Title of Patent

A Continuous Flow Multi-Stage Grinder

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Abstract

A continuous flow multi-stage grinder for grinding grains and other applicable food products comprises the Hopper (001) which receives the grain or food item to be milled and channels it to the mill housing (002) to be milled in stages. The conveyor (003) carries the milled product from one stage on grinding to the next. Contained in the mill housing at every stage are the grinding plates (004). The finally ground product comes out for collection through the discharge Channel (005). Grinding is achieved by an arrangement of pulleys (006) and v-belts (007) driven by an electric motor (008). Motion is transmitted to the mill housing at the three grinding stages by the transmission shaft (009). The entire grinder and electric motor are supported on a frame (010) and base (011) respectively.

Description

FIELD OF THE INVENTION

The present invention relates to a machine for grinding grains and other food materials by the serial combination of three (3) burr mill grinders for the purpose of getting ultra-fine products from a machine in a single grinding flow.

BACKGROUND

It is discovered that there are problems associated with the existing popular single unit burr mill grinder used commercially in Nigeria and many parts of the developing country. These short

comings include: constant application external pressure to the screw conveyor so as to transmit incoming product to the grinding chamber; twisting of the transmission shaft due to the excess pressure and torque transmitted to the shaft; long time spent in grinding due to the fact that there is a need to turn the product into the machine several times in order to achieve the actual fineness required; boredom because the operator keeps adjusting the screw every time the product is poured into the grinder.

The general objective of the project is to produce a machine for grinding grains and other food materials by the serial combination of three (3) burr mill grinders for the purpose of getting ultra-fine products from a machine in a single grinding flow. This general objective is attained by the following specific objectives. (i) To produce a grinding machine with less required labour. (ii) To produce a grinding machine that is much faster than what has been in existence (iii) To produce a grinding machine that will come out with smooth fine product at a grinding flow (iii) To produce a grinding machine that will reduce time consumption during grinding process

SUMMARY OF THE INVENTION

An object of the invention is to overcome at least some of the drawbacks relating to the existing single stage grinding discussed above.

The operation of the multistage grinder starts with the feeding of the grains or materials into the hopper. The prime mover is actuated which simultaneously puts the machine into motion. In this case of A.C motor, the power is transmitted to the transmission shaft with the aid of two pulleys and belts.

The transmission shaft carries tapered screw conveyor shafts and the grinding mills. It thus impacts the same rotating motion to other members. The moist grain or material from the hopper through the inlet passes into the groove of the screw conveyor. As the second screw rotates, it impacts both the axial and spiral motion to the moist grains or materials which crush, shear, compress, and pulverize them.

The grains follow the spiral path of the screw conveyor until it impinges on the surface of the rotating half of the grinding plates. The plates have ridges on their surface to effect abrasive and crushing effects. The crushed grains are flung outward towards the periphery of the plates to gather and flow through the outlets. Sequentially the operation is repeated at the other two stages, to produce the slurry form of the moist grains. The desired fineness is obtained by varying the distance between the surface of the grinding plates with the aid of the fly screw and nut at the cover's end. The slurry is collected below the third outlet

BRIEF DESCRIPTION OF THE DRAWINGS

Having thus described the invention in general terms, reference will now be made to the accompanying drawings, which are not necessarily drawn to scale, and wherein:

FIG. 1 shows the front view of the multi-stage grinder according to one embodiment of the present invention.

FIG. 2 shows the side view of the multi-stage grinder according to one embodiment of the present invention.

FIG. 2 shows the Plan of the multi-stage grinder according to one embodiment of the present invention.

FIG. 4 is a picture plate of the multi-stage grinder during testing.

DETAILED DESCRIPTION OF THE INVENTION

The present inventions now will be described more fully hereinafter with reference to the accompanying drawings, in which some examples of the embodiments of the inventions are shown. Indeed, these inventions may be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided by way of example so that this disclosure will satisfy applicable legal requirements. Like numbers refer to like elements throughout.

The component by component description of the multi-stage grinder machine is given with reference to FIG. 1, 2, 3 and 4.

The Hopper (001) is conical in shape with a circular cross-section, both at the top and bottom. It is made from stainless steel sheet of about 3.0mm thickness. The grain or material is poured into the machine through the hopper and it goes on from there into the milling chamber. .

The Mill Housing (002) also known as the grinding disc chamber is that part of the machine that encases the mill. It is usually held in position by fastening bolts and fly nuts at the mill back plate. The mill housing is fabricated with galvanized steel while the exit channel is made of stainless steel. At the centre of the housing, there is a closed cylindrical pipe, also made of galvanized steel. The pipe is threaded internally in order to accommodate a long adjusting screw with handle. Three of this housing with approximately the same dimensions and material specifications were used for all the three grinding stages.

