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Design of a New Color and Caliber Sorting Device

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Annotation: The article presents the technology of creating a new modern seed sorting device for efficient use of agricultural machinery. Cotton seeds are split into pieces, mixed with kernels and husks, and then put into a press to extract oil. There are mechanical aerodynamic, fluid and electrical methods and methods of this device with low efficiency, low amount of released oil.

Key words: aerodynamic sorter, dielectric sorter, spectrum.

Introduction

In the world experience, large-scale scientific-research works aimed at improving the technique and technology of initial processing of seed cotton are being carried out. In this field, among other things, the development of an effective technology for sorting cotton seed with the help of air flow, uniform continuous transfer of seed, creation of efficient devices of resource-efficient suppliers, optimization of operating modes and parameters are becoming important.

Shortcomings And Problems In The Research Object

When sorting cotton seeds or seeds of other grain crops, they need to be cleaned from additional impurities with the help of various mechanisms and devices before they are divided into pieces of different sizes. Various devices are used to perform these tasks. The most widely used of these is the SPS-type device, which works in the aerodynamic method [1] (Fig. 1). and its technological scheme is as follows:

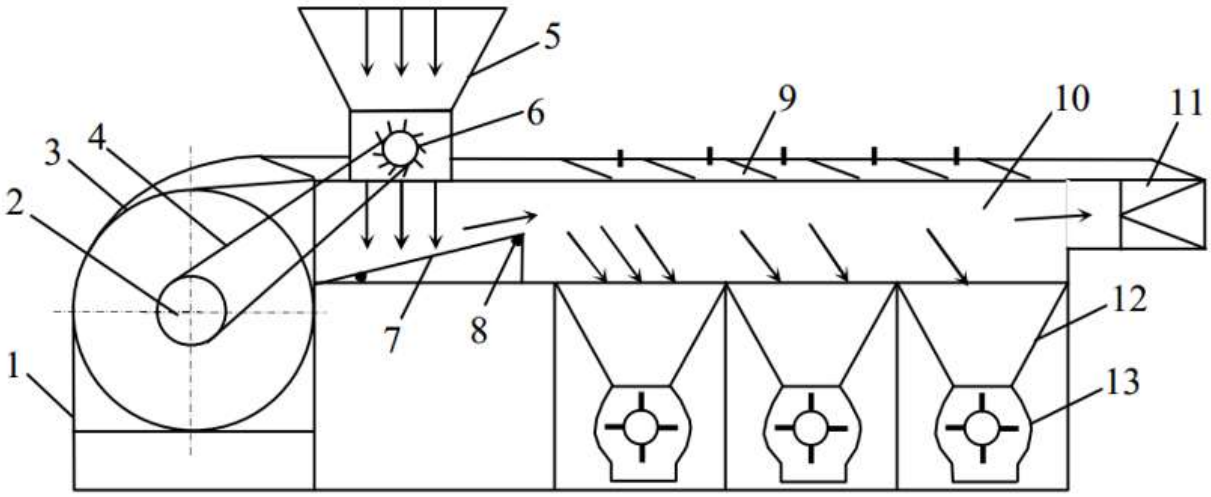

Figure -1. Aerodynamic sorter
1-Frame 1; 2- electric motor; 3- VS- 8 fan; 4- skiff, 5- seed hopper; 6- provides seed evenly; 7- plate; 8- axial regulator with belt element; 9- holes; 10- seed fraction chamber, 11- cyclone for light mixtures, 12- seed hoppers, 13- vacuum valves.

The mass, length, specific weight, width, and thickness of cotton seeds, which are important in sorting technology, were analyzed on the physical and mechanical properties of the varieties created in recent years. According to the results of practical studies, the largest share among seeds is 28% of seeds with a length of 10.4 mm, 25% of seeds with a length of 10 mm, 21% of seeds with a length of 9.6 mm. The amount of other seeds is less than 10%. 20-25% of cotton seeds of a certain variety are 6-10 mm thick, and 27% are seeds with the highest specific gravity.

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Based on the results of theoretical research, an aerodynamic separator for sorting cotton seed was created and is used in seed processing technology. This device has a high separation efficiency with a regulator that changes the trajectory and speed of the flow of air and seeds between the inlet pipe and the separation chamber [2].

Sorter Scheme

The principle of operation of the aerodynamic seed sorter: through the seed feeder 6, the separation falls into the 10 chambers. As a result, seeds whose speed has decreased in the sections fall to the collectors 12 placed under the separation chamber under the influence of their own weight, and the sorting process takes place. As a result of the reduction of the air speed in the separation chamber, the split seeds are separated into fractions due to their aerodynamic properties under the influence of gravity. Full seeds are sent to the first section of the collector, medium to the second collector, loose and light seeds to the last collector according to the air flow, and dust and impurities are removed from the separation chamber through the air flow outlet 11.

