Global Scientific Review
A Peer Reviewed, Open Access, International Journal
www.scienticreview.com
Volume 16, June 2023 ISSN (E): 2795-4951

Prospective Ways of Electrical Sorting Devices

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Annotation: Sorting of seeds of agricultural crops allows to reduce the consumption of seeds planted on land, to ensure uniform and smooth germination of seeds, to increase productivity and to reduce the cost of cultivated products. In order to carry out these works, it is necessary to use energy and resources wisely, to develop technology and technical means that save them.

In the article, among other agrotechnical measures, in order to obtain a high yield from agricultural crops, the principles of operation of electric sorting devices are developed to improve the quality indicators of seeds prepared for planting, to obtain seeds with similar biological properties, high fertility and potential yield in laboratory and field conditions. and the results of the study of work bodies are presented.

Keywords: Electric sorter device, melon seed, electric field strength, counter electrode, voltage, sorting, seed fraction, technical fraction.

It is known that the sorting of seeds of agricultural crops in the electric field has advantages over other methods, namely mechanical and pneumatic methods. Because, depending on the physical-mechanical properties of the seeds, the electric field acts on them with the force of the electric field directed to them, changing the seeds with all important physical-mechanical properties, i.e. mass, geometric dimensions, density, electrical resistance, dielectric absorption and other similar allows sorting by properties [1-11]. As a result, seeds with high quality, similar biological parameters, high fertility and potential yield in laboratory and field conditions are separated into the seed fraction. In addition, the electric field has a positive effect on the seeds and ensures their uniform and smooth germination, accelerates the growth of seedlings and increases the yield by ripening the crop quickly.

Taking this into account, since the 60s of the last century, dielectric devices with several types of working bodies have been proposed for sorting the seeds of agricultural crops. The working bodies of these proposed dielectric devices differ from each other and are aimed at increasing the efficiency of seed sorting.

For example, B.S. Leonov proposed a dielectric device with a working organ with bifilar electrodes wound on the surface of a dielectric drum for sorting the seeds of agricultural crops [2].

Figure 1 shows the principle scheme of the working body, where bifilar electrodes are wound on the surface of the drum. The working body consists of a metal

drum 1, a dielectric drum 2, electrodes with opposite directions 3, a source 4, side disks 5, a current transmitter 6 and a shaft 7.

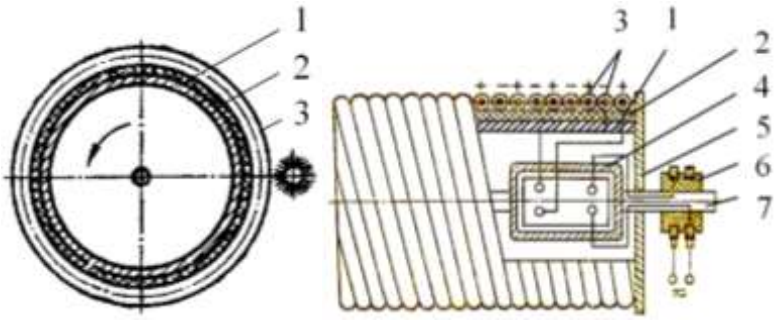

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Figure 1. Bifilar electrodes on the surface of the dielectric drum The principle scheme of the winding working body:

1-metal drum; 2-dielectric drum; 3-electrodes with opposite signs; 4-source; 5-side discs; 6-current transmitter; 7-val

As a disadvantage of this working body, it can be noted that it is mainly designed for sorting small seeds.

A.A. Niyazkulov proposed a dielectric device with a working body in the form of "Olmakhon people" for sorting hairless seeds [3].

Figure 2 depicts the principle scheme of the working body in the form of "Almakhon people".

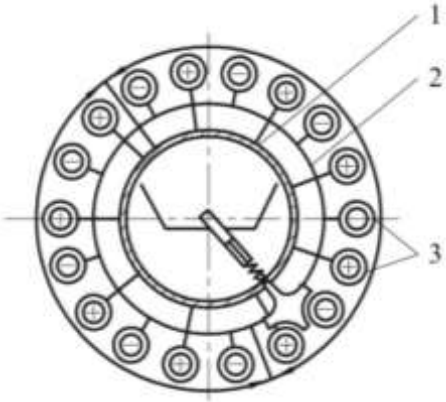

Figure 2. Working body in the form of "Almakhon people". principle scheme:
1-metal drum; 2-dielectric drum; 3-electrodes with opposite signs

The working body consists of a metal drum 1, a dielectric drum 2 and electrodes 3 with opposite directions installed along its length.

