A method of and an apparatus for the drying of comminuted material, especially wood particles and fibers and particles of cellulosic or plant materials in general, as may be used for the production of pressed board. The particulate mixture, including a fine component, a coarse component and at least one further component such as splinters, is subjected to gas classification to separate the fines from the coarse particles which are conveyed in respective hot-gas streams eventually to respective separators. In the separators, the particles are recovered from the cooled gas, part of which is returned to the hot-gas generator which the remainder or at least another part is mixed with the hot gases produced by this generator for recycling to the drying stage. The gas cycles of the fine and coarse stages may be operated independently.

12 Claims, 3 Drawing Figures
METHOD OF AND APPARATUS FOR THE DRYING OF COMMINUTED MATERIAL

FIELD OF THE INVENTION

The present invention relates to a method of and an apparatus for the drying of comminuted material and, more particularly, to the drying of wood particles (e.g., chips, fibers, dust) or particles of other cellulosic or plant materials, preparatory to the use of such particles in the production of pressed board.

BACKGROUND OF THE INVENTION

In the production of pressed board, regardless of density and other structural properties, it is a common practice to make use of particulate organic materials, especially plant cellulosic material, as a filler or as the major constituent of the board. The term "particulate" as used herein, and terms of similar import are intended to refer to fibers, granules, chips, dust, splinters and other comminuted forms of cellulosic material, especially wood.

For example, a pressed-board plant may include means for subdividing wood into a particulate mixture containing wood dust or powder, wood chips, splinters and fibers, or may subdivide the wood under heat and pressure to provide a mass of cellulosic fiber. Other organic cellulosic sources may also be used. The particulate material is generally deposited in mats or layers, with or without thermally activatable binders, and introduced into a press, e.g., a multiplate press. Depending upon the particle size characteristics of the particulate matter, the proportions of binder and other additives, the pressing temperature and pressure, the ratio of compression and the nature of the particles, the resulting board is more or less dense. The board may have high porosity and low structural strength where it is desired for use as an insulating member, or may be of high density, weather-resistance and structural strength where it is used for construction purposes. Between the lowest density stage and the highest density stage, any number of intermediate stages may be provided, simply by varying the above-mentioned parameters.

The particulate mixtures used for the production of pressed board generally require drying to a greater or lesser extent for optimum handling and processing characteristics. For example, pressing is facilitated at certain moisture contents, as is milling or further comminution. It is often desirable to deposit the particulate material in several layers; for example, a core layer of coarse particles flanked by finishing layers of fine particles. In these cases, experiments have shown that optimum handling and pressed-board manufacture require certain moisture contents or even moisture absence in the particles of the several layers.

Prior-art systems for drying the particulate materials have hitherto treated them with hot gases in layers on a support of a drying chamber. These directly heated dryers are provided with combustion chambers in which fuel is burned to produce hot gases which are passed over a bed of the particulate material. When the heating is excessive, the burner is cut off, and residual heat stored in the refractory walls of the combustion chamber is transferred to the gas which, in turn, dries the particles.

An important disadvantage of such systems resides in the fact that the degree to which drying is effective is dependent upon the thickness of the bed and upon the particle sizes. Thus, if it is desired that the particulate mixture be dried to 4 percent by weight moisture, processing in the manner previously described results in total drying of the fines (90 percent moisture) and the coarse particles which have not been dried at all or at any rate are at a moisture content above 4 percent. However, in the production of pressed board with surfacing layers of fine particles, it is desirable that the fine particles retain some moisture while the coarse particles are dried as much as possible. Consequently, the bed-drying process previously described is unsatisfactory with respect to the selectivity of the residual moisture.

Moreover, it is difficult, if not impossible, to accurately control the drying process because of the fact that the burner must be turned on and off repeatedly and there is always thermal lag in the system. Finally, it may be mentioned that the nonuniform drying of the particulate material can only be overcome in conventional systems by providing either excessively long-drying times or excessively high temperatures of the exhaust gases leaving the combustion chamber. On the one hand, therefore, the treatment duration may reduce the output of the plant and requires high capital expenditure for equipment of a capacity adapted to compensate for long-residence times, and on the other hand the high temperatures waste heat and may cause charring of the product.