Depending on the effectiveness of the sorting process, the direction and speed of the air flow and the seed is reduced or increased by means of the guide 7 through the regulator 8. It is possible to control the seed separation by changing the separation plane to the right or left. The device is simple, durable, long-lasting. The disadvantage is that it consumes a lot of energy and is expensive due to the large amount of metal used in its construction. Accuracy in seed separation is low in fractions. This can be justified by the fact that the resistance of the air flow depends on the size of the seed and the fluffiness of the upper part [3]. Therefore, this sorter limits the use of the device in mass production.

Analysis Of An Electrophysical Seed Separation Device

The conducted scientific research showed [4, 5, 6] that the use of an electric field is effective in sorting seeds, especially in separating the surface part from the core, and therefore, it allows to increase the amount of oil obtained from the seed, as well as its quality. [7, 8, 9]. When using this method, it is possible to use the electrophysical and biological properties of the seed to divide it into pieces [10].

Scientists of the Academy of Sciences of Uzbekistan used this method for the first time in 1964-1967 when sorting cotton seeds before sowing. V.V. Mazayev divided the hairy seed into seed and technical pieces using electric crowns (Fig. 2). The technological scheme of the device is as follows:

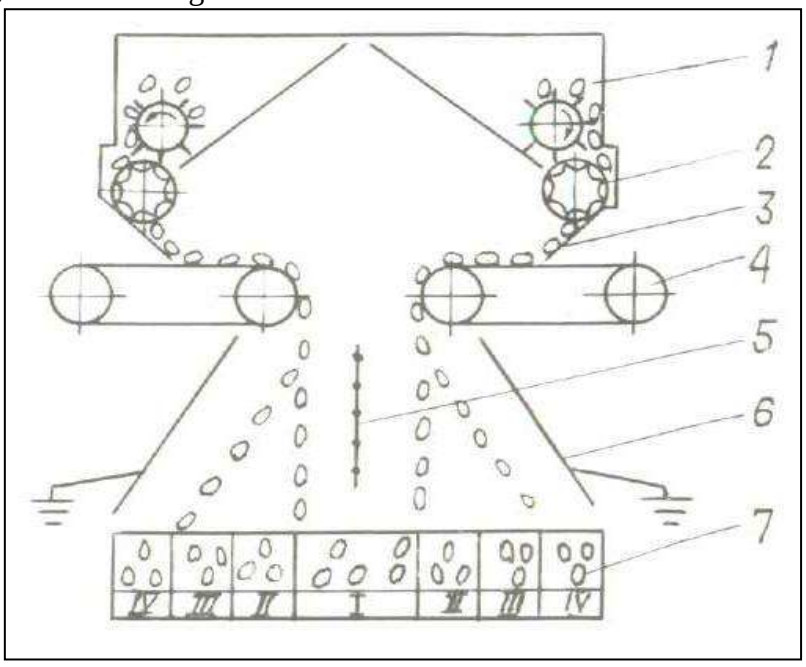

Figure -2 Scheme of electrophysical separation of seed

Analysis of a seed charged in a coronal charge field and an electric force separation device.

The device works as follows: the seed is fed from banker 1, through feeder 2 to tray 3. Through the conveyor 4, it is fed between the electrodes 5. As the chamber is variable, the electrodes are switched between.

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In the coronal field, the charged seed is divided into different fractions based on its physical and mechanical properties of gravity, air resistance and electric field: heavy (1), medium (2), mechanically damaged (3) and light (4) fractions. compartment (7). The disadvantage of the device is that it requires a special direct current source of 35...45 kV, and 80...85 kV is intended for split seed, therefore, the possibility of using this device on a large scale is limited.

Conclusions

Among the considered separators, the most promising are those that work on the basis of the electrical method.
1. Dielectric separators are considered to be the future of electric separators or separators, because if we separate the crushed seed with this method, we can separate the product without charging, both by alternating and direct current, without the influence of the environment on the separation process.
2. Due to the installation of dielectric separators in the seed preparation system, we will be able to increase the amount of seeds released from the seed by 4÷5%.
3. To do this, we need to justify the theoretical and practical parameters of the dielectric device, which is intended to be installed during the separation process.
4. As a result of justifying the energy consumption of the device, we present its main parameters to the production based on the comparison of the saving of electricity.

To solve the above we will need to do the following:
- study of some physical and mechanical properties of seed;
- adaptation of the working body and main dimensions of the known dielectric separator, as well as operating modes to the separation of seed;
- justification of the technical and economic dimensions of the dielectric separator in laboratory conditions and in the seed preparation system.

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