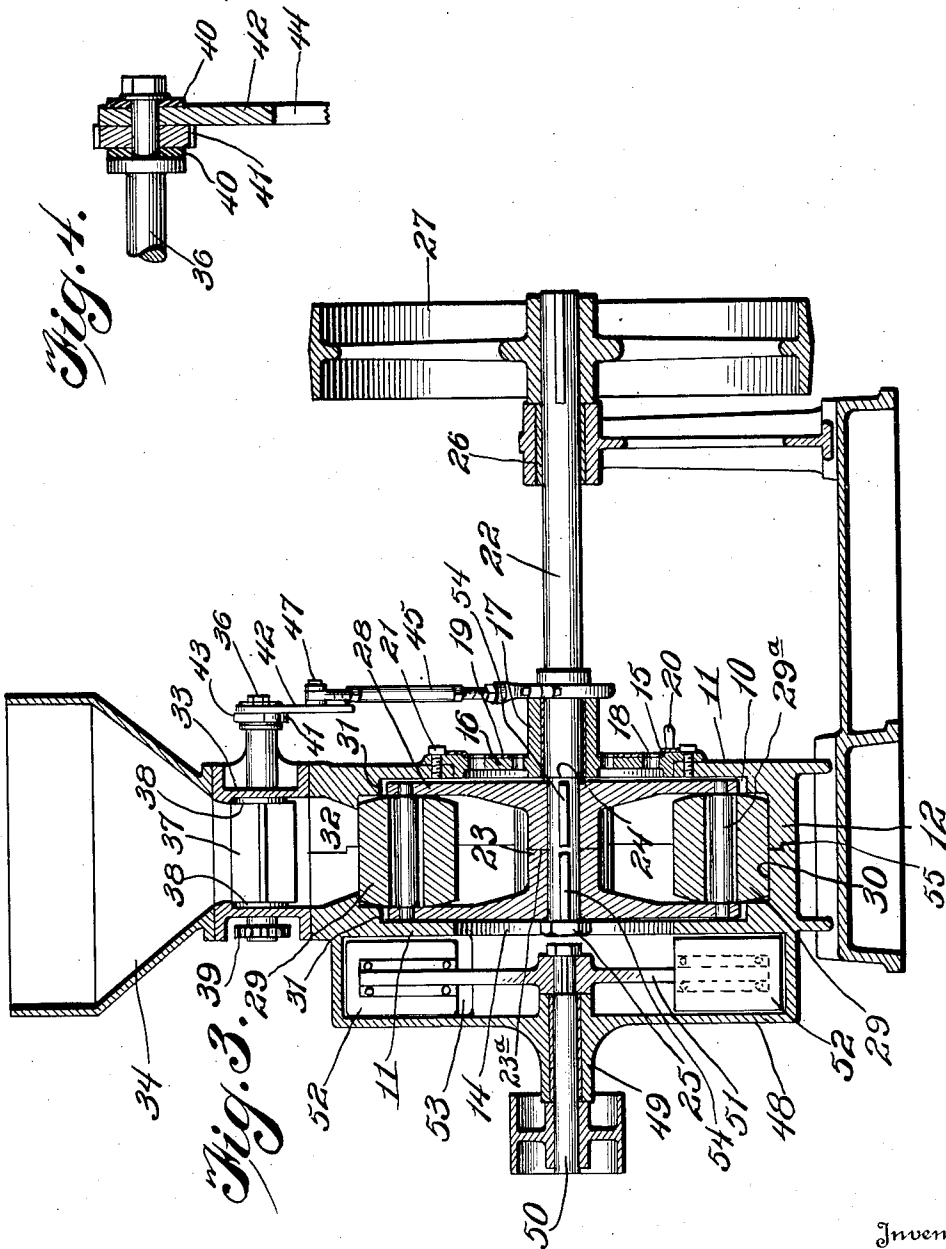
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PULVERIZING MACHINE

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE.

CHARLES C. TROWBRIDGE, OF OAKFIELD, WISCONSIN.

PULVERIZING MACHINE.

Application filed November 5, 1925. Serial No. 67,040.

This invention relates to pulverizing machines, and particularly to those for pulverizing talc and like substances and to a machine in which the talc is pulverized by rolls rotating in a drum.

