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GRINDING MILL PLANT

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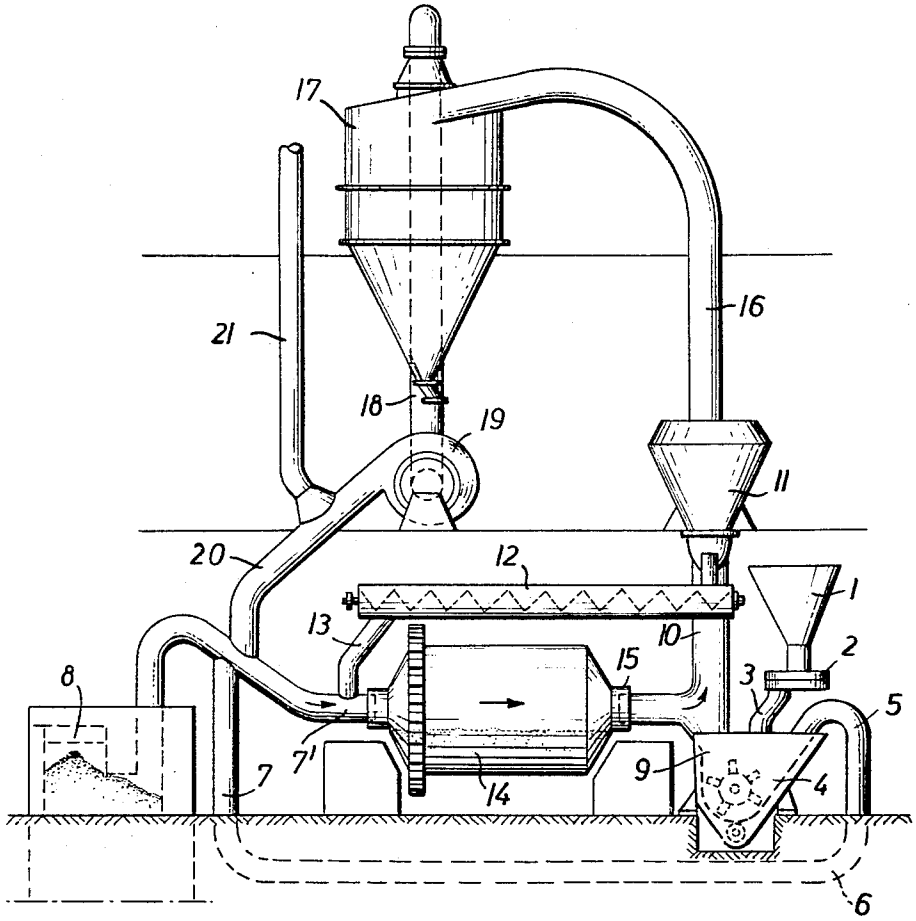

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# GRINDING MILL PLANT

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## ABSTRACT OF THE DISCLOSURE

Grinding mill plant includes a comminuting machine for primary crushing, a fine grinding mill for secondary crushing and a separator for separating coarsely and finely ground material, a standpipe directly connecting the separator in common to the comminuting machine and the fine grinding mill, hot gas supply means connected to the comminuting machine and the fine grinding mill for conveying ground material therefrom through the standpipe to the separator, and means for reconveying from the separator to the fine grinding mill the coarsely ground material separated by the separator. The comminuting machine is located directly below the lower end of the standpipe whereby coarse material too heavy to be conveyed up the standpipe by the hot gas drops down into the comminuting machine to be further crushed therein.

My invention relates to a grinding mill plant of the type having a comminuting machine for primary breaking or crushing and a fine grinding mill for secondary crushing as well as a common separator.

In plants of this type, the raw material is supplied to the separator by gases from the primary comminuting machine and the secondary fine grinding mill and the coarser components of the material are fed back from the separator into the fine grinding mill.

In a particular air flow-type grinding mill plant or installation of this type of construction, the material to be processed is comminuted in an impacter or beater mill, which simultaneously serves as an air blower, and is subsequently fed to a separator in which separation of the coarse and the fine material takes place. The coarse material is then delivered to a fine grinding mill and after suitable comminution is again fed back to the beater mill through a horizontally disposed conduit by a gas flow guided in the flow circuit or loop in the plant. The deposition of ground material in the horizontal conduit, which can lead to complete obstruction of the conduit, cannot be avoided. Consequent interruption of the operation may result therefrom, and the prevention of such an occurrence requires exceptional expenditure in labor, duration and costs. Furthermore, these known plants are disadvantageous in that the beater mills which serve as blowers must not only be designed for the quantity of air required for drying the material in the mill itself but must also accommodate the additional quantities of air guided through the plant loop which are necessary for transporting the material. Since the blower action of the beater mill is very slight, however, the energy requirement for the large quantities of circulating gas and air is exceptionally large. This known air flow grinder mill plant is therefore not only very costly to install but is also very uneconomical to operate.

It is therefore an object of my invention to provide a grinding mill plant which avoids the disadvantages of the known aforedescribed plant of this type and to simplify the structure of such a plant.

With this and other objects in view, I provide in accordance with my invention a grinder mill plant which comprises a comminuting machine and a fine grinder mill that are directly connected with a separator. Thus, each of both the comminuting machine and the fine grinder mill need be subjected respectively to that quantity of gas only that is necessary for drying and for transporting the material solely therein.

