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Description

Subject of the present invention is a direct-firing agricultural drier of a type comprising a drying chamber adapted to accommodate products to be dried, means of dispensing air into said drying chamber, and a hot air generator having an air heating chamber with a feed conduit for the air to be heated and a conduit for delivering hot air to said dispensing means, a furnace in said heating chamber, a liquid fuel burner mounted externally of said heating chamber and connected to said furnace, and a fan for force feeding air into said dispensing means through said heating chamber, said fan having a delivery port connected to the feed conduit for the air to be heated.

The expression "direct-firing" refers, in an agricultural drier to that the related hot air generator is designed such that the hot flue gases enter the drying chamber admixed to the heated air; that is to say the furnace is open to the air heating chamber.

The driers of the aforesaid type are widely employed in agriculture to reduce the relative moisture content of freshly harvested products in order to improve the preservability thereof.

In accordance with the current state of the art, direct-firing agricultural drier are equipped with a hot air generator whose fan is located downstream (with reference to the air flow direction through the heating chamber) of the burner/furnace assembly. The fans employed are mostly of the axial flow type.

With that burner arrangement, the feed air to the fan has a high thermal content. This involves a number of non-negligible problems both in the design and operation of the drier.

One of these problems comes from the deterioration of the fan performance due to the lower density of the air flowing through it, especially if the fan employed is of the axial flow type.

That deteriorated performance of the fan reflects, in the majority of cases, in a decreased overall performance of the drier.

A second problem resides in the high rate of wear of the fan impeller bearings due to their high operating temperature, of the impeller itself especially where this is of the centrifugal type, due to the occurrence of hot deformation, and of the motor members driving the fan.

Furthermore, conventional direct-firing driers are liable to a high rate of heat waste through the fan case and the walls of the heating chamber.

To obviate such drawbacks, it has been suggested of mounting the burner in the heating chamber of the hot air generator downstream of the fan, similarly to gaseous fuel-fired hot air generators.

An example of this construction is disclosed in EP-A-68733. The burner disclosed in Fig. 1 of this document and in the relevant part of the specification is however not equipped with built-in parts and accessories, such as a built-in fan for feeding

a combustion air at a predetermined pressure and turbulence, which are usually provided in most commercially available liquid fuel burners.

While on the one side that approach may provide advantageous improvements in the drier output, on the other side it brings about such important problems as the impossibility of controlling the burner with the drier in operation, the conveyance of dust and dirt through the burner itself with the attendant possibility of damaging it and difficulty in servicing the hot air generator due to accessibility to its component parts being poor.

For these reasons, preference has been given heretofore to the manufacture of direct-firing agricultural drier according to the first-mentioned technical solution, i.e. with the fan placed downstream of the burner, making good with all the disadvantages that go with that construction.

The problem underlying the present invention is that of providing a direct-firing agricultural drier which is operated on liquid fuel and so conceived, construction- and function-wise, as to overcome all the problems encountered with the cited prior art.

Broadly speaking, the solutive idea to the above problem is that of mounting the hot air generator upstream of the air heating chamber and of so pressurizing the burner as to enable its installation externally of said heating chamber.

This solutive idea is embodied by a direct-firing agricultural drier as indicated, which is characterized in that said burner includes a fan for force feeding of combustion air into the furnace, said fan having a combustion air intake which is connected through a conduit with said delivery port.

Further features and advantages of the invention will be more clearly apparent from the following detailed description of an agricultural drier according to the invention, as shown by way of illustration and not of limitation in the accompanying drawing, where:

Figure 1 is a diagrammatic side elevation view of an agricultural drier according to the invention, partly shown in longitudinal section.

Depicted in Figure 1 is a direct-firing agricultural drier of the wheel-mounted kind, comprehensively designated 1.

The drier 1 comprises, on a dolly 2, a vertical axis cylindrical silo 3 having at the bottom a hopper 4 which tapers down into a well 5, an auger elevator 6 drawing from the well 5 and extending coaxially with the silo 3, a perforated drum 8 supported inside the silo 3 coaxially therewith, and a hot air generator 10 mounted in fluid communication with the drum 8.

The silo 3 and drum 8 are constructed of perforated sheet metal, and defined in the space therebetween is a drying chamber 12 intended for accommodating a product to be dried, usually a granulate matter.

The drum 8 has the function of dispensing hot air through the drying chamber 12 to thereby prompt removal of moisture from the product

loaded therein.

The hot air generator 10 comprises a centrifugal fan 15 of the dual intake type, i.e. having two intake ports indicated at 16a and 16b, respectively, and a delivery port 17.

The fan 15 is supported on the dolly 2 and driven by motor means not shown, such as the power take-off of an agricultural tractor.

The delivery port 17 is connected to a heating chamber 19 through a feed conduit 20 for the air to be heated.

A delivery conduit 21 extending between the chamber 19 and the drum 8 supplies hot air under pressure to the dispensing means.

Inside the chamber 19, there is mounted a furnace 22 which is suspended from brackets 23.

The furnace 22 has an end 24 open toward the conduit 21 and provided with a baffle plate 25.

The hot air generator 10 further comprises a burner 27 mounted on the exterior of the chamber 19 and connected to the furnace 22 through a nosepiece 28.

The burner 27 incorporates a fan 30 for the force feed of combustion air into the furnace 22 through the nosepiece 28 and is liquid fuel operated with fuel, such as oil, picked up from a tank not shown.

The fan 30 has a combustion air intake 32 which is connected, through a bypass conduit 31 and the chamber 19, to the delivery port 17 of the fan 15.