The general object of the invention is to provide a very effective machine of this character wherein the talc, after it has been pulverized, is drawn out from between the rolls by means of a fan instead of the air being drawn through a mass of talc, thus reducing the horsepower required to drive the exhaust fan, and further so constructed that the ground talc is instantly cleared from the mass and this stops the cushioning effect of the fine talc in the mass, thereby increasing the grinding capacity or tonnage capacity of the mill and reducing the driving power required.

A further object is to provide means for feeding the talc automatically into the pulverizing drum.

A still further object is to provide means whereby in case any obstruction attempts to pass through the feeding means, the feeding means will stop operating until the obstruction is removed, thus eliminating all danger of breakage.

Another object is to provide means whereby a current of air may be caused to pass through the center of the machine between the grinding rolls and between the rolls themselves and whereby this blast of air may be regulated.

Other objects will appear in the course of the following description.

My invention is illustrated in the accompanying drawings, wherein:—

Figure 1 is a side elevation of a talc pulverizing machine constructed in accordance with my invention;

Figure 2 is a vertical sectional view thereof;

Figure 3 is a section on the line 3—3 of Figure 2;

Figure 4 is a fragmentary section at the end of the shaft 36 showing the operating mechanism for the feed wheels;

Referring to these drawings, 10 designates generally a drum including the two side walls 11 and the circumferential wall 12, the circumferential wall being illustrated as being made in two sections with the two side walls and the two sections of the circumferential wall and the side walls being held together by means of bolts 13. One side

wall of the drum is formed with a circular outlet opening 14 and the other side wall with a central opening 15. Fitting in this last named circular opening is a plate 16 having attached thereto the shaft bearing 17. This plate 16 is perforated at a plurality of points, as at 18, and the outer face of the plate is slightly recessed for a disk 19 which is oscillatably mounted in this recess, the disk being annular, and this disk is formed with a plurality of perforations corresponding in size, shape and number to the perforations 18, and the disk is shiftable by means of a knob 20 so as to open all of the perforations 18, close them all, or only partially close them. This means the passage of air into the interior of the drum may be controlled. This disk 16 is held in place by means of screws 21 or like devices.

Passing through the bearing 17 is a shaft 22 which extends through to the opening in the opposite side 11 and this shaft has keyed upon it the sectional spider 23, this spider being formed in two abutting sections which bear against a shoulder 24 on the shaft and are held in place by means of a nut 25 engaging the inner end of the shaft. The shaft at its outer end is mounted in a suitable bearing 26 and carries a driving pulley 27.

The spider has four pairs of arms 28 and each pair of arms supports the gudgeons of a roller 29, this roller being smooth-faced. There are thus four rollers and these rollers bear against the inner face 30 of the drum 10, this inner face being smooth and the rollers rolling against it. The sides of the drum are recessed at 31 to accommodate the arms of the spider. At one point the drum has a receiving opening 32, and mounted above this receiving opening is a feed chamber 33 and above that a hopper 34.

Extending through the feed chamber are two shafts 35 and 36 carrying means for feeding the talc little by little in the required amounts into and through the feed chamber. The shaft 36 extends out through the wall of the feed chamber and is engaged by feed actuating mechanism to be later described. The feeding devices within the chamber 33 comprise feeding wheels each consisting of a central hub and radiating blades 37 and disks 38 at the ends of the blades. It will be noted from Figure 2 that the blades of one feed wheel are disposed intermediate the blades of the next adjacent

feed wheel. The extremities of both shafts 35 and 36 carry upon them the interengaging wheels 39. Mounted upon the shaft 36 are a pair of fiber disks 40 and disposed between these leather disks is a ratchet wheel 41 which is frictionally engaged by the fiber disks.

Also oscillating upon the shaft is an arm or lever 42 carrying a pawl 43 which engages with the ratchet wheel, and this arm or lever is longitudinally slotted, as at 44. The arm is engaged by an eccentric rod 45 mounted upon an eccentric 46 and having a pin, screw or like member 47 which engages in the slot 44 and may be adjusted along this slot so as to control the stroke of the lever 44 and thus control the feed. As the eccentric 46 rotates, a movement of oscillation will be given to the arm 44 and this will act to give a step by step rotation to the feed rolls, feeding material slowly downward in regulated quantities into the mouth of the drum, and by shifting the connecting rod along the slot 47 the degree of throw of the lever may be controlled and thus the amount of feed. It will be noted also that the connecting rod is formed in sections having screw-threaded engagement with each other and is thus adjustable to shift the position of the feeding wheels with relation to each other. By reason of the fact that the ratchet wheel is mounted between the two leather disks 40, if there is an obstruction such as a body of foreign matter passing through the hopper which would prevent the rotation of the feed wheels 38 and cause a breakage of these feed wheels, then the feed wheels will stop, though the arm 44 will, of course, continue to oscillate as heretofore.