OBJECTS OF THE INVENTION

It is, therefore, the principal object of the present invention to provide an improved method of drying particulate material, especially wood particles, fibers and the like, wherein the above-mentioned disadvantages are avoided.

It is another object of the invention to provide an improved plant for the drying of such particulate material, especially for use in the production of pressed board, which is of relatively low cost, is capable of operating efficiently and with minimum heat loss, and which provides precision control of the drying process.

The invention also has as its object the provision of a method of and a plant for the drying of particulate material to obtain particles of proper moisture content with accurate regulation, for limiting heat loss in the drying process, and for enabling the drying to be carried out at relatively low cost.

SUMMARY OF THE INVENTION

These objects and others which will become apparent hereinafter are attained, in accordance with the present invention, in a method of and an apparatus for the drying of a particle mixture (preferably of wood particles/fibers and particles/fibers of other cellulosic materials) wherein two independent gas cycles are provided. According to the principal feature of the present invention, a fine component and a coarse component of the particulate mixture are separated therefrom by gas classification with hot-gas streams with which the respective particles are dried, the cycles also including gas/particle separators for recovering the fine component and the coarse component from the respective cool-gas streams resulting from the absorption of moisture by the gas stream. A part of each of the cool-
gas streams or one of the cool-gas streams may be returned to the hot-gas generator while a portion of the remainder is mixed with the hot-gas output which forms the respective hot-gas stream delivered to the cycle.

More specifically, the invention provides that the particulate mixture will be treated with a gas mixture of freshly heated gas (i.e., a mixture of hot gas produced by combustion in the gas generator and recycled cool gas) and cool gas which is recycled by bypasses the hot-gas generator. The coarse-particle component and the splinter component from which the latter component is separated, are afterdried with a gas mixture of the hot gas from the generator and recycled cool gas from the coarse-particle cycle. The fines, recovered in a first gas-operated classifier, are afterdried in a drying chamber independent of that for the coarse-particle component with a mixture of recycled cool gas and the hot gas produced in the generator by the combustion of fuel in the presence of a portion of a recycled cool gas as noted earlier. The coarse particles are, in turn, separated from the splinters in a second gas-operated classifier and may be afterdried with the carrier gas which, in turn, is a mixture of the output of the gas generator with recycled cool gas from the separator at which the coarse particles are recovered from the latter gas stream.

In its apparatus aspects, the present invention provides a drying plant for a particulate mixture including at least the fine component and the coarse component mentioned earlier and, possibly a splinter component as also mentioned. The plant comprises first and second gas-operated classifiers for respectively separating the fine component and coarse component from the mixture; first and second drying chambers connected respectively to the first and second classifiers for treating the particles traversing the respective classifier with respective hot-gas streams; first and second gas/particle separators for separating particles of the components from respective cool-gas streams resulting from the absorption of moisture by the drying gas, the separators being connected in fluid circuit with the first and second chambers as already noted; and generator means for producing a hot gas. According to an essential feature of this invention, respective ducts are provided between each separator and the hot-gas generator to return a portion of the respective cool-gas stream to the generator and incorporate it in the hot-gas stream emerging from the latter. Respective conduits also connect the hot-gas generator with the respective classifiers so that the separation of the fine component from the coarse component is effected by a respective hot-gas stream which also serves as the drying medium for the respective component. Each of the conduits, in turn, is provided with mixing means for combining another part of one or both of the cool-gas streams of each cycle with the hot gas of the conduit to form the hot-gas stream used to treat the particulate material. Consequently, the proportion of hot gas (generator gas) and cool gas (recycled separator gas) may be adjusted within wide ranges to maintain any desired temperature of the hot-gas stream brought into contact with the particles.

When the fine component is separated in the first gas-classification process with the aid of a first hot-gas stream formed by mixing the generator gas with the cool gas from the fine-particle separator, the coarse particles are separated from the splinters in a second gas-classifier operating with a mixture of generator gas and cool gas derived from the coarse particle separator, and the fine and coarse particles are conveyed at least in part in separate hot-gas streams to the latter separators, the recycle portion of the gas only need be reheated.

