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(54) **Method for generation of a heating medium for drying products, advantageously food products, and device for realization of that method**

(57) The subject of the patent is the method for generation of heating medium for drying products, advantageously food products and the device for realization of that method.

The method for generation of heating medium for drying products, advantageously food products is characterized in that as straw is combusted in the furnace(1) and the heat obtained from that combustion is used to heat a liquid medium, advantageously oil placed in the furnace(1) body, whereas with that liquid medium the pipes(3) mounted in the furnace(1) body are heated and

through the pipes(3) air is passing. The air is heated up to the temperature 50 - 300°C.

The device for generation of heating medium for drying products, advantageously food products is characterized in that as it is composed of the furnace(1), advantageously straw-fired one with the dual jacket(2) and in the jacket(2) space the heating medium, advantageously diathermic oil, is placed and in the jacket(2) the through-pipes(3) for air-flow are mounted, the outlets of which on one side are shielded with the collector(4), whereas at the collector(4) outlet the fan(5) is mounted.

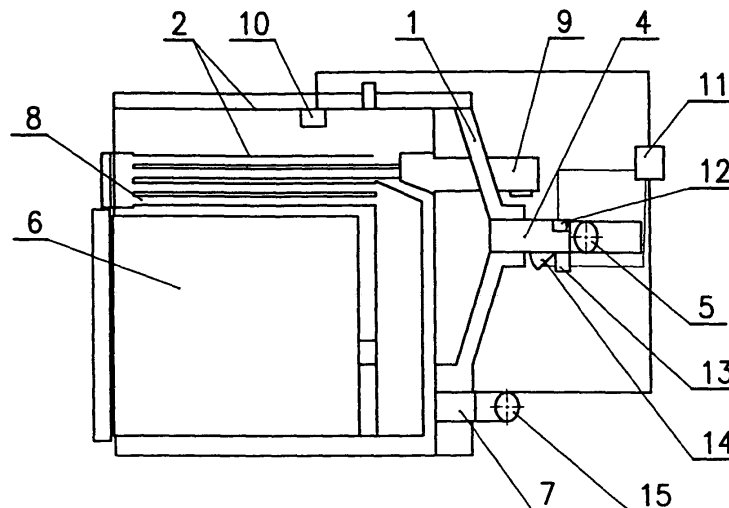


Fig. 1

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Description

[0001] The object of the invention is method for generation of heating medium for drying products, advantageously food products and device for realization of that method.

[0002] The method of drying forage for animals with the use of hot air is known as presented in description of the patent application No. P-366253 published in the Bulletin of the Patent Office of Polish Republic No.18 of 2004. That furnace is provided with an air heater, which is composed of segments of flue gas heating pipes placed in hot air chamber which has an outlet channel and the pipes are connected between each other with chambers for turning back flue gas. Those chambers are closed with internal doors, advantageously made of refractory material, provided with pins, by means of which the internal doors are mounted slidably in external doors provided with clamps, which hold down the internal doors to the chambers for turning back flue gas after closing the external doors. Between the internal and external doors there are interdoor chambers. Inlets of the flue gas heating pipes of the initial segment of the air heater have connection with the after-heating chamber, which through a gas swirling channel provided with small gable roofs mounted on its vertical walls, has connection with the combustion chamber. Beneath the small gable roofs there are preheating channels, which through the interdoor chamber positioned at inlets of the flue gas heating pipes of the initial segment, have connection with the hot air chamber, from which the hot air is carried away through the outlet channel to accommodations heated. On vertexes of the small gable roofs there are air intake nozzles mounted, which have connection through a cold air channel with an inlet channel of a fan, which forces cold air sucked in from surroundings. The inlet channel mentioned has also connection with a main air intake nozzle and through an air guide with air intake elements positioned in a dual door.

[0003] The method for generation of heating medium for drying products, advantageously food products, according to the invention is characterized in that, as straw is combusted in a furnace and with the heat obtained in that combustion a liquid medium, advantageously oil, positioned in the furnace body, is heated, whereas the liquid medium heats pipes mounted in the furnace body and through the pipes air is passing. The air is heated up to the temperature 50 - 300°C. A diathermic oil is used as the liquid medium. Heating of the liquid medium is carried on up to the temperature 100 - 350°C, while measuring the temperature of the liquid medium and a signal of that measuring is sent to a controller of air inflow to the straw combustion chamber. The liquid medium heated is stirred. When air is passing through the pipes its temperature is being measured and signal obtained in that measurement is sent to the controller which opens or closes the side air intake. The air temperature is measured at the inlet to the fan.

[0004] The device for generation of heating medium for drying products, advantageously food products, according to the invention, characterized in that, as it is composed of the furnace, advantageously straw-fired one, with a dual jacket and in the jacket space the heating medium, advantageously diathermic oil, is placed and in the jacket through-pipes for air-flow are mounted, the outlets of which on one side are shielded with the collector, whereas at the collector outlet a fan is mounted. The through-pipes are spaced advantageously in the upper part of the furnace. At the uppermost point of the jacket space the temperature sensor is positioned which is connected by means a conduit to the controller of air intake to the combustion chamber. At the air inlet to the fan the temperature sensor is positioned which is connected by means of a conduit to the controller of side air intake.

