

[54] **ARRANGEMENT FOR BURNING OF
PULVERULENT AND FINE GRAIN
MATERIAL**

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34/10; 35/57 E

[56] **References Cited**

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[57]

ABSTRACT

Pulverulent and fine grain material is burned in a burning aggregate of the cyclone type, into the upper cylindrical part of which the treated material is entrained by a stream of preheated air terminating tangentially into said burning aggregate, whereby particles of larger size forced by centrifugal force to the circumference of the cyclone remain in the burning zone longer than particles of smaller size, which occupy the central part of the cyclone.

8 Claims, 2 Drawing Figures

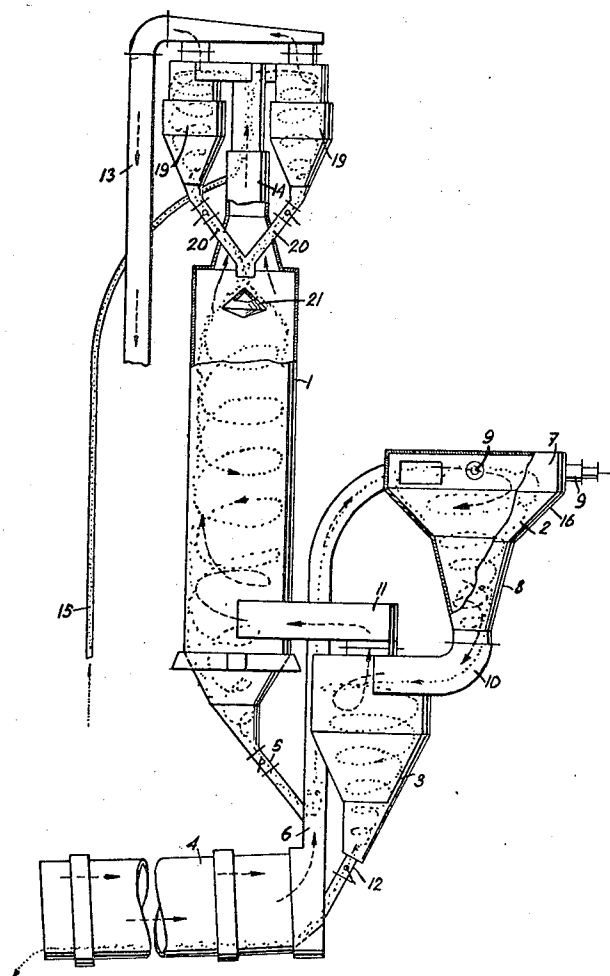


Fig. 1

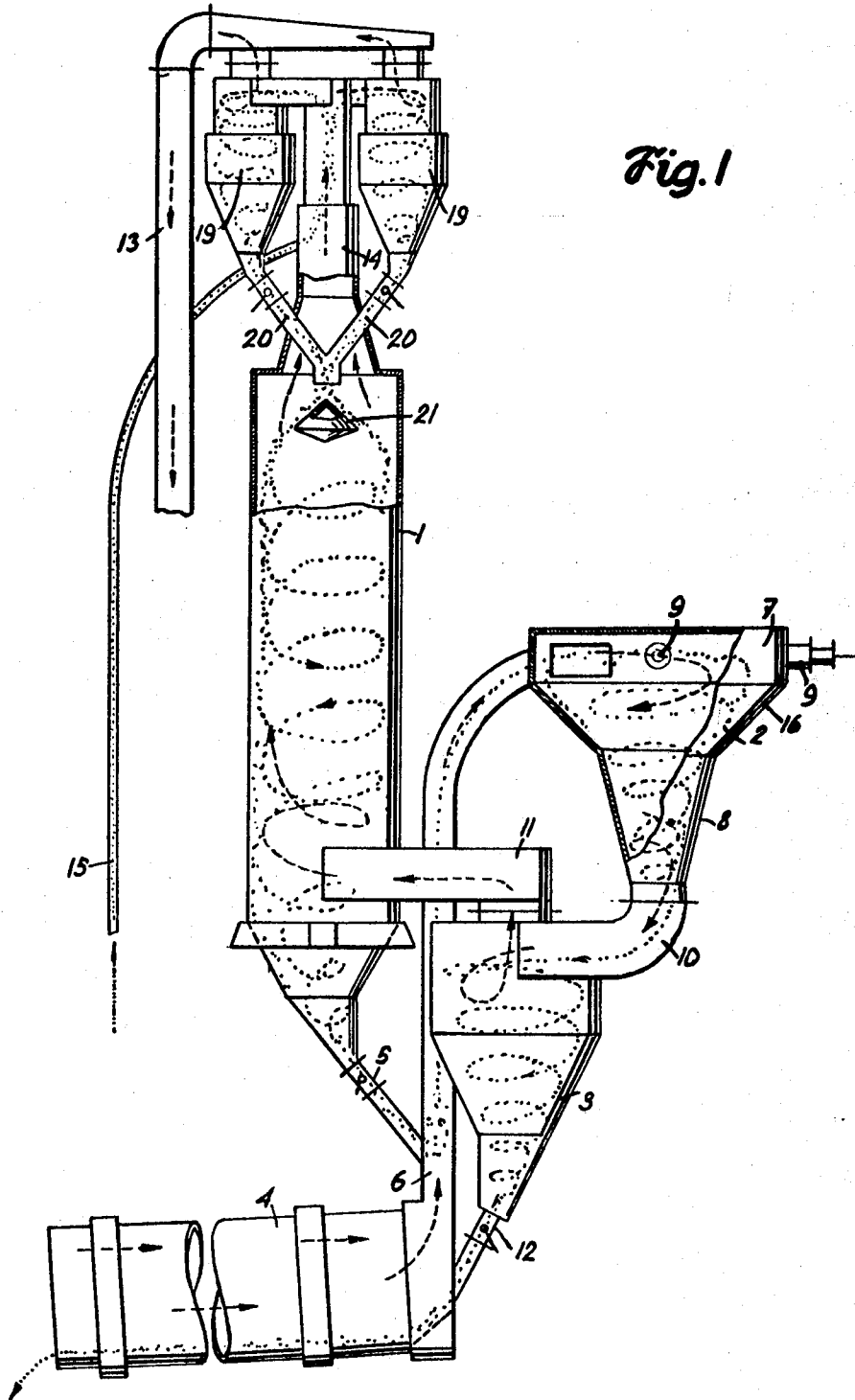
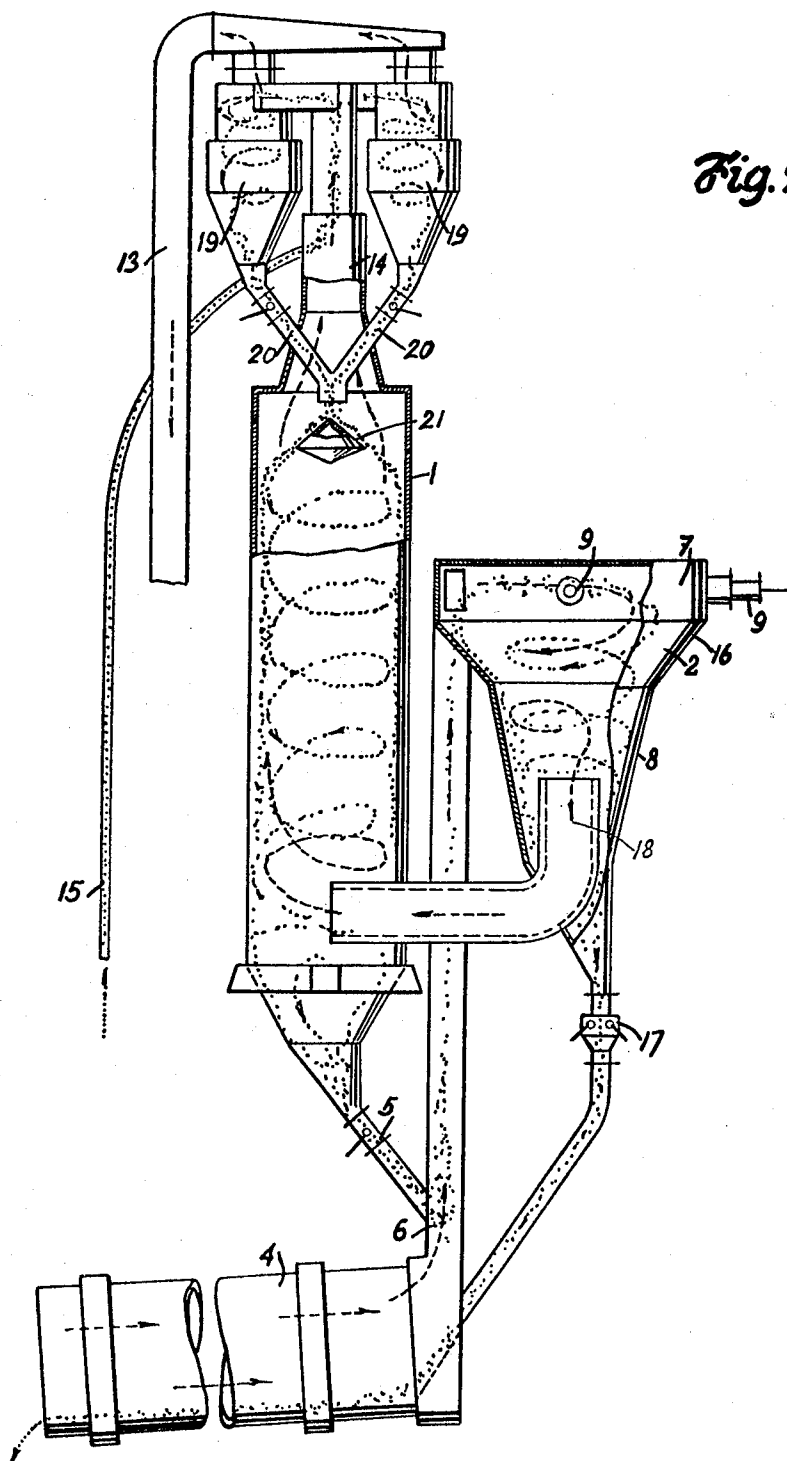


