



THE CONVEYOR DRYING EQUIPMENT IS CONTROLLED BY A MECHATRONIC SYSTEM

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Annotation

This article presents the results of scientific work on the primary processing of cocoons and agricultural products, in particular, drying equipment and their mechatronic control. There are reports that the use of a mechatronic system in the devices used to dry the product has resulted in energy efficiency and significantly reduced drying times. Drying equipment has been developed for scientific research and its advantages have been demonstrated in comparison with similar devices.

Keywords: Mechatronics, mechatronic system, drying chamber, humidity, temperature, drying time, drying, solar energy, absolute black body, energy efficiency, thermal energy, conveyor.

Introduction

One of the key issues today is the drying of agricultural products, improving their quality and introducing energy-efficient technologies. That is, the use of renewable alternative energy and the complete drying of the entire volume of the product should be considered. This, in turn, reduces the time spent on drying and the specific energy consumed in drying the product. The essence of the scientific work lies in the fact that the issue of comprehensive drying and heat treatment with solar energy and partly with electricity is being considered.

The function of the proposed device, unlike previous devices, is to dry the entire volume, partly as an alternative, partly due to electricity, while spending less time and energy on drying the product. This was achieved by increasing the number of conveyors used by one and using a solar-air collector. The location of conveyors and solar-air collectors is shown in the drawings. The conveyors used are arranged in





series, the product to be dried is turned over from the first conveyor to the second conveyor, and the product is heat treated by solar and electric energy on both sides. In view of the foregoing, it can be seen that scientific research on this topic is one of the most pressing issues today.

Method

The use of the method of comparison with similar devices to substantiate the scientific novelty and advantages of the scientific work performed and the created drying equipment is the basis for a simple and clear explanation of the method of explanation.

As a device similar to the proposed device, fruit dryers of the USK-7 brand conveyor type (conveyor), installed in the drying process of fruit drying plants, designed to remove moisture from the products, were selected [1].

This device consists of a drying chamber, a heat source to remove moisture, a single conveyor (tape) for transporting the fruit into and out of the drying chamber, and a drive that moves the conveyor.

The drying process in this device is such that the sliced fruit is placed on conveyors. It is driven by an electric motor on a conveyor belt. The moving conveyor, in turn, carries the harvested fruit to the drying chamber. In the drying chamber, heat is supplied to the fruits on the conveyor. As a result of the heat, moisture is released from the fruit, and the dehydrated (dried) fruit escapes from the drying chamber through moving conveyors. Drying of agricultural products is carried out by repeating this technological process.

The main disadvantage of this device is that the product being dried is dried only unilaterally, and to remove moisture, heat energy is used only from electricity or natural gas, which is a global shortage. The uniformity of drying of agricultural products is not sufficiently organized. That is, the use of renewable alternative energy sources is not considered, except for the issue of complete drying of the entire volume of the product. Drying condition and quality organization work on such devices takes a little time, which in turn requires a little more energy. The heat flux from the non-renewable energy is transferred to a certain part of the volume of the product being dried.

To solve the above problems, the task of the proposed device is to place the two conveyors used in it on top of each other and in series, and to use electric heaters from the bottom of the solar-air collector. This design allows the fruit to be dried by both solar and electric power. The product on the first conveyor is heated by electricity from the top to the bottom of the sun. During the transition to the second conveyor, the





product is inverted and the solar-heated side is electrically heated, and the electrically heated side is heat-treated by the sun. The rate of construction of the product drying on both sides is also reduced. It also has a positive effect on the quality of construction.