[0005] The method and the device, according to the invention, allow to obtain a heating medium useful for drying various products, in those also food products. Usefulness of that medium consists in that as this medium does not affect disadvantageously any forage, because that medium is the air which does not introduce to it any noxious additives. Furthermore, the method and the device, according to the invention, secure introduction of the drying medium of suitable temperature to a product being dried, therefore the product properties are not changed. This is obtained due to the use of diathermic oil as a medium transferring heat from the combustion chamber body to the pipes in which air is passing and due to a set of sensors together with temperature correcting controllers. The use of the diathermic oil causes correct collection of heat from the combustion chamber body, owing to that there is no overheating of the body sheets and allows to transfer the heat to the pipes through which air with temperature higher than 100°C is passing. As a result it is possible to heat the air in a great temperature range depending on needs. The use for that purpose the straw-fired boiler allows to obtain quickly needed air temperatures, because straw is combusted rapidly, thus the whole device starts to operate in a short time from the moment of commencing preparation actions. The use of sensors connected with controllers allows for correction of drying air to a level necessary for given product. Furthermore, the method and the device, according to the invention, allow to dry even such products like sand or wood. Therefore both the method and the device are universal.

[0006] The method and the device, according to the invention, are more precisely explained in the example of execution and in the drawing, in which fig.1 presents the device scheme and fig.2 is a cross section of the furnace.

[0007] As it is shown in fig.1 and fig.2 the device for generation of heating medium for drying products, according to the invention, is composed of the furnace 1 adapted to burn straw. This furnace has the dual jacket 2 and in the jacket space there is a heating medium in form of diathermic oil. Furthermore, in the jacket 2 there

are through-pipes 3 mounted. Outlets of the pipes 3 on one side are shielded with the collector 4, whereas at the collector 4 outlet there is the fan 5 mounted. The through-pipes 3 are spaced mainly in the upper part of the furnace 1 and on its sides. The furnace 1 has the combustion chamber 6 adapted for combustion of straw and the air intake collector 7, through which air is introduced to the combustion chamber 6. Furthermore, the furnace 1 has the channels 8, through which flue gas is coming out and the channels are ended with the flue gas collector 9. In the uppermost point of the jacket 2 space there is the temperature sensor 10 positioned, which by means of a conduit is connected to the controller 11 for air intake to the combustion chamber 6. At the air inlet to the fan 5 there is the temperature sensor 12 positioned, which by means of a conduit is connected to the controller 11, which sends a signal to the executive member 13, which causes half-opening and closing the side flap 14 allowing for side air intake.

[0008] Operation of the device is as follows. To the combustion chamber 6 straw is loaded, which is lighted and the fan 15 mounted at the inlet to air intake collector 7 is started and air necessary for combustion is provided. As a result of straw combustion the jacket 2 of the furnace 1 is heated and together with the same the oil placed in the jacket 2 is also heated. The oil heats the pipes 3 mounted in the jacket 2 of the furnace 1. Furthermore, flue gas generated is passing through the channels 8 positioned inside the furnace jacket 2 to the flue gas collector 9 and due to that the oil is additionally heated. Then the fan 5 positioned at the collector 4 outlet is started and causes air flow through the pipes 3. The flowing air is heated from the pipes 3 and is passing through the collector 4 to a dryer where flowing round the product in the form of maize takes humidity from it causing its drying. During straw combustion the oil inside the jacket 2 is continually stirred in a known way by means of a stirrer which is not shown in the figure. At the same time in the uppermost point of the furnace 1 the oil temperature is measured by means of the temperature sensor 10. The signal from the temperature sensor is sent to the controller 11, which sends a suitable signal to the fan 15 and due to that it is possible to increase or decrease the air quantity forced to the furnace 1, thus intensifying or extinguishing straw combustion. Furthermore, temperature of air flowing through the pipes 3 is measured by means of the temperature sensor 12 positioned in the collector 4 channel before the fan 5 inlet. The signal from the temperature sensor 12 is sent to the controller 11, which sends the signal to the executive member 13, which causes half-opening or closing the flap 14 positioned on the collector 4. A change in position of the flap 14 causes intake of additional cold air owing to which it is possible to lower temperature of passing air to a level required.