Disposed at one side of the drum and extending outward therefrom is the housing 48 of a fan, this housing being circular in form and the end wall of the housing constituting a bearing 49 of a shaft 50. This fan shaft 50 extends through the bearing and into the interior of the fan housing, and mounted upon the shaft is the fan 51 having blades 52. This is an exhaust fan and acts to draw material from the interior of the drum through the space between the arms of the spider and discharge the material out through a discharge passage 53 which is disposed tangentially to the circumference of the fan housing.

I have above described the general structure of this mechanism and certain of the details thereof, but there are certain other details which I will now refer to more specifically. The rollers 29 are loosely mounted upon the pins 29^a whose projecting ends constitute gudgeons extending into the arms of the spider to permit the insertion of these rollers into place and the proper support of these rollers. The spider is made in two half sections separated, as at 23^a, (see Figure

3). In the actual practice of this invention, the pins 29^a have a diameter of one and a quarter inches and are turned down to a one-inch diameter at each end, leaving a shoulder against which the arms of the spider abut. The roller 29 is bored larger than the pin. Thus, for instance, it may have a one and a half inch bore. Thus the rollers are loosely hung each upon its individual pin and by loosely hanging the rollers a vibrating action is set up that enables the coarse talc as it enters the grinding chamber to be fed immediately under the rollers and a very rapid pulverizing effect is obtained. By loosely hanging the rolls, I eliminate lubricating trouble, the action of the air passing through the drum keeping the space between the pin and the roller clean.

The spider, as before remarked, is in two sections and the shaft 22 that drives the spider has a shoulder 24 against which one of the spider sections abuts, and a key 54 is inserted through this spider section and the shaft to prevent the spider turning on the shaft. The other half of the spider or the outside spider section is put on with another key 54 and the two spiders are held rigidly together by means of the nut 25 on the end of the shaft. Thus when the spider sections are in place and the nut 25 is in place, the four pins 29^a are held in place with a tight sliding fit into the holes in the outer ends of the spider. The advantage of this is that by constructing the spider in sections it is only necessary to move one nut to take off the outer spider, thereby liberating the four rolls and pins and enabling quick and easy replacement of the parts.

The drum or housing 12 is likewise constructed in two parts, but the abutting edges are rabbeted, as shown at 55, so that the hammer-like or vibratory action of the rolls against the periphery 30 of the housing cannot throw the housing out of alignment. This enables the housing sections to be held together by fewer stud bolts than would otherwise be the case, and by taking out these stud bolts the two halves of the housing can be readily separated, exposing the rolls, again making for quick repair work and replacement of parts.

The operation of the mechanism may be briefly stated as follows: The drum has a smooth internal surface, as have the rolls. As the rolls revolve, the fine or ground talc is drawn into the center of the drum and is carried off by the exhaust fan which produces a current of air drawn through the perforations 18 and 20, this air passing through the center of the rolls. By shifting the damper or disk 19, the volume of air may be controlled. Crushed talc is fed into the hopper and fed automatically by the feeding wheels into the drum. These

feeding wheels, as before stated, are given a step by step rotation. By imparting a proper speed to the rolls so as to give a proper centrifugal force, the talc is taken in and as it is pulverized it is carried around to the circumference of the drum to almost the point of entrance, where it is thrown into the center of the drum and drops down through the air current, the coarse and fine particles dropping down this way permitting the fine particles to be drawn off laterally by the air current from the fan, while the coarse particles drop down to the bottom of the drum and are pulverized still further. This results in a great saving of power in driving the exhaust fan.