It has been found that the temperature of the hot-gas stream should be regulated with or in dependence upon the temperature of the waste gases, i.e., the relatively cool-gas streams of the respective cycles and/or the moisture content of the components. The mixing of the relatively cool gas with the generator gas is preferably controlled in accordance with the moisture content of the afterdried fine component and coarse component respectively, the drying cycles being completely independently controllable and regulatable.

To ensure a rapid response of the control means, the temperature of the hot gas is additionally controlled in response to the temperature of gas mixture and/or the temperature of the recycled gas and it has been found preferable to regulate the temperature of the hot gas also in response to the original moisture content of the particle mixture. It is especially convenient to control the threshold of the temperature controller which responds thermostatically to the temperature of the cool-gas stream emerging from the separator in accordance with the moisture contained of the solids emerging from the same separator as will be apparent hereinafter.

In practice it has been found to be desirable to further comminute the fine component, by milling or shredding, this process being advantageously carried out in the presence of some moisture.

Under these circumstances the mixture contained is measured only after such further comminution.

In the plant of the present invention, the mixing stations provided along the conduits connecting the hot-gas generator with the respective gas-operated classifiers are preferably formed at the junction of the conduit with a branch leading to the respective gas/particle separator, and with a swingable-flap valve for proportioning the relative amounts of generator gas and recycled cool gas which are fed further along the conduit to the classifier. The position of the flap may be controlled continuously in response to the moisture content of the solids recovered from the respective cycle.

According to yet another feature of the invention, a regulating, computing or calculating stage of conventional construction is provided to regulate the operation of the burner of the hot-gas generator and the input thereto include a signal representing the exhaust-gas temperature, a signal representing the cool-gas temperature, signals representing the moisture content of the respective components, and a signal representing the moisture content of the particulate material and the input to the plant.

The control of the plant can be made highly sensitive by providing both of the moisture detectors responsive to the residual moisture of the product (fine and coarse components) so that they also control the set points of the thermostats of the respective cycles. In this case, the controller for the combustion chamber may be of
the type described at pages 22–82 ff of PERRY'S CHEMICAL ENGINEERS' HANDBOOK, McGraw-Hill Book Company, New York 1963, modified only to provide a servomechanism for varying the set point of the thermostat in accordance with the moisture signal. The term "signal" as used herein can, of course, refer to electrical outputs, but also is intended to refer to any of the outputs or inputs of a system within the meaning of the expression as used in the automatic control art. Consequently, the "signal" may also be a pressure, where the control system is operated, for example, pneumatically.

When the set points of the thermostats are not adjusted in response to the moisture content of the respective products, a signal transmitted to the flap valves of the mixing stations may respond rapidly to close off the cool gas stream and deliver only the generator gas to, for example, the first gas-operated classifier. This will automatically raise the gas temperature at the outlet to cause the thermostat, in turn, to control the combustion by reducing it or terminating it altogether. The system then overresponds. When, however, setpoint control is provided, the burner and operation of the combustion chamber are regulated only where both a temperature change of the output gas and increased moisture content indicate that such combustion regulation is required.

It has already been mentioned that the starting material can be introduced to the classifiers in succession, prior to any other treatment, and separated into fine-particle and coarse-particle components, each component being subjected separately to drying in a respective chamber. It has also been found that it is possible to provide a drying chamber ahead of the classifiers in which case this drying chamber is oversized. This embodiment is based upon the fact that, when an oversized drying chamber is provided, the fine-particle component is substantially completely dried when it reaches the first classifying stage. An unusually high stability of the final moisture content of the fine-particle component which is used as an outer layer in the first part, is thus obtained. This final moisture content is related to the exhaust-gas temperature and can be readily controlled simply by servoregulation of the exhaust-gas temperature. Hardly any fluctuations in the automatic control signal are developed. This type of control is also advantageous when the moisture content must be held in a critical range for convenience in subsequent milling.