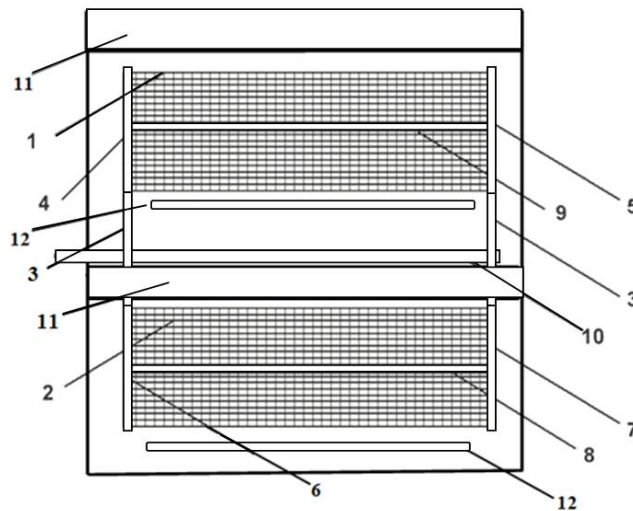


Figure 1

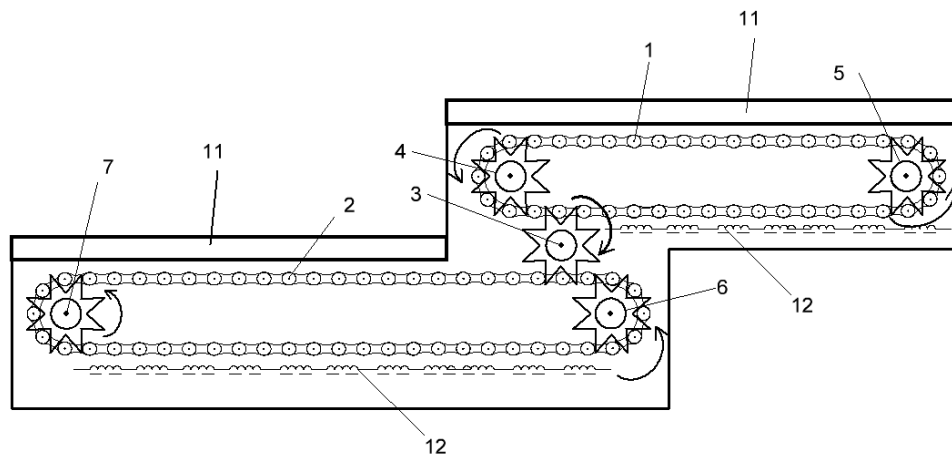


Figure 2

To illustrate the proposed conveyor drying device in Fig. 2 shows a side view and Fig. secondary conveyor (fine wire mesh through which heat flow can pass), 3rd guide wheel, 4-5-6-7 guide wheel, shaft connecting 8-9 guide wheels (shaft), 10-drive wheel, connecting shaft (drive shaft) 11 - solar-air collector, 12 - electric heater.

Result

One of the important results of the operation of the mechatronic system controlled drying chamber is that the number of conveyors used in the nearest device mentioned above has increased by one. In addition, structural elements used in the device may



be characterized by the presence of a solar collector. The dependence of this element is that it is more energy efficient than its closest counterpart. Increasing the number of conveyors to one gives a drying effect due to double-sided drying.

The use of two conveyors for drying both sides of the product using both solar and electric energy had a positive effect on the results of scientific work. On the first conveyor, the required amount of the dried product is transferred by the movement of the conveyor to the second conveyor. As a result of such a transfer, the product will be turned upside down. As a result, the other side is also dried by receiving heat from two different energy sources. At the beginning of the operation of the device, only the product is collected on the first conveyor. After a certain drying period, the drive is transferred to the second conveyor, at the same time a new product is added to the first conveyor. As a result of this recycling of the process, the product on the second conveyor is removed. The process can be repeated in the same way. Another advantage of this innovation is that both conveyors are driven by the same drive. The results and experiments of scientific work are presented in Figure 3.



Figure 3.

Briefly, the proposed "Conveyor Drying Equipment" consists of guide wheels, driving wheels, axles connecting the wheels at both ends of the conveyor, an electric heater and a conveyor (belt), which differs from its close counterpart in that it is again high energy efficiency and reduced drying time through the use of double-sided drying and concentrated solar energy by equipping with a conveyor (2nd conveyor) show that scientific work has a positive result.



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