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PULVERIZING SYSTEM FOR MOISTURE LADEN FUELS

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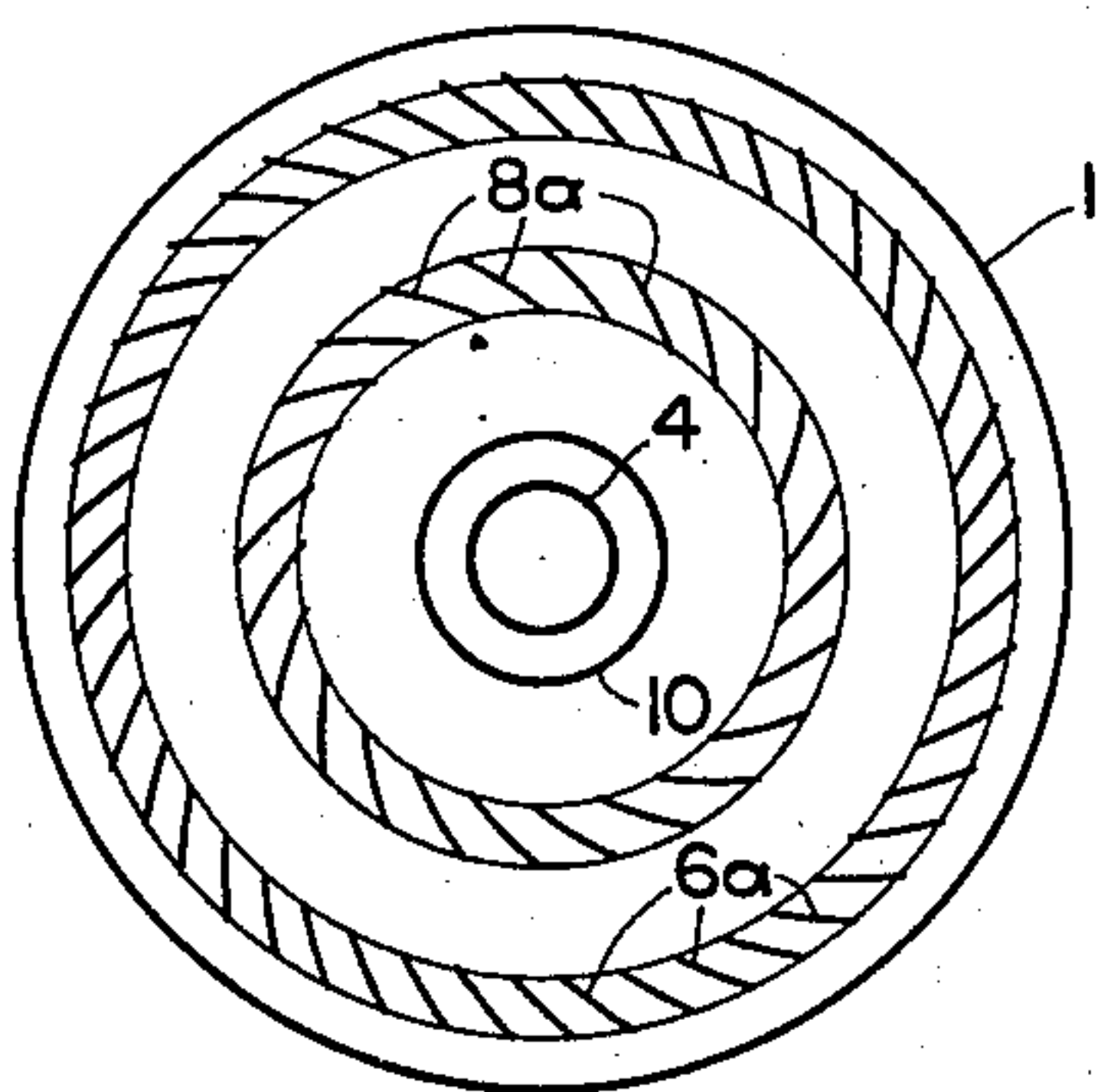
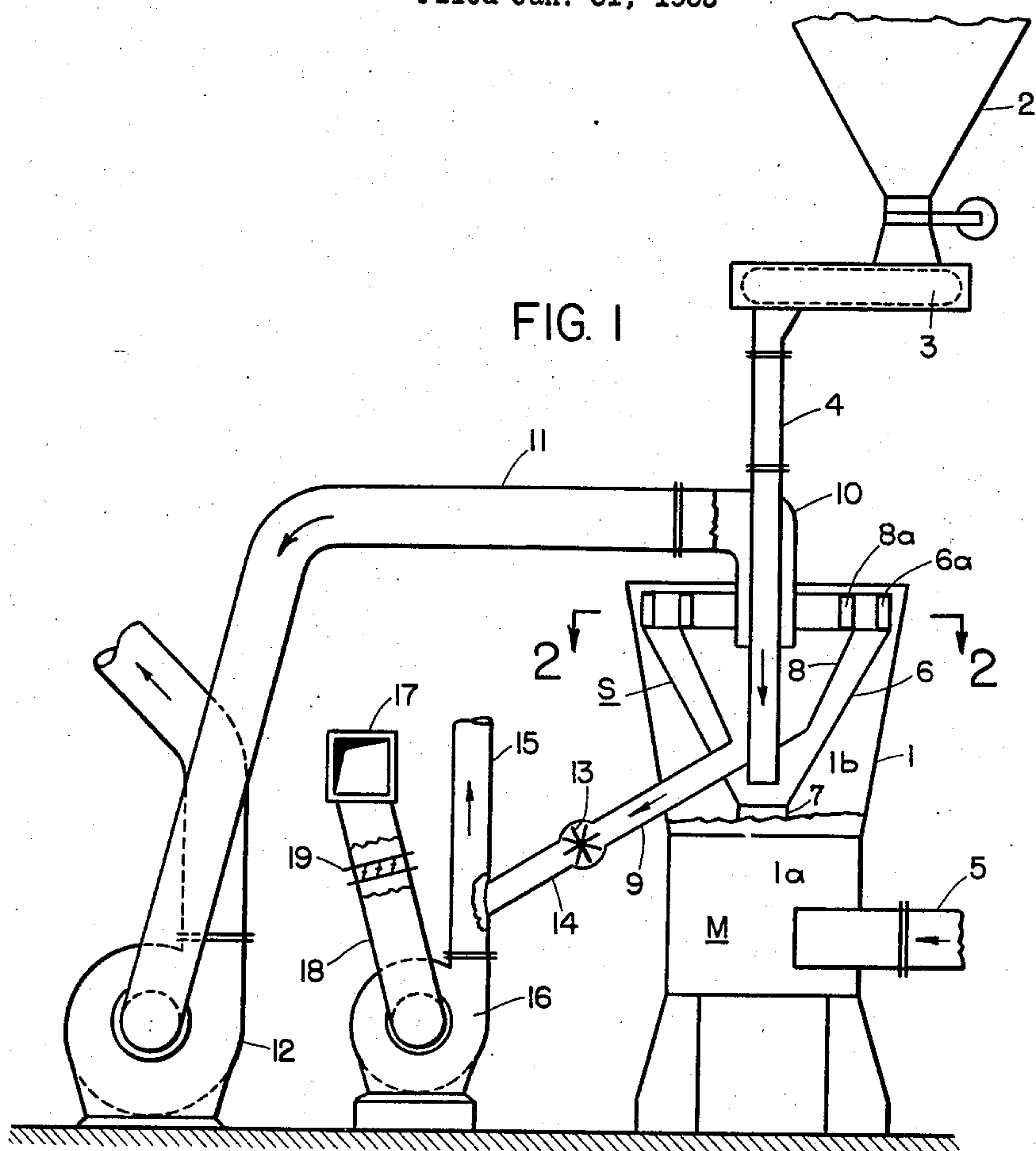


FIG. 2

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PULVERIZING SYSTEM FOR MOISTURE LADEN FUELS

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3 Claims. (Cl. 110—106)

This invention relates to certain new and useful improvements in grinding, drying and classifying apparatus and is more particularly applicable to a system of pulverizing and drying moisture laden fuel.