One of the advantages of the present invention is that the mixing stations can be operated independently in response to temperatures detected in the exhaust-gas outlet of the first separator or in the recycling conduit of the second separator. The set points of the flap-type proportioning valves of the mixing stations can be adjusted to establish the desired moisture content of the products and it is also possible to control these plates solely in response to the product-moisture detectors. In this manner, the final moisture content of the fine-particle component can be set at, say, 8 percent while the moisture content of the coarse particles can be held at 3 percent. The setting may be made based upon the type of wood, the character of the particle, the moisture at the input site of the system or other parameters which influence the desired moisture content. The control of the entire drying operation and especially of the burners can be established with thermostatic devices as indicated.

In a third embodiment of the invention, a respective drying chamber is provided ahead of each of the classifiers, the duct and separator arrangements being similar to those already set forth. The only disadvantage of arrangements in which the drying chamber is provided ahead of the classifier, is that a certain amount of energy is consumed in unnecessary drying of the splinter component. In general, it is desirable that the splinter component be relatively moist to facilitate milling. However, in systems in which the first classifier is provided downstream of the first dryer, there is the advantage that the classifier operates at a constant gas temperature and is not mechanically stressed by excessively high temperatures as may otherwise be present. Constant gas temperatures improve the reproducibility of the classification or separation of fine particles from coarse particles, coarse particles from the splinter component etc.

DESCRIPTION OF THE DRAWING

The above and other objects, features and advantages of the present invention will become more readily apparent from the following description, reference being made to the accompanying drawing, in which:

FIG. 1 is a diagrammatic elevational view of a drying plant according to the invention;
FIG. 2 is a view similar to FIG. 1 wherein, however, a drying chamber is provided ahead of the classifiers; and
FIG. 3 is another view similar to FIG. 1 wherein the drying chambers and classifiers are connected in series.

SPECIFIC DESCRIPTION

In the following discussion, reference will be had to several components of an apparatus for the drying of particulate matter according to the present invention. These components may be of a variety of types and can be constructed as known in the art. For example, the gas-operated classifier according to the present invention may be of the type described in Chapter 8, page 27 and 50 ff. of PERRY'S CHEMICAL ENGINEERS' HANDBOOK, McGraw-Hill Book Co., New York, 1963, in which a gas entrains particles of the desired range through a duct away from the classifier chamber. A mill for further comminuting the particles is described at pages 8–29 ff. and the separators may be of the type described at pages 20–67 ff. of PERRY'S CHEMICAL ENGINEERS' HANDBOOK. A combustion chamber of the type described at pages 9–30 ff. with appropriate controls may also be used.

In FIG. 1 of the drawing, we show a plant for the drying of particulate matter, especially a fine component 33, a coarse component 34 and a splinter component 35 which are obtained together as a mixture and which is required for use in the production of pressed board. The plant basically comprises a first or fine-particle gas-operated classifier 1 having an inlet fitting 10 for a hot gas stream, an outlet fitting 11 for discharging fine particles entrained by the hot gas stream, a discharge fitting 12 for passing the remainder of the mixture and an inlet 9 into which the particulate material is introduced as a mixture 33–35.
In series with the first classifier 1, is a second classifier 2, also of the gas-operated type, provided with an inlet fitting 13 connected by a duct 13a with the outlet fitting 12 of the preceding classifier 1 and receiving the mixture of coarse particles and wood splinters therefrom. The gas-operated classifier 2 is also provided with an inlet fitting 14 receiving its hot-gas stream, an outlet fitting 15 adapted to carry off the coarse-particle fraction received in the classifier 2 in the hot-gas stream, and a further fitting 16 for discharging the splinter component.

The first gas-operated classifier 1 forms a first fluid cycle with an afterdrying chamber 3 which has its inlet fitting 3a connected to the outlet fitting 11 and classifier 1 via duct 17. The chamber 13 is dimensioned to permit the desired duration of contact with the fine particles and the entraining hot gas and thus to dry the particles. The chamber 3 has a discharge fitting 19 from which the particle-gas mixture is delivered to a separator 4 of the type previously described. The inlet 4a of this separator is connected to outlet 19. The separator 4 is designed to separate the fine particles recovered by classifier 1 from the particulate mixture, from the gas entraining this component into the separator. The separator has an outlet 24 for the dried fine-particle fraction, an outlet 21 in the form of a duct connecting the separator with a hot-gas generator 7, and a vent or chimney 23 adapted to release a part of the cold gases to the atmosphere.