The placing of the exhaust fan in close proximity to the feed rolls and the drawing of the air between the rolls instead of through the crushed talc reduces the horsepower required to drive the exhaust fan, and furthermore secures the instant clearing of the ground talc from the mass. This stops the cushioning effect of the fine talc in the mass and thus increases the grinding capacity or tonnage capacity of the machine and obviously reduces the power required to run it. The drive pulley is relatively large, while the rolls rotate at a relatively slow speed which reduces the horsepower consumed.

The arrangement of the openings 18 in the damper and in the plate 16 are such as to prevent the stalling of the mill, which would occur if air were shut off entirely. The arrangement of these openings and their size and distribution secures an even current of air distributed over all that inner portion of the drum not occupied by the grinding rolls so as to catch all fine talc thrown into the center of the drum and carry it out. The damper can be set to carry out nothing but a 300 mesh fine. This cuts down capacity of the mill, however. Under usual operation the damper is set to take out all fine from 20 mesh to 300 and then a further separation is carried on outside the mill by an air flotation process. A roll passes the hopper opening some 800 times a minute. There is, therefore, not much chance for talc to drop directly through but if it does pass between the rolls it is merely caught by a roll passing along the bottom of the drum and is immediately pulverized.

I claim:—

1. A pulverizing machine of the character described including a drum, a shaft extending into the drum, a spider mounted upon the shaft and including a plurality of outwardly projecting arms, rolls carried upon the extremities of the arms for free rotation against the peripheral wall of the drum, one wall of the drum having an opening communicating between the spider arms

with the interior of the spider, a fan casing mounted upon the last named wall of the drum approximately concentric to the axis of the spider and into which said opening discharges, an exhaust fan mounted in said casing and means for driving the fan independently of the spider carrying shaft.

2. In a pulverizing mechanism of the character described, a drum having a smooth peripheral wall and having one side wall formed at its center with a central opening, a shaft entering the drum, a spider mounted upon the shaft and carrying a plurality of freely rotatable rollers bearing against the periphery of the drum, the spider having openings communicating with the opening in the side wall of the drum, means for feeding material in graduated quantities into the drum, power operated means for rotating the drum, a fan casing mounted upon the side wall of the drum and concentric to the axis of the spider and having its interior communicating with the interior of the spider by means of said opening, an exhaust fan mounted in said casing and driven at a speed independent of the speed of the drum, the wall on the opposite side of the drum from the exhaust fan having a plurality of air inlet openings disposed uniformly around the axis of rotation, and means for controllably admitting air into the interior of the drum through said openings.

3. In a pulverizing machine of the character described, a drum having a smooth peripheral wall and having one side wall formed at its center with a central opening, a shaft entering the drum on one side of the drum, a spider mounted upon the shaft and carrying a plurality of freely rotatable rollers bearing against the periphery of the drum, the spider having openings communicating with the opening in the side wall of the drum, means for feeding material in graduated quantities into the drum, power operated means for rotating the drum, a fan casing mounted upon the side wall of the drum approximately concentric to the axis of the spider and having its interior communicating with the interior of the spider by means of said opening, an exhaust fan mounted in said casing, means for driving the fan independently of the spider carrying shaft, and means on the opposite side of the drum from the exhaust fan for controllably admitting air into the interior of the drum, said means including a member having a plurality of air openings disposed concentric to and uniformly staged around the axis of said spider carrying shaft, and a control disk oscillatable concentric to said member and having corresponding air openings and constituting a damper.

4. A pulverizing machine of the character described including a drum, a shaft extending into the drum, a spider mounted

upon the shaft and including a plurality of outwardly projecting arms, roller supporting pins carried by the arms and extending transversely across the drum, rollers
5 mounted upon said pins between the arms and bearing against the periphery of the drum, the rollers having beveled ends and being so loosely mounted upon the pins that the rollers may oscillate through a limited
10 distance in planes radial to the pins.

5. A pulverizing machine of the character described including a drum, a shaft extending into the drum, opposed spider sections mounted upon the shaft and each including

a plurality of outwardly projecting pairs of 15 arms, transversely extending pins mounted in said arms, rollers mounted upon said pins, the ends of the rollers being convexly rounded, each roller having a bore sufficiently larger than the corresponding pin that the 20 roller may shift bodily outward against the face of the drum under centrifugal action and may rock upon the pin in planes radial thereto.

In testimony whereof I hereunto affix my 25 signature.

CHARLES C. TROWBRIDGE.