Fig. 2



ARRANGEMENT FOR BURNING OF PULVERULENT AND FINE GRAIN MATERIAL

BACKGROUND OF THE INVENTION

This invention relates to an arrangement for burning 5 of pulverulent and of fine grain material particularly of powder lime, aluminium oxide, plaster and similar material.

Pulverulent materials, for instance powder lime are generally burned in rotary kilns. In the known different 10 systems, the burned material proceeds in the rotary kilns in layers so that all fractions are not in close contact with the heat transmitting medium, the heat transmission into the material proceeding at a slow pace.

It is therefore necessary to work with a large amount 15 of material which is simultaneously subject to processing so that the respective apparatus becomes very large and requires high investment costs. Interference with the operating conditions become obvious only after the lapse of a considerable time, causing particularly difficulty in the automation of the process. The mixture of 20 raw material prepared for processing are heterogenous in their fractions and as the burned material proceeds within the rotary kilns practically as a block and all fractions are subject to burning for the same time without regard to their size. The fractions of smaller size become overburnt and the fractions of larger size are not 25 sufficiently burnt with a resulting inferior quality of the final product.

SUMMARY OF THE INVENTION

It is an object of this invention to provide an arrangement which would enable different fractions to be 30 burnt for a different time according to their grain size.

In is another object of this invention to speed up the process of the burning of such granular materials as described.

Another object is to achieve a final product of the highest quality with reduced investment and operating 35 costs.

In accordance with this invention a cyclone type burning chamber or aggregate is provided, having an upper cylindrical part provided with burners and a lower part tapering toward the bottom, whereby the 40 preheated pulverulent or fine grain material is entrained into this upper cylindrical part by the preheated combustion air terminating into said part tangentially and causing particles of the treated material of larger size to orbit in the cyclone type burning chamber for a longer period than particles of smaller size, which occupy zones closer to the axis of the burning chamber and are thus withdrawn earlier than the particles of 45 larger size, so that the burning proceeds in accordance with the particle size of the treated material.

