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Analysis of Innovative Approaches to the Drying of Raw Cotton in Solar Dryers

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Annotation: The article analyzes the current state of solar air dryers and dryers and the results of research and shows the possibilities and advantages of using horizontal type dryers in terms of economic efficiency.

Key words; Heat sink, hot air ducts, drying chamber, steel heat sink, solar, process equipment

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Introduction:

Although the analysis of the state of modern drying processes in the world and in our country and the design and fundamentals of drying drums for raw cotton on the basis of existing technological regulations, the analysis of scientific sources and patents shows that the optimal design parameters of solar drying devices the data are very shallow;

Results and discussions: It is known that the analysis of the drying process of raw cotton and its impact on fiber and seed quality has been studied in depth, but at the same time it has been found that optimal solutions to problems of preserving the natural properties of fiber and seeds have not been found.

The analysis of scientific research on the design of drying drums shows that the use of alternative energy in the drying process in our country has not yet been studied and researched;

Based on the analysis of the current state of solar air dryers and drying devices and the results of research, it was found that dryers of various designs have been created. However, it was argued that these drying devices are only effective for drying agricultural products, grapes, peanuts, etc., but are not suitable for drying raw cotton.

All the listed air heaters have the same main drawback, i.e. because of their low thermal characteristics, they are not able to obtain the optimal temperature regime and drying agent for drying cotton raw materials.

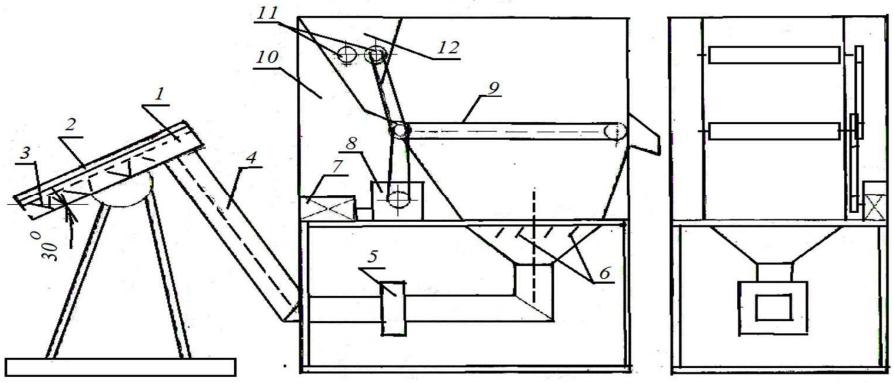
Based on the scientific analysis, the goals and objectives of the work were formed, taking into account the need to expand research on maintaining the quality of cotton fiber and reducing energy consumption.

In addition, research on the current state of solar dryers and the preservation of the natural properties of cotton fiber, reducing energy consumption revealed the need to create a solar dryer

equipped with optical magnifiers. The analysis led to the development of a number of promising solar drying devices.

In order to eliminate a number of the mentioned shortcomings of the drying devices, a laboratory version of the solar drying device with optical magnifiers was prepared. The kinematic scheme of a solar drying device for drying raw cotton is shown in Figure 1.

Figure 1. Schematic of a horizontal solar dryer



1-air heater; 2-optical magnifiers; 3 heat sink; 4- air duct; 5- fans; 6 hot air ducts;7-electro motor; 8-reducer; 9-convector; 10-drying chamber; 11th cotton raw material supplier; 12 bunker supplier.