In the coarse-particle cycle, there is provided an afterdrying chamber 5, also dimensioned to provide the desired degree of contact between the hot gas stream and the coarse particles entrained therewith from the gas-operated classifier 2. To this end, the chamber 5 is provided with an inlet 5a connected via duct 18 to the outlet fitting 15 of the classifier 2. The discharge port 20 of chamber 5 is connected to the inlet 6a of a gas-particle separator 6 (see the cited portions of PERRY'S CHEMICAL ENGINEERS' HANDBOOK) which separates the relatively cool gas from the coarse particles. The latter is discharged at 25. The separator 6 also includes, as part of the coarse-particle cycle, a duct 22 which delivers a portion of cool gas, freed from particles, to the combustion chamber 7.

At the discharge side 24 of separator 4, there is provided a comminutor or mill 8, as described in the cited pages of PERRY'S CHEMICAL ENGINEERS' HANDBOOK, for further subdivision of the fine component.

The combustion chamber 7 is provided, in addition to inlets 21 and 22 for respective portions of the cold gas resulting from moisture pickup in the drying chamber, with a burner B controlled by a computer type regulator 36 of conventional construction, the function of which will become more readily apparent hereinafter. A hot gas duct 26 extends from the combustion chamber 7 and is branched at 26a and 26b to form a pair of hot-gas conduits which are connected to the respective classifiers 1 and 2 via conduits 30 and 31, respectively. Between the conduits 30 and 26a and the conduits 31 and 26b, respectively, there are provided mixing stations 27 and 28 with swingable-flap valves 32 which control the temperature of the gas delivered to the respective classifiers. Each of the mixing devices receives a portion of relatively cool gas delivered via duct 29 from the separator 6, via branches 29a and 29b, for mixture with the generator gas to regulate the temperature of the hot gas stream traversing the conduits 30 and 31 and entering the classifiers 1 and 2, respectively.

The apparatus also includes a control system having a moisture detector 39 of conventional construction for determining the moisture content of the particulate mixture introduced to the inlet 9. Moisture sensors 40 and 41 for detecting moisture content of the discharged particles at the outlet mill 8 and the outlet 25 of separator 6, respectively, and thermostatic devices 37 and 38 responsive to the temperature of the cool gas traversing duct 23, and the cool gas traversing duct 22, respectively. The flaps 32 are connected with the product sensors and the outputs of the latter may also be used to control the set point of thermostatic devices 37 and 31, respectively. The thermostats of the raw-mixture sensor deliver the signals to the controller 36.

In operation, the set points of the valve flaps 32 are established in accordance with the desired moisture content of the respective product, namely, the first or fine component and the second or coarse component of the particle mixture. The particle mixture is introduced into the inlet 9 through the classifier 1 in which the fine-particle fraction is entrained by the hot-gas stream from line 30 through the duct 17 and into the afterdrying chamber 3. Drying of the fine particles occupies the entire duration of contact of the particles with the hot-gas stream and eventually cools the latter as the gas-entrained particles enter the separator 4. The cool-gas stream is vented at 23 in an amount equal to the gas product rate in the combustion chamber 7. The fine-particle fraction passes at 24 into the mill 8 in which it is further subdivided to the size range suitable for use as cover layers in the manufacture of pressed board. The non-vented portion of the cool gas is returned to the combustion chamber 7 and serves in part to re-form the hot gas or as a heatable gas component which is entrained with the generator gases.

In the event the moisture content of the particles at the discharge side of mill 8 rises, the sensor 40 detects the moisture content and substantially instantaneously adjusts the flap 32 of the mixing means 27 to reduce the cool gas flow from branch 29a and thereby increase the proportion of hot generator gas supplied to the classifier 1.

