

METHOD AND RESULTS OF DETERMINING THE OPERATING MODE OF AN ELECTROMECHANICAL SORTING DEVICE

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Annotation

This article presents the method and results of determining the operating mode of a pilot copy of an electromechanical sorting device designed for sorting agricultural seeds, including cotton hairless seeds.

Keywords

sorting device, electric field, electrodes, voltage, planting seeds, technical fraction

Currently, sorting of agricultural seeds under the influence of an electric field is more effective and more productive than other methods. The reason is that when sorted by the influence of an electric field, the seeds are sorted according to all important properties, such as physical and mechanical properties, mass, geometric dimensions, dielectric absorption.

In order to obtain a bountiful harvest of agricultural crops, along with agrotechnical measures, planting high-quality, selected seeds is of great importance. Therefore, measures to properly organize quality selected seed production are being carried out on a large scale in the world. For this purpose, a number of legislative acts and presidential decrees have been developed and put into practice in the Republic of Uzbekistan.

In order to determine the operating modes of an energy- and resource-saving electromechanical sorting device that sorts agricultural crops under the influence of an electric field, a pilot copy of the device shown in Figure 1 was prepared and research was conducted at the Research Institute of Agricultural Mechanization.

Based on the analysis of patent research and previously conducted scientific research on sorting agricultural seeds in an electric field, a schematic diagram and working body of an electromechanical sorting device for sorting hairless seeds have been developed.

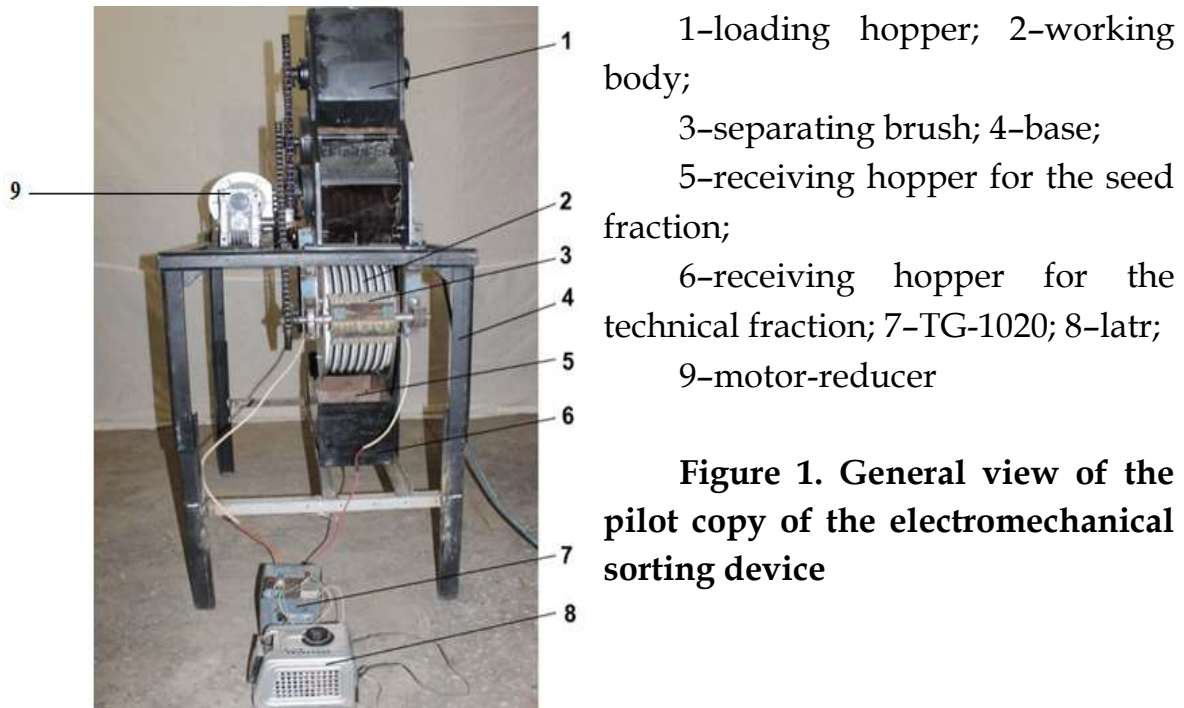


Figure 1. General view of the pilot copy of the electromechanical sorting device

Experimental studies on determining the operating modes of the electromechanical sorting device were carried out on its pilot copy. In this case, the diameter of the working body of the device was unchanged, and its number of revolutions was changed using a modern electronic inventory of the CDI-EM60G2R2T4B model. The number of revolutions of the working body was measured with a tachometer. A high voltage, i.e. around 3000, 4000 and 5000 V, was applied to the potential electrode wrapped in a dielectric ring through a latr from a TG-1020 transformer, and when the number of revolutions of the working body was adjusted using an inventory to 30, 40 and 50 r/min, experimental studies were conducted on sorting hairless seeds. During the studies, the number of revolutions of the working body was measured using a tachometer. The results obtained in the studies were recorded in a field notebook. For experimental studies, hairless seeds of the Andijan-36 variety of cotton, which is currently widely planted in the fields of farms, were used.