The development of a horizontal solar dryer with a heat accumulator will solve the existing problems. It is known that the drying of raw cotton can take days, even weeks, in the case of misuse of low-potential heat, including solar energy. [1]

In such cases, the use of daytime running dryers is less energy efficient and less feasible. First, the duration of operation of a device designed to use solar energy, as well as production efficiency is reduced. It is also necessary to use a significant amount of solar heat every day (in the first half of the day) to heat the material being dried. Second, from the second half of the drying process, most of the high-temperature heat begins to be released from the drying chamber into the atmosphere as a result of an exponential decrease in the moisture retention of the material during the drying process and a decrease in the drying intensity. Based on the above, it is expedient to conduct scientific research on the creation of 24-hour solar dryers. One of the ways to create devices of this design is the use of heat storage batteries in the design of solar devices. To solve this problem, it is possible to use ordinary river stones with a volume of 0.5-1.0 m3. This is because a few tons of river stones of the specified size are placed in a certain closed volume in any case, and when air is sent from one side of it, it comes out from the other side. To prepare the heat accumulator, a 3 m deep trench with a right angle (3x10x3m) is dug into the ground. It is filled with stones, covered with a heat-insulating cloth and covered with soil. In view of the above, we aim to eliminate the shortcomings in solar devices by the authorsa new device for drying cotton with a solar device, which operates at the expense of a night-time heat accumulator, has been proposed. In this solar-powered dryer, heat loss during drying is slightly reduced, and its efficiency is increased.

Figure 2 shows a schematic view of the proposed battery-powered solar dryer. The principle of operation of this device does not differ from the above devices, but it is equipped with a heat storage battery.

Invited.

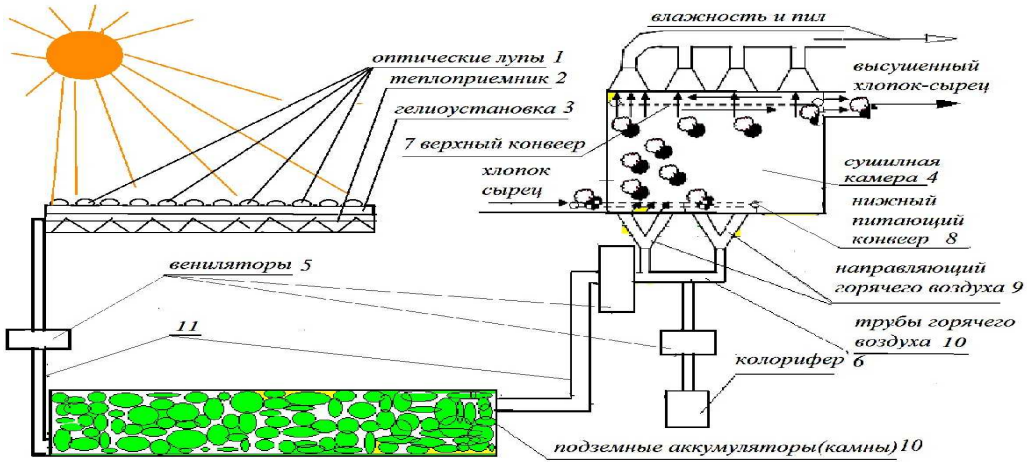
The drying device is characterized by a high degree of heat efficiency and can be used in autumn and spring. In addition, the design of the proposed battery-powered solar dryer is simple, easy to

manufacture and can be made several times cheaper without the need for precious metals or other materials. The battery-powered solar dryer offered is more convenient than other solar devices. [2]

Advantages:

1. A battery-powered solar dryer with round-the-clock operation reduces the drying time of the drying process.
2. Ensures the economic efficiency of the drying process.
3. Due to the use of a cololifier in the dryer, the service life of solar heaters increases when the dryer switches from one mode to another.

Fig. 2 Scheme of use of horizontal type drying devices equipped with a heat accumulator for drying raw cotton.



1-optical magnifiers; 2-steel heat sink;

3 air heater; 4 drying chambers; 6-color; 7 upper convector;

8 lower supply convector; 9 hot air ducts; 10-11 hot air ducts.

Conclusion: Based on the analysis of drying processes of raw cotton in the above-mentioned devices, heat transfer parameters and their design features were developed.

Heat for drying raw cotton in a drying devicemodes, its rational parameters, the ability to determine the operating efficiency of the air heater and select the optimal size of the air heater in accordance with the drying device.

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