Claims

1. The method for generation of heating medium for drying products, advantageously food products, **characterized in that** as straw is combusted in the furnace(1) and a liquid medium, advantageously oil placed in the furnace(1) body is being warmed with the heat obtained from that combustion, whereas the pipes(3) mounted in the furnace(1) body are heated with that liquid medium, while the air is passing through the pipes(3),
2. The method according to the claim 1, **characterized in that** as the air is warmed up to the temperature 50 - 300°C,
3. The method according to the claim 1, **characterized in that** as the liquid medium a diathermic oil is used,
4. The method according to the claim 1, **characterized in that** as heating of the liquid medium is carried on up to temperature 100 - 350°C, while measuring the liquid medium temperature and a signal of that measurement is being sent to the controller(11) of air inflow to the straw combustion chamber(6),
5. The method according to the claim 1, **characterized in that** as the heated liquid medium is stirred,
6. The method according to the claim 1, **characterized in that** as during air passing through the pipes(3) its temperature is being measured and a signal from that measurement is being sent to the controller(11), which opens or closes the side air intake,
7. The method according to the claim 6, **characterized in that** as air temperature is being measured at the inlet to the fan(5).
8. The device for generation of heating medium for drying products, advantageously food products, **characterized in that** as it is composed of the furnace (1), advantageously straw-fired one, with a dual jacket(2) and in the jacket(2) space the heating medium, advantageously diathermic oil, is placed and in the jacket(2) the through-pipes(3) for air-flow are mounted, the outlets of which on one side are shielded with the collector(4), whereas at the collector(4) outlet the fan(5) is mounted.
9. The device according to the claim 8, **characterized in that** as the through- pipes(3) for air-flow are spaced advantageously in the upper part of the furnace(1),
10. The device according to the claim 8, **characterized in that** as at the uppermost point of the jacket(2) space the temperature sensor(10) is positioned

which is connected by means a conduit to the controller(11) of air inflow to the combustion chamber(6),

11. The device according to the claim 8, **characterized in that** as at the air inlet to the fan(5) the temperature sensor(12) is positioned which is connected by means of a conduit to the controller(11) of side air intake.

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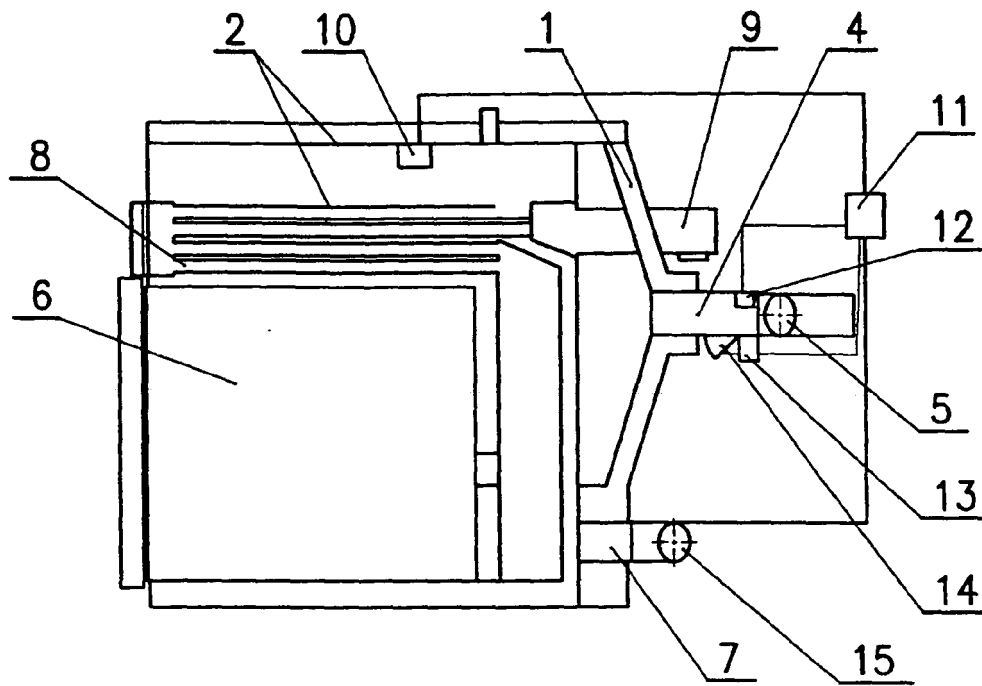


Fig. 1

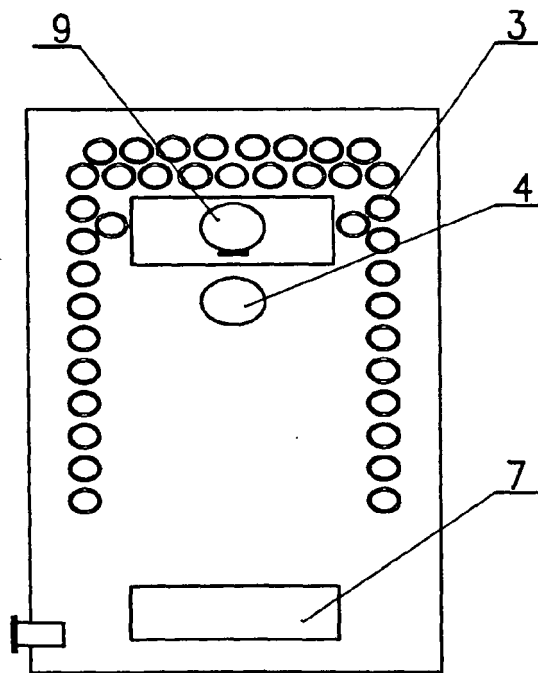


Fig. 2

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO P366253 A [0002]