The drier 1 operates as follows: the product to be dried, such as cereal grains, is loaded into the chamber 12 and recirculated through said chamber upwardly through the conveyor 6.

Contextually, the hot air generator 10 is started. Air is drawn in for heating through the intakes 16a, 16b of the fan 15 and conveyed under pressure into the heating chamber 19.

Some of the air compressed by the fan 15 is utilized to pressurize the burner 27 through the conduit 31, and the remainder is circulated in turbulent flow through the chamber 19 to remove heat from the furnace 22.

This arrangement affords the possibility of keeping the outer shroud of the chamber 19 at near ambient temperature.

The air forced in by the fan 15 and the hot flue gases issuing from the furnace 22 through the end 24 mix together and are dispensed into the drum 8 interior as a blend.

As previously mentioned, the hot drying air, that is, the mix of air being introduced by the fan and flue gases, is dispersed homogeneously through the produce being dried and flows out through the perforated walls of the silo 3.

Listed herein below are some of the advantages afforded by the inventive drier:

the fan 15 handles cool air, with consequent improved output, longer life of the impeller and its bearings, and a more constant air pressure as measured at the delivery port;

the burner 27, as mounted externally of the heating chamber 19, is easily controlled even with the drier in operation, and is not subjected to deterioration;

improved thermal efficiency is obtained of the

hot air generator because less heat is dissipated through its walls;

centrifugal fans, even of the dual intake kind, which are known to be quieter and less expensive than axial flow fans, may be employed and are simple to install.

Claims

1. Direct-firing agricultural drier comprising a drying chamber (12) adapted to accommodate products to be dried, means (8) of dispensing air into said drying chamber (12) and a hot air generator (10) having an air heating chamber (19) with a feed conduit (20) for the air to be heated and a conduit (21) for delivering hot air to said dispensing means (8), a furnace (22) in said heating chamber, a liquid fuel burner (27) mounted externally of said heating chamber (19) and connected to said furnace (22), and a fan (15) for force feeding air into said dispensing means (8) through said heating chamber (19), said fan (15) having a delivery port (17) connected to the feed conduit (20) for the air to be heated, characterized in that said burner (27) includes a fan (30) for force feeding of combustion air into the furnace (22), said fan (30) having a combustion air intake (32) which is connected through a conduit (31) with said delivery port (17).

2. Drier according to Claim 1, characterized in that said fan (15) is of the dual intake (16a, 16b) centrifugal type.

Patentansprüche

1. Direkt geheizter Trockner für landwirtschaftliche Zwecke
mit einer Trocknungskammer (12) für die Aufnahme der zu trocknenden Produkte,
mit einer Verteilungseinrichtung (8) zur Verteilung von Luft in der Trocknungskammer (12),
mit einem Warmlufterzeuger (10), der mit einer Lufterwärmungskammer (19) und einer Zuführungsleitung (20) für die zu erwärmende Luft und einer Leitung (21) zur Lieferung von erwärmter Luft an die genannte Verteilungseinrichtung (8) ausgestattet ist
mit einem in der Lufterwärmungskammer (19) angeordneten Ofen (22),
mit einem Brenner (27) für flüssigen Brennstoff, der außerhalb der Lufterwärmungskammer (19) montiert und mit dem Ofen (22) verbunden ist,
sowie mit einem Ventilator (15) zur Zwangszufuhr von Luft in die Verteilungseinrichtung (8) durch die Lufterwärmungskammer (19), wobei dieser Ventilator (15) einen Auslaß (17) aufweist, die mit der Zuführungsleitung (20) für die zu erwärmende Luft verbunden ist,
dadurch gekennzeichnet, daß der Brenner (27) einen Lüfter (30) für die Zwangszufuhr von Verbrennungsluft in den Ofen (22) besitzt,
und daß dieser Lüfter (30) einen Einlaß für die Verbrennungsluft (32) aufweist, der über eine Leitung (31) mit dem Auslaß (17) des genannten Ventilators (15) verbunden ist.

2. Trockner nach Anspruch 1, dadurch gekenn-

zeichnet, daß der Lüfter (15) ein Zentrifugallüfter mit zwei Einlässen (16a, 16b) ist.

Revendications

1. Séchoir agricole à chauffage direct comprenant une chambre de séchage (12) adaptée pour contenir des produits à sécher, des moyens (8) pour distribuer de l'air dans ladite chambre de séchage (12) et un générateur d'air chaud (10) possédant une chambre de chauffage de l'air (19) munie d'un conduit d'alimentation (20) servant à amener l'air à chauffer et d'un conduit (21) servant à débiter l'air chaud dans lesdits moyens de distribution (8), un appareil de chauffage (22) placé dans ladite chambre de chauffage, un brûleur à combustible liquide (27) monté à l'extérieur

de ladite chambre de chauffage (19) et relié audit **appareil de chauffage (22) et un ventilateur (15)** servant à introduire de l'air à force dans lesdits moyens de distribution (8) à travers ladite chambre de chauffage (19), ledit ventilateur (15) possédant un orifice de sortie (17) qui est raccordé au conduit d'alimentation (20) servant à amener l'air à chauffer, caractérisé en ce que ledit brûleur (27) comprend un ventilateur (30) servant à introduire de l'air comburant à force dans l'appareil de chauffage (22), ledit ventilateur (30) possédant une entrée d'air comburant (32) qui est raccordée audit orifice de sortie (17) par un conduit (31).

2. Séchoir selon la revendication 1, caractérisé en ce que ledit ventilateur (15) est du type centrifuge à deux entrées (16a, 16b).

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