In apparatus of the above character it is customary to cause a stream of hot air or gas to flow through the pulverizing chamber of the mill so as to dry the material while being ground and to carry the finely divided material in suspension into the classifying or separating chamber. The heavier or coarser particles of material are then thrown out of the main air or gas stream and are returned to the pulverizing chamber of the mill for further grinding. In an apparatus not equipped with my inventive improvement the fine particles are then ejected from the mill with the gas or air stream and are thus transported to the burners of the furnace. In cases where fuel of high moisture content is pulverized the carrier air or gas absorbs a large portion of moisture and discharges it with the fuel into the furnace. This excess moisture lowers the furnace temperature causing considerable difficulties in the operation of the furnace, especially at low loads.

In a slagging bottom furnace, for instance, a lowering of the furnace temperature may interfere with a free discharge of molten ash through the outlet of the slagging chamber. Or when firing fuel of low volatile content a lowering of the furnace temperature may cause failure of ignition during low load operation.

Furthermore, in a system of the above character and where the pulverizing apparatus is under suction, it is customary to utilize an exhaustor at the mill outlet side to transport the carrier air or gas and pulverized fuel to the burner. In passing through the exhaustor the pulverized fuel causes undesirable wear on the exhaustor blades and fan housing which necessitates the frequent and costly replacement of parts.

According to my invention the above disadvantages are eliminated or greatly reduced by providing an improved pulverizing, drying and classifying system in which the moisture laden gases are replaced by dry hot carrying gases or air; and in which the abrasive pulverized fuel does not pass through the exhaustor.

It is accordingly a main object of the invention to substantially reduce the wear on the exhaustor parts. A further object of the invention is to maintain favorable temperature conditions in a slagging furnace when firing high moisture fuel. Another important object of the invention is to improve ignition in the furnace especially at low loads by preventing the cooling of the furnace chamber caused by moisture laden gases being fed with the fuel into the furnace. Further objects and advantages of the invention will be readily apparent from the following detailed description of one approved form of apparatus structure and operating according to the principles of this invention.

In the accompanying drawings:

Fig. 1 is a diagrammatic illustration of a pulverizing

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system embodying the invention with portions of the mill housing cut away.

Fig. 2 is a horizontal section through the upper portion of the mill and taken on line 2—2 of Fig. 1.

The apparatus here shown may be generally described as comprising pulverizer M including housing 1 having a lower grinding chamber 1a and an upper classifying or separating chamber 1b. The fuel to be pulverized passes from fuel hopper 2 onto a conveyor 3 from which the fuel is discharged through a pipe 4 into the grinding chamber 1a. Fuel pipe 4 is preferably located coaxial with the vertical axis of the pulverizer M. Hot air or gas enters the mill through duct 5. The heat carried by these gases serves to dry the fuel while being ground and while being suspended therein. This gas also serves to carry the pulverized fuel upwardly along the inner periphery of the mill housing 1 into the separating chamber 1b. A separator S of conical form occupies the classifying chamber 1b and comprises a first separation stage 6 and a second separation stage 8. Stage 6 is equipped with a row of radial vanes 6a, as shown in Fig. 2. The second separation stage 8 is arranged coaxial with the first stage 6 and is also equipped in its upper portion with radial vanes 8a. Vanes 6a and vanes 8a may be of a straight or curved form. The gas and fuel mixture enters the classifier 6 between the vanes 6a and a peripheral motion is thereby imparted to the gas and fuel mixture causing the heavier coarser particles to drop out and pass down through the outer lower conical portion of separator S and through the outlet 7 thereof back into the grinding chamber 1a of the mill M for further grinding. The finer fuel particles together with the moisture laden carrier gases continue in their peripheral motion and pass through vanes 8a of the inner classifying stage 8. Centrifugal force causes these finer particles to separate from the gases and to pass downwardly into the lower conical portion of the classifying stage 8 and to leave by way of pipe 9. The moisture laden gases are withdrawn upwardly through centrally located outlet 10. This outlet 10 is connected through duct 11 to an induced draft fan 12 which discharges the moisture laden gases to the atmosphere or to a location in the furnace (not shown) which is removed from the ignition chamber thereof. An air locking star feeder 13 connects pipe 9 with pipe 14 and serves to deliver the finely pulverized material from the low pressure zone of pipe 9 to a higher pressure zone in pipe 14. Pipe 14 is connected to the outlet duct 15 of a forced draft fan 16. This fan draws air from a hot air source 17 through an inlet duct 18 which is equipped with dampers 19. As the pulverized material leaves pipe 14 it is picked up by the hot air and is carried to the burners and furnace (not shown).