There is a certain distance between electrodes with opposite directions, and seeds with small geometric sizes pass through it.

As a drawback of this working body, it can be noted that it is complicated to prepare and that seeds get stuck between electrodes with opposite directions.

B. D. Mamadjonov proposed a dielectric device with a combined working body to increase the accuracy of sorting hairless seeds according to their geometric dimensions [4].

Figure 3 shows the principle scheme of the combined working body.

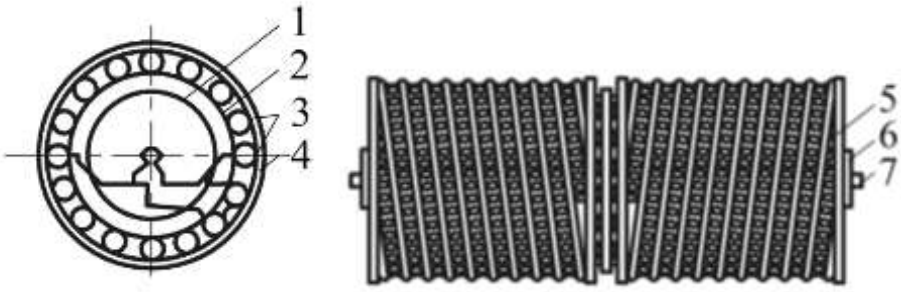

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Figure 3. The principle scheme of the combined work body:
1-metal drum; 2-dielectric drum; 3-main electrodes;
4–additional electrodes; 5-side discs; 6-current transmitter; 7-val

The working body consists of metal drum 1, dielectric drum 2, main electrodes 3, additional electrodes 4, side discs 5, current transmitter 6 and shaft 7. The main electrodes 2 are wrapped along the surface of the dielectric drum 1, additional electrodes 3 are installed above the main electrodes along its length.

As a disadvantage of this work body, it can be noted that it is difficult to prepare and its functional capabilities are limited.

A. Yusubaliev and P. Shayimov proposed a working body in which the distance between electrodes with opposite directions changes for sorting hairy and hairless seeds [5].

Figure 4 shows the principle scheme of the working body, in which the distance between electrodes with opposite directions changes.

The working body consists of a metal drum 1, dielectric material 2 covered on its surface, electrodes 3 with opposite directions, and the distance between electrodes with opposite directions can be changed according to the geometrical dimensions of the seeds.

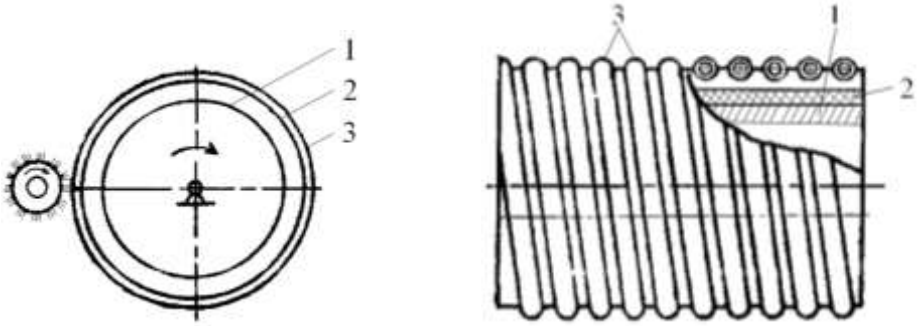

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Figure 4. The distance between electrodes of opposite sign The principle scheme of the variable working body:
1-metal drum; 2-dielectric material; 3-opposite pointing electrodes

As a disadvantage of this working body, it is necessary to change the diameter of electrodes with opposite directions and the distance between them to sort seeds of different sizes.

Sh.G.Aydarov and A.T.Rosaboev proposed a working body assembled from metallic and dielectric materials for sorting the seeds of various agricultural crops [6].

Figure 5 shows the principle scheme of the working body assembled from non-ferrous metal and dielectric materials.

