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OPERATION PROCESS AND EXPERIMENTAL RESULTS OF CONTINUOUSLY FRUIT AND VEGETABLE DRYING EQUIPMENT

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Annotation: The article describes the device of continuous drying of fruits and vegetables and the process of its operation. The drying devices currently used in industry and the processes and disadvantages of their operation are presented.The drying device is now compared to existing devices and the advantages are explained.

Keywords: Continuous drying, input cartridge, cover, dnishe, bearing, self-rotating horizontal pads, vertical housing.

By dehydrating solid and pasty materials, it gives them the necessary properties, enables transportation and long-term storage. Dewatering can be done in three different ways: mechanical (squeezing, settling, filtering, centrifuging, etc.); physico-chemical (using substances that absorb water (calcium chloride, sulfuric acid, etc.); dehydration under the influence of heat, i.e. drying. But the most effective of the above methods is dehydration under the influence of heat, i.e. drying. Because if complete dehydration is achieved during the drying process will be[3].

Heat drying of wet materials is the most common method in industry. This method is used in chemical, food and a number of other technologies. The moisture in the material is initially removed by a cheap, mechanical (for example, filtering) method, and the final, complete dehydration is carried out by drying. Such a combined method of dehydration is economically efficient.

In the industry, artificial (in special drying devices) and natural (open air drying - a very long process) methods are used to dry wet materials.

In its physical essence, the drying process is a complex diffusion process. Its speed is determined by the rate of diffusion of moisture from the material being dried to the environment. It is known that the drying process is the movement of heat and matter (moisture) inside the material and its transfer from the surface of the material to the environment. Thus, drying is an interconnected complex of heat and mass exchange processes.

The drying process is carried out in drying devices of various designs used in chemical, food and other industries. They differ from each other according to various signs. Depending on the type of heat transfer to a solid, wet material, it is divided into convective, contact and special dryers. Air, gas and steam can be used as heat carriers. Depending on the pressure in the drying chamber, they are divided into vacuum and atmospheric pressure dryers. Depending on the method of organizing the process, there can be periodic and continuous dryers. In addition, depending on the movement of the material and the heat conductor, dryers with parallel, opposite and intersecting directions are made. Chamber, tunnel, tape, shaft, surface, abstract fluidized bed, drum, vibration, beam, spray, pneumatic, two-stage and other dryers are used in various sectors of the economy.

In the industry, a tunnel dryer is used, which operates in a periodic mode under atmospheric pressure, consisting of a drying chamber, carriages for materials, an air heating heater and a heated air transfer fan. The carriages move slowly on rails from a right-angled corridor through a long-track chamber. At the entrance and exit of the corridor there are hermetic doors that periodically open simultaneously for loading and unloading material: a wagon with dried material is removed from the chamber, and a new wagon with wet material is inserted from the opposite side. The movement of the carriages is carried out using a cable and a mechanical pulley (winch). The drying agent moves in the right or opposite direction to the material to be dried[1].

The disadvantage is that the drying process takes a long time, the material does not dry evenly, and maintenance is mainly done by hand.

Also, for drying fruit, a universal combination moving, vertically mounted cylindrical body fixed to the frame shaft, a carousel with a rotating gear shaft fixed to the frame shaft, and a carousel fixed to the inner body and pallets fixed to the frame along the tiers for placing the processed material, for the input and output of the drying agent, as well as the equipment consisting of means of energy supply is

used. . The frame is made in the form of a cone, the meeting pallets have the appearance of a funnel and are fastened to the frame inclined to the shaft, a high-frequency energy generator is used to provide energy, and a reflector is placed on each layer of pallets in one of the sectors of the housing [2].

The disadvantages of this equipment are the complexity of the construction, the use of a high-frequency energy source is dangerous for human health.

In practice, the most used device in production enterprises is a chamber dryer. Chamber dryers are the simplest of the convective devices and have carriages inside the shell. In such devices, drying of materials is carried out in a periodic mode under atmospheric pressure. The dryer consists of one or more rectangular chambers in which the wet material is placed on wagons or pallets and is dried in a fixed position. Air is heated in a heater, blown by a fan, and passes over or through the material to evaporate the moisture. Part of the used air is mixed with fresh air. They are designed for drying of wet materials in small enterprises in soft mode and low temperature[3].

The disadvantages of this device are low productivity, the process takes a long time because the material to be dried does not move and the product does not dry evenly, the heat loss when loading and unloading the material into the chamber is very large, the process is difficult to maintain and control, and it is unhygienic, due to insufficient use of the heat of the drying agent. energy consumption is relatively high.

Due to the fact that the drying process is carried out periodically in the fruit and vegetable drying devices used in production enterprises, the heat loss during loading and unloading of raw materials is very high. Also, a large amount of energy is consumed due to the fact that the heat of the drying agent is not fully utilized. The product on pallets does not dry evenly due to contact with the drying agent only on the surface. In addition, product quality decreases as a result of product sticking on pallets. To solve these problems, we have come up with a self-tipping pallet dryer.

The device consists of an envelope-shaped cover and bottom, self-rotating horizontal pallets placed in several rows, an extension that ensures parallel rotation of the pallets, inlet and outlet nozzles for drying agent. The body has a right-angled parallelepiped shape, and the drying agent consists of pallets, which rotate at an angle of 180°, and are fastened to the wall of the body with bearings on both sides.