Should the moisture content of the gas fall, this deviation from the set point results in displacement of the flap 32 of the mixing means 27 and an increase of the flow of cool gas via branch 29a and thus reduces the temperature of the gas supplied to the first classifier 1. Should the temperature of the cool gas (as detected by the thermostant 37) be excessive for a given moisture content, this indication of heat loss or wastage results in a signal which is applied to regulator 36 of the combustion chamber 7 and a reduction in the heat output of the latter.

It will be understood that the heat output may be reduced with respect to another input, in which case the temperature of the gases introduced into classifier 1 will be reduced accordingly. However, to the extent that such reduction in temperature results in an increased moisture content in the product 33, flap 32 of the mixing means 27 will be adjusted accordingly to
throttle the flow of cool gas from branch 29a into the classifier 1 which will increase the gas temperature in the latter. Since the duration of contact of the entire particle mixture with the hot gas in the first classifier is minimal, both the coarse-particle fraction and the splitter component pass substantially heated into the second classifier 2.

In classifier 2, the coarse-particle fraction is entrained with a hot gas strain supplied at 31 into a duct 18 and thence into the drying chamber 5 which provides the requisite duration of contact to reduce the moisture content of the coarse-particle fraction to a level consistent with its use as the intermediate layer in the manufacture of pressed board. The dried particles are separated at 6 into the product 34 and into the cool gas stream, a portion of which is recycled at 22 to the heating chamber 7. It has already been pointed out that the portion of the cool moist gas recycled to chamber 7 is heated by combustion of a fuel which results in the production of additional hot gas of low moisture content. The gas mixture (hot gas stream) is thus never saturated with moisture, and the moisture lost by the system leaves with the gases vented at 23. The recycled cool gas may also be in part reacted with the fuel as an oxidizing constituent because of the presence of water vapor. It will be appreciated that the flags 32 consequently not only affect the temperature, but also the moisture content of the hot-gas stream used in the classifiers.

The portion of the cool gas which is not reheated in chamber 7, passes from the separator 6 to the branches 29a and 29b to supply the cool gas to the mixing units 27 and 28, the operation of the former having been described previously. The latter mixing unit has a flap valve 32 controlled with a set point determined by the desired moisture content of the product. The sensor 41 detects this moisture content and adjusts the flap 32 accordingly, i.e. to increase the temperature of the gas entering the classifier 2 when the moisture content exceeds the set point value and to decrease the temperature when the moisture content falls below a predetermined value. If the temperature in the cool gas returned at 22 to the chamber 7 is excessive, the thermostat 38 calls for an adjustment of the controller 36 to reduce the output of the burner whereas the output of the latter is raised when the thermostat 38 indicates insufficient temperature of the gas traversing the coarse-particle path. The splitter component, recovered at 35, passes the classifier 2 substantially without drying and hence, is relatively moist, a convenience for aftermilling or grinding.

The most significant advantage of the aforesaid system is that control of the moisture content is independent of the operating conditions of the burner in the sense that control is possible without turning the burner off and on merely to adjust the temperature of the gases delivered to the respective drying arrangements. Furthermore, the drying cycles are substantially independent and only a small proportion of the heat of the system is lost by the venting of the moisture-laden air to the atmosphere at 23. The apparatus can be operated with high temperatures in the heating chamber 7 since the hot gases are mixed with cool gases prior to introduction into the classifier and thus the combustion essentially can be improved with increasing heat loss.

In FIG. 2, the classifiers 1 and 2 are disposed downstream of the dryer 3 which is provided with the inlet 30 for the hot-gas stream used to operate the classifier 1. In this embodiment, the particle mixture 33, 34, 35 is introduced at the inlet 9 into the over-dimensioned heating chamber 3 in which the fine-particle fraction is substantially completely dried while the coarse-particle fraction is only slightly dried. The mixture passes at 19 into the classifier 1 in which the fine-particle fraction is diverted in the gas stream through duct 11 to the separator 4 in which the fine-particle fraction is recovered. The fine fraction is milled at 8; after separation of the fines in classifier 1, the coarse particles are separated in classifier 2 and delivered to the drying chamber 5 as described in connection with FIG. 1. In this case, the splitter component 35 passes through the drying chamber 3 but not through the drying chamber 5. The system of FIG. 2 is provided with controls analogous to those of FIG. 1.