DESCRIPTION OF DRAWINGS

The attached drawings show in FIG. 1 a schematic elevation of an arrangement according to this invention with parts of the combustion chamber seen in section.

FIG. 2 is a similar view of an alternative arrangement suitable particularly for burning of aluminium oxide. 50

DESCRIPTION OF PREFERRED EMBODIMENT

The arrangement according to FIG. 1 comprises a shaft preheater 1, with an outlet conduit of the raw material provided with a closure 5 terminating in an air 65 conduit 6 for air required for the combustion process.

The air conduit 6 interconnects a cooler 4 with the upper cylindrical inlet part 7 of a conical cyclone reactor 2. The air conduit 6 terminates tangentially into this cylindrical part 7 of the conical cyclone reactor 2. One or more burners 9 with fuel supply are provided in the wall of said cylindrical inlet part 7.

The cylindrical part 7 passes above a part 16 of conical shape tapering towards the bottom which itself lies above a similarly conical piece 8. The pieces 8 connects the bottom of part 16 with a channel 10 terminating tangentially in the upper part of a second cyclone 3. The withdrawal conduit of raw material from cyclone 3 is provided with a closure 12 leading to the cooler 4. An outlet channel 11 for the gaseous fraction leads from above to the preheater 1. The outlet conduit 13 from the preheater 1 proceeds to a not shown suction fan with a filter.

A supply conduit 15 for feeding raw material into the preheater 1, which raw material is generally conveyed pneumatically, terminates in the upper narrowed part 14 of the preheater 1, which in turn terminates tangentially into cyclone type separators 19. The separators have an upper outlet for gases connected to the outlet conduit 13 and a bottom outlet terminating at the top of the preheater 1 for the treated material. A baffle cone 21 is provided at the top of the preheater 1 for distributing the incoming treated material. The alternative arrangement shown in FIG. 2 differs from that in FIG. 1 in that the conical cyclone reactor 2 is modified at its 30 lower part for direct separation of the burnt raw material. The material is withdrawn from the bottom of the cyclone reactor 2 which is arranged as a hopper 22, connected by means of tubing provided with a closure 17 directly with the drum shaped cooler 4.

The channel 18 for removal of gases terminates with one end axially into the conical piece 8, and with the other end into the preheater 1. In the drawing, the course of the raw material is indicated by dotted lines and the course of the air and of the combustion products by broken line. 40

The air for burning the fuel in the course of the burning process is introduced by means of a suction fan through the cooler 4 and passes through the air conduit 6 into the conical cyclone reactor 2 where, due to its 45 tangential entrance into the low upper cylindrical part 7 and due to the large diameter of this part, it rotates substantially as an annular body. Its mean axial advance at this stage is low. The fuel is injected into this rotating annulus through the burners 9 and burns rather intensively due to the intensive turbulence.

The combustion products are removed by way of the form piece 8 and the channel 10, through the cyclone 3 and the channel 11 into the preheater 1. Thereafter, the combusted gases pass through the conduit 13 and a dust separator into the atmosphere. 55

The mixture of raw material is pneumatically supplied into the preheater 1 through the conduit 15 into the narrowed part 14 where it proceeds in a direction opposite to the passage of hot combustion gases, from which it receives heat and is thus preheated. The raw material preheated in the preheater 1 passes by way of the conduit (with the closure) 5 into the air conduit 6, through which the preheated air from the drum shaped cooler 4 streams upwards and the material is thus taken along into the conical cyclone reactor 2, where, by the direct action of flames, it is burnt at the predetermined temperature. The adjustment of this temperature is ac-

complished by adjustment of the amount of supplied raw material.

Due to rotation of the raw material dispersed in the flame, a separation of the treated raw material is accomplished according to the fractional composition of particles. The influence of the centrifugal force is largest for particles of larger size, and these fractions therefore rather remain close to the conical surface 16 of the cyclone reactor 2, and orbit in the close neighbourhood of its circumference, causing the time lag required for burning of these larger particles. The influence of the centrifugal forces is smaller on fractions of smaller size and, they are therefore removed from the reaction space in a short time with a smaller time lag. This enables a homogenous burning of a fractionally heterogeneous mixture of raw material.