It consists in organizing a continuous drying process, ensuring even drying of the product due to the circulation of the raw materials being dried, minimizing energy consumption and increasing the device's performance. The solution to the given problem is performed in a vertical housing, which consists of rotating horizontal pallets placed in several rows fixed with a drying agent inlet and outlet pipe, cover and dnishe.

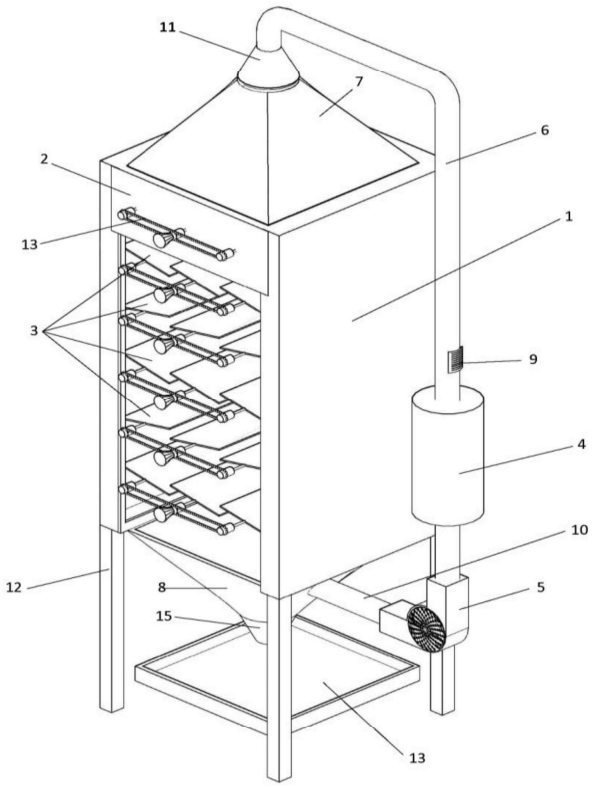

Figure 1. General drawing of the drying plant

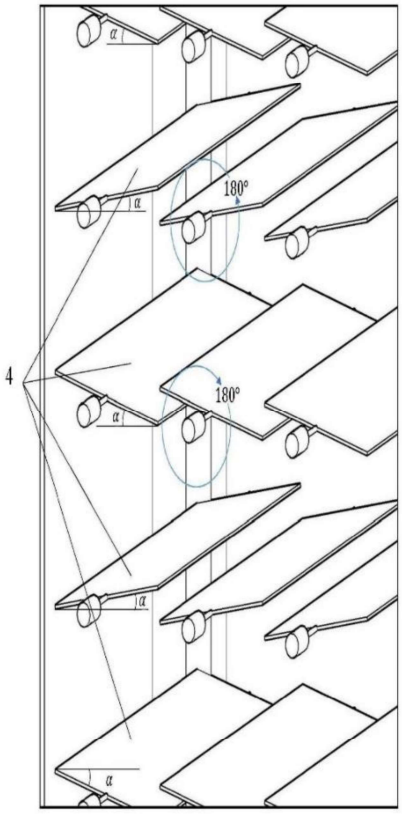

Figure 2. Location of pallets

An overview of the proposed dryer is shown in Figure 1. The device works in the following order: the raw material is loaded into the device through the raw material feeder (2). The hot air flow is supplied to the vertical drying chamber body (1) through the inlet nozzle (10) from the lower side of the horizontal pallets located at the bottom at an inclined angle of 5°. The pallets (3) are installed in series at opposite angles (5°, 180°). This ensures that the drying agent moves in a "zigzag" pattern along the height of the chamber and dries the product on the surface of the pallets. The product in the lowest pallet exiting the device collides with the fresh drying agent fed into the chamber. The product to be dried and the drying agent move in opposite directions. A drying agent with high temperature, low relative humidity, and high enthalpy has the opportunity to maximally remove moisture from the product. The used air passes through the pallets and is released into the atmosphere through the pipe (11) or is mixed with the fresh air entering through the hatch (9), heated to the required temperature in the heater (4) and returned to the drying chamber through the circulation pipe (6) with the help of the fan (5). The lid (7) is made in the form of an envelope in order to keep the speed of the drying agent uniform in the drying chamber and prevent it from accumulating in the chamber. Dnishe (8) is also made in the form of an envelope, and the dried product is first collected in this place, and under the influence of gravity, it is lowered from the device to the pallet of dried product using the weight dispenser (15). The weight dispenser opens when the product weight reaches a certain value, otherwise it stays closed. This prevents heat loss. The device is mounted on a support (12). High intensity and uniform drying of the product is achieved due to the uniform distribution of air flow on each

pallet and the product falling from one pallet to another in a different position compared to its initial position. The distance between the pallets is chosen in such a way that the product that may stick to the upper pallet in some cases is pulled down by the rotation of the lower pallet.

Figure 3. Device for continuous drying of fruits and vegetables

The interior of the chamber consists of self-rotating horizontal pallets placed in several rows, which are locked by bearings on both sides. All horizontal pallets are attached to one axle and move parallel. The axle is driven by a chain drive (13).

Rotating pallets are installed in series at opposite angles (5°, 175°) (Fig. 2). This ensures that the drying agent moves in a "zigzag" pattern along the height of the chamber and dries the product on the surface of the pallets. The product in the lowest pallet exiting the device collides with the fresh drying agent fed into the chamber. The product to be dried and the drying agent move in opposite directions.

In the proposed device, the drying process is organized continuously, due to the circulation of the raw materials being dried and the complete treatment of the surface of the products, uniform drying of the product is ensured, energy consumption is minimized, the productivity of the device increases, and a quality dried product is obtained.

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