In FIG. 3, the coarse-particle fraction and the splitter component pass into the dryer 5 instead of the classifier 2 and only enters the latter after traversing the dryer 5. Otherwise, the system is equivalent to that of FIG. 2. The system of FIG. 3 can, of course, be modified in that the inlet 9 can be provided directly in the hot-gas line 30. The separator 4 can be connected to the mixing stations in all of the embodiments described and the vent 23 eliminated if other means are provided to prevent the build-up of gas. In addition, when the separator 4 is connected to the mixing stations 27 and 28, all of the cool gas of separator 6 may be supplied to the separator 7.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A drying plant for a particulate mixture including at least a fine component and a coarse component, said plant comprising in combination:
a. first and second gas-operated classifiers for respectively separating said fine component and said coarse component from said mixture;
b. first and second drying chambers connected respectively to said first and second classifiers for treating particles traversing the respective classifiers with respective hot-gas streams;
c. first and second gas/particle separators respectively connected in fluid circuits with said first classifier and chamber and with said second classifier and chamber for separating particles of said components from respective relatively cool gas streams formed in a respective chamber upon drying of particles therein;
d. generator means for producing hot gas;
e. respective ducts for connecting each of said separators with said generator means for delivering at least a portion of at least one of the cool-gas streams thereto;
f. respective conduits connecting said generator means with each of said classifiers for operating same with respective hot-gas streams drawn at least in part from said generator means; and
g. respective mixing means along each of said conduits connected to at least one of said separators for combining the hot gas drawn from said generator with a controlled portion of the cool-gas stream.
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derived from said one of said separators to form said hot gas streams.

2. The plant defined in claim 1 wherein said one of said separators is said second separator and said first separator is provided with means for venting a portion of said one of said separators to form said hot gas streams. 2. The plant defined in claim 1 wherein said one of said separators is said second separator and said first separator is provided with means for venting a portion of its cool gas stream from the plant.

3. The plant defined in claim 1 wherein each of said mixing means includes a branch duct connected to the respective conduit at a junction therewith and communicating with said one of said separators, and swinging flap means at the respective junction for controlling the proportions of the hot gas derived from said generator means and the cool gas stream derived from said one of said separators which form the respective hot gas stream supplied to the respective classifier.

4. The plant defined in claim 3 wherein said first chamber is connected upstream of said first classifier and is traversed by the entire mixture prior to its entry into said first classifier.

5. The plant defined in claim 4 wherein said second chamber is provided upstream of said second classifier and between the latter and the first classifier for traversal by said mixture following removal of said fine component therefrom.

6. The plant defined in claim 3 wherein said mixture is introduced first into said classifiers and the particles then pass into said chambers.

7. The plant defined in claim 3, further comprising a mill connected to said first separator for comminuting the fine component upon its separation from the cool gas stream in said first separator.

8. The plant defined in claim 7 wherein said plant has an inlet for feeding said mixture to said classifiers, chamber and separators, said plant further comprising moisture detection means at said inlet for producing a signal representing the moisture content of said mixture, regulator means connected with said generator means for controlling combustion of a fuel to produce said hot gases, and means connecting said moisture-detection means with said regulator means.

9. The plant defined in claim 8, further comprising moisture-detection means at the output site of said separators and connected to the respective flap-type valves for controlling the mixing of the hot gas with the respective portion of the cool gas stream from said one of said separators in accordance with the moisture content of the respective component.

10. The plant defined in claim 9 wherein the moisture-detection means of said first separator is provided at the discharge site of said milling means.

11. The plant defined in claim 9, further comprising respective thermostat means responsive to the temperature of the cool gas streams at said separators and connected to said regulator means for controlling same.

12. The plant defined in claim 11 wherein the thermostat means each has a set point, further comprising means for adjusting said set points in accordance with the moisture contents of said components as determined by said moisture-detection means.

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