The Conveyor shaft (003) is used to transport grains from the hopper to the grinding plates, it is made of mild steel, with a part of the shaft exposed within the hopper. That part of the shaft is made of chromium steel and also welded to it is a spiral with pitch and height decreasing towards the mill end. The shaft is enclosed in tapered conveyor housing.

Grinding Discs (004) bring about the grinding or milling operation in the machine. They are made of mild steel with rough surface to give the desired crushing. For this machine, the size of grinding disc used was the standard A3 size. The plates make it possible for the grinding of both wet and dry products, since it is making use of shear action.

The Adjusting Screw also known as the fly screw is mainly used for adjusting the gap between the grinding plates. Since the grinding process uses shear action which is obtained by moving one of the plates against a stationary grinding plate. The adjustment screw is fabricated by threading a steel rod in alignment with the threading of the cylindrical pipe where it is going to pass through.

The Pulley (006) is situated at the other end of the shafts, which will receive the power directly from the electric motor and also transmit power to the other shafts. The power transmission takes place by means of the flat and V- belts (007). The pulley used for this design is made of mild steel.

Transmission belt (007) is the major transmission device to transmit power from the first shaft to other shafts by means of pulley at same speed. The belt is V-belt made of rubber, thus it is flexible.

Transmission Shaft (008) is the major operating device. It is about 385mm long with 25mm diameter and is made of mild steel. It has worm gear welded at one end of the shaft. It brings about the forward and backward movement of the grinding plate which performs the grinding operation. The other end of the transmission shaft is extended to the end of the machine where a pulley is fitted to the shaft through the manual threading of the shaft by tapering.

The Motor Stand (011) is the support made to carry the electric motor. It is made of galvanized steel to withstand the weight of the motor, corrosion, as well as the effect of vibration. The motor - stand has a base on which the electric motor is bolted.

DRAWING

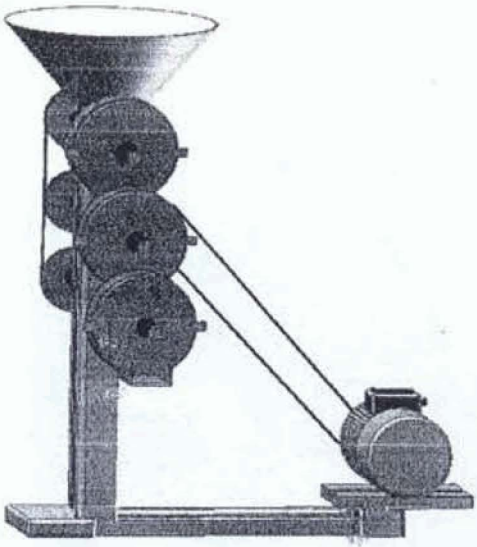

Figure 1: Front view

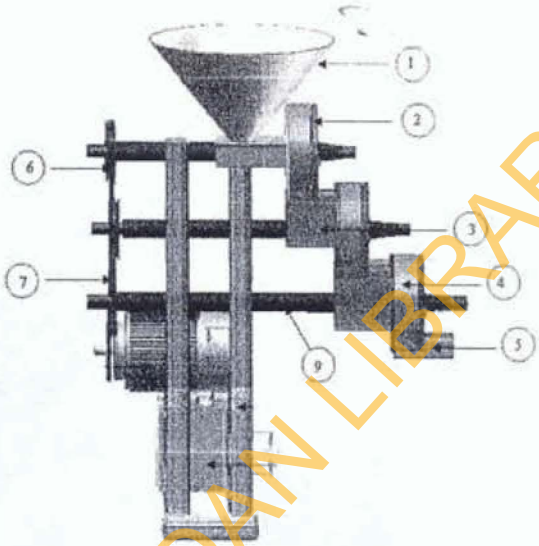

Figure 2: Side view

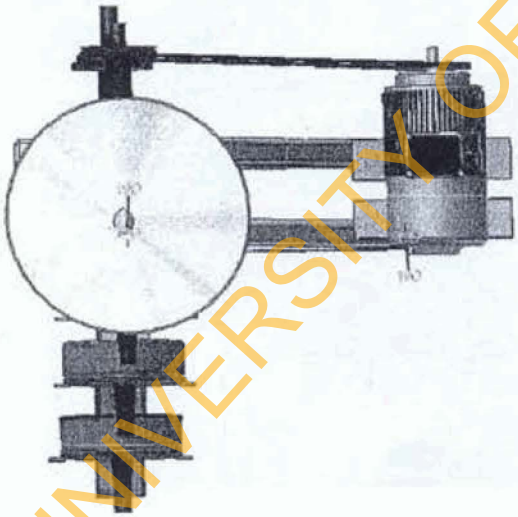

Figure 3: Plan

PART NO	PART MATERIAL	NO. OF ITEMS
1	Hopper	1
2	Mill Housing	3
3	Conveyor	3
4	Grinding Plates	6
5	Discharge Channel	3
6	Pulley	3
7	V – Belt	3
8	Electric Motor	1
9	Transmission Shaft	3
10	Frame	1
11	Base	1