In operation the hot gases entering the mill from duct 5 serve to dry the material while being pulverized and thereby absorb a large portion of the moisture. This moisture laden gas and pulverized material enter separator S wherein the pulverized material is then separated from the moisture laden gases by passing through classifying stages 6 and 8. The coarser particles of the fuel are returned to the grinding chamber through outlet 7, the fined particles are discharged through outlet 9 and the moisture laden gases leave by way of outlet 10 as earlier described.

Since the interior of pulverizer M is under a lower static pressure than the pressure side of fan 16 it is necessary to make use of an air locking feeder device 13 to pass the finely pulverized material from pipe 9 into pipe 14.

In accordance with the invention the pulverized fuel is again mixed with hot air in duct 15 after the air has passed through forced draft fan 15. This fan according-

ly is not subjected to the abrasive action of the pulverized fuel.

Also, since the moisture laden gases have been separated from the fuel in the mill M and are not made use of in transporting the pulverized fuel to the burners the moisture in these gases can no longer cause difficulties in the furnace chamber by lowering the temperature therein.

It will be understood that the embodiment of the invention as herein described is merely illustrative of the invention and that changes and modifications may be made therein without departing from the spirit and scope of the invention.

I claim:

1. In a system for pulverizing and drying moisture laden material the combination of a mill for grinding said material; means for flowing a first stream of hot gases through said mill for drying said material while being ground in the lower part of said mill and for holding the ground material in suspension; a first classifier in the upper part of said mill for separating the coarsely ground material from the finely ground material and first stream of hot gases; a separator located within and integral with said classifier for separating the finely ground material from said first stream of hot gases; pumping means and first duct means for moving and conducting a second stream of hot gases, said pumping means having a suction side and a pressure side; second duct means for conducting the finely ground and separated material from said separator to a point in said first duct means and on the pressure side of said pumping means; and air locking feeder means operatively connected into said second duct means for feeding said finely ground material into said second stream of hot gases while preventing these gases

from entering the separator through said second duct means.

2. In a system for pulverizing moisture laden material the combination as defined in claim 1 in which said separator is arranged in coaxial relation with said classifier.

3. In a system for pulverizing and drying moisture laden fuel the combination of a mill having a mill housing including a lower grinding chamber and an upper classifying chamber; means for feeding fuel to said mill; means in the lower portion of said housing for pulverizing said fuel; means for flowing hot gases through said grinding chamber and said classifying chamber for drying said fuel while being pulverized and for holding said fuel in suspension; a separator arranged in said classifying chamber in coaxial relation with the vertical axis of said housing, said separator having an outer classifying stage and an inner separating stage in coaxial relation therewith for passage of gas and fuel mixture therethrough; a first outlet duct leading from said classifying stage to the grinding chamber for returning coarsely ground fuel to said grinding chamber; means for conveying finely ground material from said separating stage to an air lift system; and means for removing the moisture laden gases from said separating stage.

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