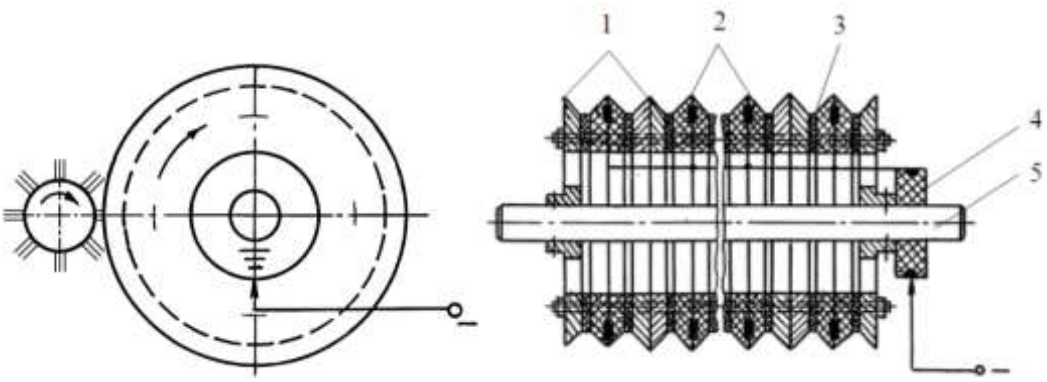

Figure 5. The ring is assembled from metal and dielectric materials the principle scheme of the working body: 1-metal rings; 2-dielectric rings; 3-volumetric resistance a large dielectric layer; 4-current transmitter; 5-val

The working body consists of metal 1 and dielectric rings 2, dielectric ring 3 with a large volume resistance, current transmitter 4 and shaft 5. In order to reduce the flow of charges between the metal rings and the dielectric rings, dielectric rings 4 with a large volume resistance are installed. han.

The disadvantage of this work body is the complexity of its construction and the difficulty of its preparation.

A.T.Rosaboev and O.K.Yoldoshev proposed a working body with two-lane channels on the surface of the dielectric drum and wrapped electrodes with opposite directions for sorting various agricultural crops [7].

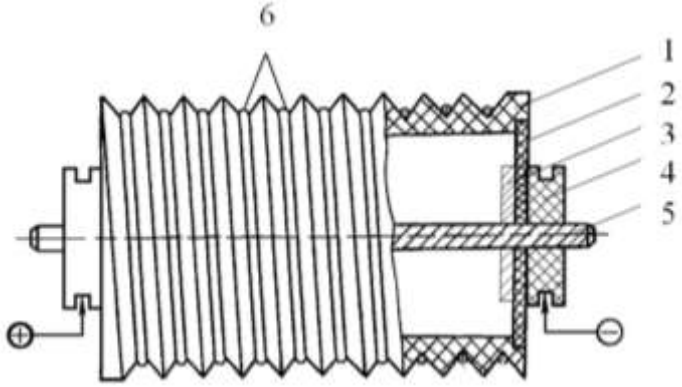

Figure 6. On the surface of the dielectric drum, two-way grooves are directed, and the working body is wrapped with electrodes of opposite direction:
1-dielectric drum; 2-side disks; 3-flanges; 4-current transmitter;
5-shaft; 6-electrodes with opposite signs

It consists of dielectric drum 1, side discs 2, flanges 3, current transmitter 4, shaft 5, and electrodes 6 of opposite direction wrapped in grooves.

As a disadvantage of this working body, it is possible to note the low efficiency of sorting seeds with heavy mass and high dispersibility.

A.T.Rosaboev proposed a working body in which two-lane screw grooves with depth angle "g", width "t" and distance between them equal to "d" are directed to the surface of the polyethylene pipe, and electrodes with opposite directions are wrapped [8].

Figure 7 shows a working body with two-lane screw grooves with depth angle "g", width "t" and distance between them equal to "d" on the surface of a polyethylene pipe, and electrodes with opposite directions are wrapped.