The criteria for evaluating the technological process of sorting in an electromechanical sorting device were the amount of separation of seeds into fractions and the mass of 1000 seeds.

When the number of rotations of the working body is equal to 30 r/min, the mass of 8.86 percent hairless seeds separated into the 1st fraction is 106.16 grams, the mass of 1000 grains of 84.34 percent hairless seeds separated into the 2nd fraction is 104.86 grams, and the mass of 1000 pieces of 6.80 percent hairless seeds separated into the 3rd fraction is 83.22 grams. When the number of rotations of the working body is equal to 50 r/min, the mass of 1000 pieces of 3.44 percent hairless seeds separated into the 1st fraction is 102.25 grams, the mass of 1000 pieces of

93.35 percent hairless seeds separated into the 2nd fraction is 99.72 grams, and the mass of 3.21 percent hairless seeds separated into the 3rd fraction is 102.25 grams. The mass of 1000 pieces was 78.32 grams. That is, with an increase in the number of rotations of the working body, the amount of separation of the sorted hairless seeds into fractions 2 and the mass of 1000 pieces was observed to decrease.

With an increase in the number of rotations of the working body, the amount of separation of hairless seeds in fraction 3 and the mass of 1000 pieces were observed to decrease. For example, when the number of rotations of the working body was 30 r/min, the mass of 1000 pieces of 6.80 percent hairless seeds separated into fraction 3 was 83.22 grams, and when the number of rotations of the working body was 50 r/min, the mass of 1000 pieces of 3.21 percent hairless seeds separated into fraction 3 was 78.32 grams.

The decrease in the number of hairless seeds separated into fraction 3 and the mass of 1000 seeds with an increase in the number of rotations of the working body can be explained by the mixing of poor-quality, light and empty seeds with quality seeds in fractions 1 and 2. The analysis of the research results shows that, from the point of view of efficiency, accurate separation of hairless seeds into 3 fractions in an electromechanical sorting device is achieved with a certain diameter of the working body and a certain value of the voltage applied to the electrodes, when the number of its rotations is 40 r/min.

In the specified mode, the mass of 1000 pieces of 6.56% hairless seeds separated into the 1st fraction is 104.52 grams, and the mass of 1000 pieces of 88.69% hairless seeds separated into the 2nd fraction is 101.65 grams, which is an increase of 6.08 and 3.21 grams, respectively, compared to the control. The mass of 1000 pieces of 4.75% hairless seeds separated into the technical fraction is 80.67 grams, which is a decrease of 17.77 grams compared to the control.

Further experimental studies were conducted with a working body diameter of 340 mm, a rotation speed of 40 rpm, a dielectric ring thickness of 14 mm, and a potential electrode diameter of 6 mm, with a voltage of 3000, 4000, and 5000 V applied to the potential electrodes.

Table

Results of sorting of hairless seeds with different voltages applied to the potential electrode

O/ ions	The value of the ge and the name of the	Fractionation	1000 pieces mass , g	The difference between the oller and the controller	
				g	%

1	U=3000 V				
	Control	100	98.44	–	–
	After sorting:				
	I- fraction	3.7	105.2	+6.76	+6.87
	II- faction	93.8	101, 5	+3.06	+3.11
III- faction	2.5	68.2	-30.24	-30.72	
2	U=4000 V				
	Control	100	98.44	–	–
	After sorting:				
	I- fraction	3.3	105.5	+7.06	+7.17
	II- faction	89.7	102.8	+4.36	+4.43
III- faction	7.0	71.4	-27.04	-27.47	
3	U=5000 V				
	Control	100	98.44	–	–
	After sorting:				
	I- fraction	2.9	106.9	+8.46	+8.59
	II- faction	76.4	104.9	+6.46	+6.56
III- faction	20.7	73.1	-25.34	-25.74	

The results obtained show that for accurate and high-quality sorting of hairless seeds into different fractions in a pilot version of an electromechanical sorting device, it is sufficient to apply a voltage of about 4000 V to the potential electrodes with the above-mentioned parameters of the working body.

Conclusion. From the point of view of technological efficiency of sorting of hairless seeds, it is sufficient to apply a voltage of about 4000 V to the potential electrodes of the electromechanical sorting device with a working body diameter of 340 mm, its number of revolutions of 40 r/min, and to obtain seeds that are heavier in mass and larger in geometric dimensions compared to the control, and that are close to each other in these indicators.

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