The raw material burnt in the cyclone reactor 2 is finally taken by gases through the channel 10 into the cyclone 3 where it is separated from the combustion gases and passes by way of the conduit (with the closure) 12 into the drum shaped cooler 4. The gases separated from the raw material are introduced tangentially into the preheater 1 where their heat is utilized for preheating the mixture of raw material. The burnt product is cooled in the cooler 4, using the thus obtained heat for preheating the air sucked inward as required for the burning process.

In the alternative arrangement in FIG. 2 the functions of the conical cyclone reactor 2 and of the cyclone 3 are combined in a single unit. The rotating burnt material is concentrated due to centrifugal forces towards the circumference of the conical cyclone and is collected in the hopper 19, whereas the gases escape through the channel 18 terminating in the central part of the cyclone reactor 2 into the preheater 1. The burnt material is removed from the hopper 22 into the cooler 4 through the channel provided with the closure 17.

The alternative arrangement according to FIG. 2 is mainly suitable for processes requiring a time lag of burning without much supplied heat, where however the required heat for the preheating zone is very high, for instance if the mixture of raw material contains much moisture.

By the application of this invention the burning process is very intensified, the investment costs are reduced and automation is enabled with relatively simple means.

We claim:

1. An arrangement for burning pulverulent and fine grain material, particularly of powder lime and of similar material, comprising,
 - a preheater for preheating the supplied material, said preheater having supply means for said material and supply means for hot gases,
 - a burning chamber of the cyclone type, closed at the top,
 - a cooling chamber, having means for the supply of air and discharge means for burned material,
 - said burning chamber comprising a substantially cylindrical upper part having a tangential inlet for preheated air and material, and a conically narrowing lower part terminating in a channel for with-

drawal of material and of gases, means connecting said channel for withdrawal of material with said cooler,

conduit means connecting said cooler with said upper cylindrical part of said burning chamber for feeding air from said cooler to said chamber, conduit means for withdrawal of preheated material from said preheater and terminating in said conduit means for entraining material preheated in said preheater in suspension with said air from said cooler and for simultaneously feeding said material and air into the upper cylindrical part of the burning chamber for burning, and

at least one burner extending tangentially into the cylindrical part of said burning chamber to heat said entrained air and material and to move the same in a cyclonic path within the entire chamber.

2. An arrangement according to claim 1 wherein the outlet of said cyclone burning chamber terminates tangentially into a cyclone separator provided with an outlet for the burnt material at the bottom leading to said cooler and having an outlet for the combustion products separated from said burnt material connected to said preheater.

3. An arrangement according to claim 1 wherein an axially arranged outlet tube for the combustion products is provided in the lower part of the cyclone burning chamber terminating tangentially into the preheater, the bottom of said cyclone burning chamber tapering into a hopper with an outlet for the burnt product terminating into the cooler.

4. Apparatus for burning granular material comprising

a combustion chamber having a cylindrical upper portion and a conically narrowing lower portion, said chamber being closed at its upper end and having a discharge opening at its lower end, means for continuously feeding material to be burned tangentially to said cylindrical upper portion and means for axially withdrawing burnt material from the discharge opening, and means for combusting said material, said combustion means extending tangentially into said cylindrical upper portion and being adapted to cause said material to flow cyclonically in said combustion chamber to said discharge opening.

5. Apparatus for burning granular material according to claim 4, wherein said combustion means comprises a plurality of burners for creating one or more flames extending tangentially within said cylindrical part in contact with said material.

6. Apparatus for burning granular material according to claim 4, including means for preheating said material before delivery to said combustion chamber.

7. Apparatus for burning granular material according to claim 6, including means for entraining said preheated material with air before entry into said combustion chamber.

8. Apparatus for burning granular material according to claim 4, including means for cooling said burnt material on discharge from said combustion chamber.

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