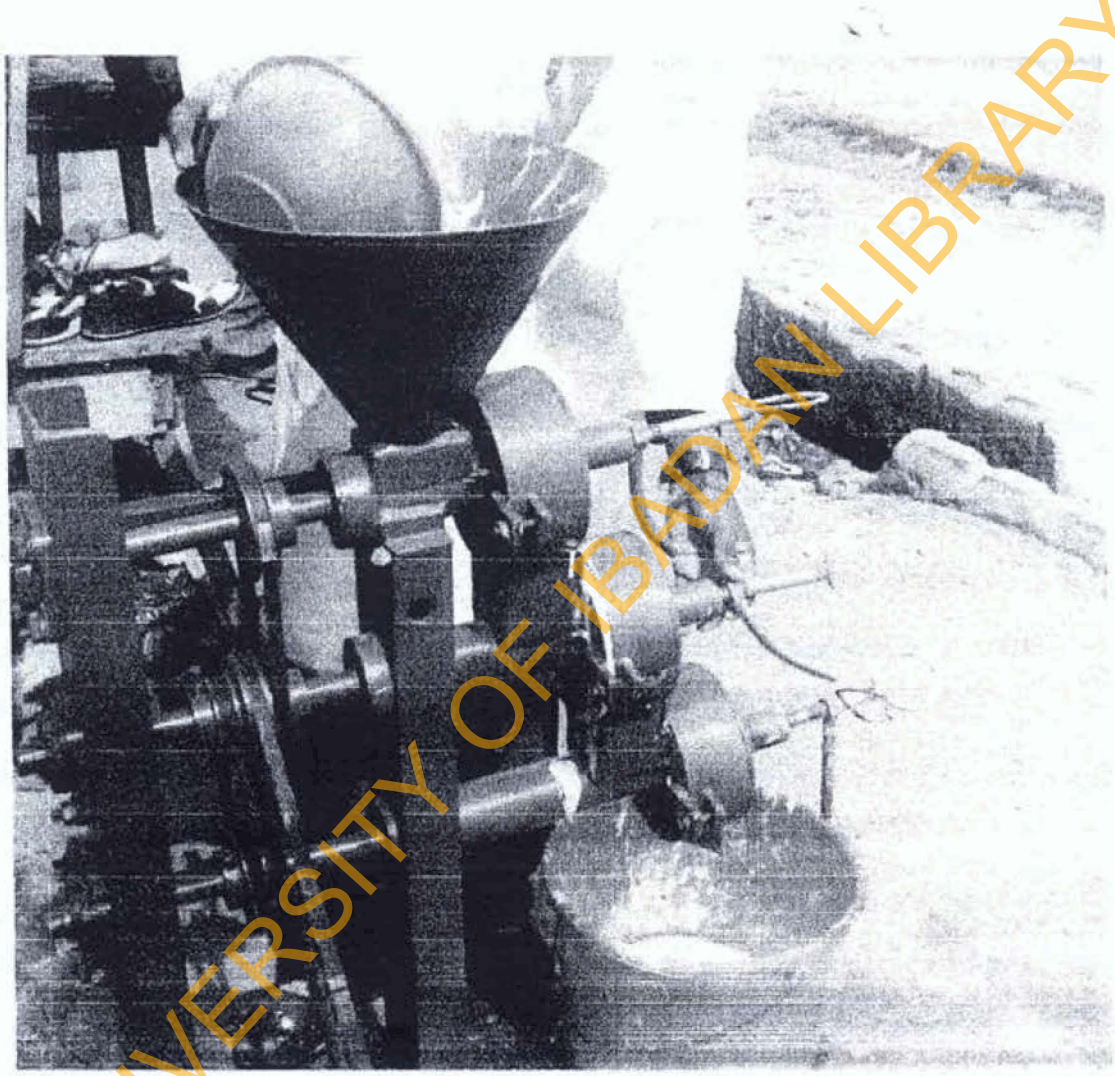

Figure 4: Assemblage of the grinding machine during testing

Claims

What we claim are as follows:

A three-stage machine for grinding or milling soaked grains and other applicable materials, said machine comprising:

1. a hopper, conical in shape with a circular cross-section, both at the top and bottom.
2. a mill housing that encases the mill held in position by fastening bolts and fly nuts at the mill back plate.
3. a conveyor shaft used in transporting grains from the hopper to the grinding plates.
4. grinding discs that bring about the grinding or milling operation in the machine.
5. adjusting screws also known as the fly screw used for adjusting the gap between the grinding plates..
6. pulleys situated at the end of the shafts which receive power directly from the electric motor and also transmit power to the other shafts.
7. transmission belt that transmits power from the first shaft to other shafts by means of pulley at same speed.
8. transmission shaft the major operating device with worm gear welded at one end of it.
9. a motor stand that supports the electric
10. a frame that supports and holds in place the entire grinder components

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