In accordance with another aspect of my invention, a final separator of the suitably ground material and the conveying gases is provided, and since the gases passing into the loop after leaving the final separator are free of material to be ground and therefore there is no longer any danger of increased wear and tear due to the material to be ground, a special mill blower is connected to the final separator in the loop so that the energy expenditure for drawing the gases through the loop is greatly reduced. In accordance with a further aspect of my invention, both the comminuting machine and the fine grinder mill are connected to an ascending conduit or stack which affords no danger of deposition of the fine ground material.

Other features which are considered as characteristic for the invention are set forth in the appended claims.

Although the invention is illustrated and described herein as embodied in a grinding mill plant, it is nevertheless not intended to be limited to the details shown since various modifications and structural changes may be made therein without departing from the spirit of the invention and within the scope and range of equivalents of the claims.

The construction and method of operation of the invention, however, together with additional objects and advantages thereof, will be best understood from the following description of a specific embodiment when read in connection with the accompanying single figure of the drawing which shows diagrammatically and in front-elevational view a grinding mill plant constructed in accordance with my invention.

In the figure there is shown a grinding mill plant or installation which includes a storage and supply hopper **1** for the material which is to be comminuted and dried. Beneath the outlet opening of the hopper there is provided an apron feeder **2**, for example, of conventional construction which ensures uniform supply or feeding of the material. A slide or chute **3** extends from the feeder **2** to a rustproof hammer mill **4**. A hot gas supply conduit **5** is connected at one end to the top of the hammer mill **4** and at the other end to one end of a gas channel **6**, located underground in the embodiment shown in the figure. The gas channel **6** in turn is connected at its other end by hot gas conduits **7** and **7'** to a hot gas producer **8**, such as an oil-fired furnace of conventional construction or a furnace fired by powdered coal or natural gas.

An outlet opening **9** of the hammer mill **4**, through which the hot gases discharge the suitably comminuted material from the mill, is connected with a standpipe or stack **10** leading to a separator or grader **11**. In this separator **11**, the coarse material is separated from the gas flow and is discharged. The coarse material discharge conduit of the separator **11** connects with a screw conveyor **12** having a discharge end connected through a slide or chute **13** and conduit **7'** with the inlet end of a tube mill **14**. The hot gas conduit **7'**, as shown in the figure, is connected to the hot gas producer **8** at one end and to the inlet end of the tube mill **14** at the other end thereof. The outlet opening **15** of the tube mill **14**, through which the gas together with the suitably comminuted material are discharged from the mill **14**, is connected with the standpipe **10**.

A gas outlet conduit **16** from the separator **11** leads to a final cyclone separator **17** in which the solid materials are separated from the gases. In the exhaust gas conduit **18** of the cyclone separator **17**, there is inserted a suction blower **19** having a conduit **20** on the pressure side thereof

which connects to the conduit 7' extending between the hot gas producer 8 and the tube mill 14. A portion of the gases advanced or propelled by the blower 19 is conducted through a branch conduit 21 through a dust removing apparatus not shown in the drawing, into the surrounding atmosphere.

The grinding mill plant shown in the drawing operates in the following manner: The raw material, for example cement raw material with a water content of 16% and a grain size up to about 30 mm., is supplied to the hammer mill 4 through the hopper 1. The material is comminuted to a grain size below about 10 mm. and is dried to a water content of 10% in the mill 4. The comminuted material is transported into the separator 11 by the hot gases produced in the furnace 8 and supplied to the hammer mill 4 through the conduit 5, and the coarse material, e.g. those component particles having a grain size above about 0.1 mm., is separated and conducted into the tube mill 14 by the conveyor 12. In the mill 14, the material is then ground to its ultimate fine form and completely dried. The material discharging from the tube mill 14 is also conveyed by a gas flow back to the separator 11. Coarse materials possibly entrained by the gas flow are then separated in the separator 11 and consequently the fine material from both mills 4 and 14 is delivered by the gas flow through the conduit 16 into the cyclone separator 17, wherein the gases and the solid particles are separated from one another. A portion of the gases is finally conducted from the cyclone separator 17, under the action of the suction blower 19 connected in the loop or flow circuit, through the conduit 21 into the surrounding atmosphere while the remainder of the gases is returned through the conduits 20 and 7' into the tube mill 14.

I claim:

1. Grinding mill plant comprising a comminuting machine for primary crushing, a fine grinding mill for secondary crushing and a separator for separating coarsely and finely ground material, a standpipe directly connecting said separator in common to said comminuting machine and said fine grinding mill, hot gas supply means connected to said comminuting machine and said fine grinding mill for conveying ground material therefrom through said standpipe to said separator, and means for reconveying from said separator to said fine grinding mill the coarsely ground material separated by said separator, said comminuting machine being located directly below the lower end of said standpipe whereby coarse material too heavy to be conveyed up said standpipe by the hot gas drops down into said comminuting machine to be further crushed therein.

2. Grinding mill plant according to claim 1, wherein said hot gas supply means comprises a hot gas source directly connected in common to respective hot gas inlets of said comminuting machine and said fine grinding mill.




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