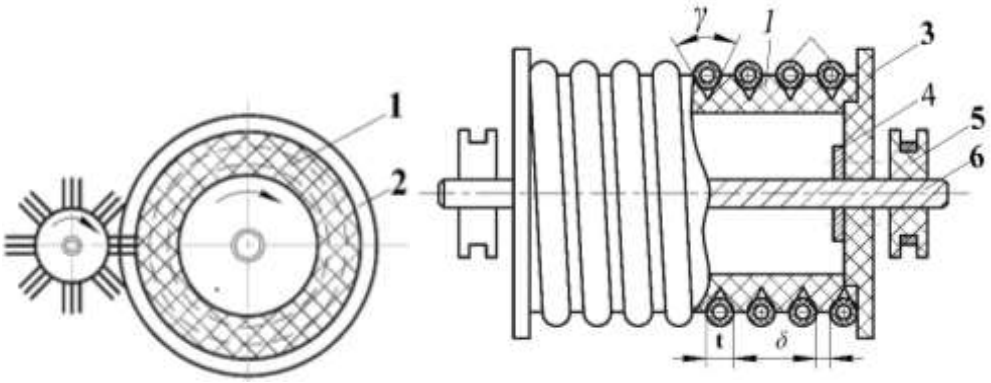

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Figure 7. Two-lane screw grooves with a depth angle "g", width "t" and a distance between them equal to "d" are directed to the surface of the polyethylene pipe, and the working body is surrounded by electrodes with opposite directions: 1-polyethylene pipe; 2-electrodes with opposite signs;3-side disks; 4-flanges; 5-current transmitter; 6-val

Polyethylene pipe 1, electrodes 2 with opposite direction, side disks 3, flanges 4, current transmitter 5 and shaft are directed to the surface of the working body with two-lane screw grooves with depth angle "g", width "t" and distance between them equal to "d". consists of 6, in two different conditions, i.e.
As a result of ignition, an electric field is created between electrodes with opposite directions.

In this working body, seeds with a relatively light mass can be sorted out by applying voltage to the electrodes of the opposite direction, and seeds with a relatively heavy mass can be sorted in the electric field created as a result of friction. However, this body of work also has a drawback and does not allow to fully consider the structure of seeds.

An in-depth analysis of the working bodies of the proposed dielectric devices showed that there are ways to improve the working bodies of electrical sorting devices in this direction. Taking this into account, we put forward the scientific idea that using the advantages of sorting the seeds of agricultural crops in the electric field, the shape of the electrodes with opposite directions can be achieved by taking into account the structure of the seeds and improving the working body.

Figure 8 shows the principle scheme and working body of the electric sorter device developed for sorting melon seeds.

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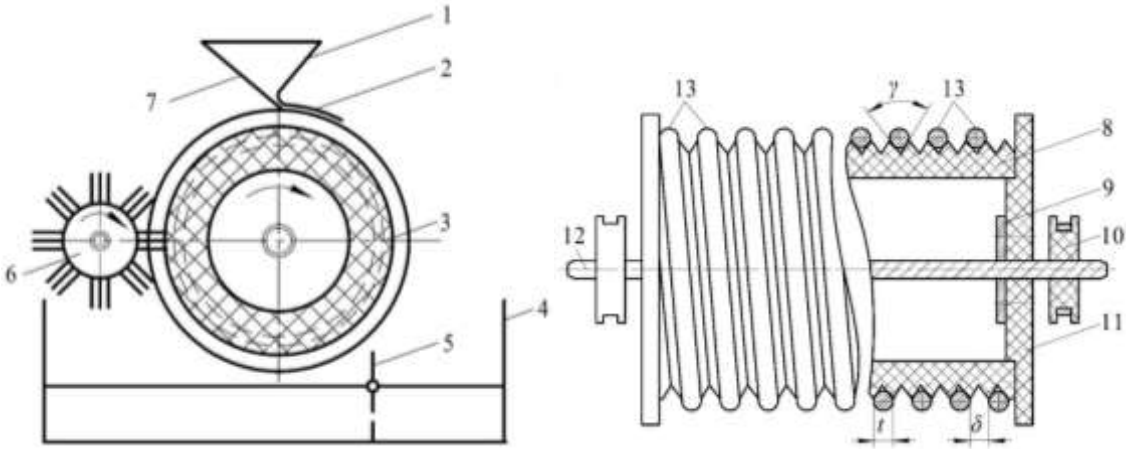

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Figure 2.1. Electric designed for sorting melon seeds

The principle scheme of the sorting device (a) and the working body (b):

1-loading hopper; 2–directing device; 3-work body; 4-receiving bunker; 5th division plane; 6–a separating brush; 7-sliding board; 8-polyethylene pipe; 9- flanges; 10-current transmitters; 11-side discs; 12-shaft; 13-electrodes with opposite signs

The device consists of loading hopper 1, guiding device 2, working body 3, receiving hopper 4, dividing plane 5, separating brush 6, sliding board 7, polyethylene pipe 8, flanges 9, current transmitters 10, side discs 11, shaft 12 and counter- electrodes with opposite direction are composed of 13.

The working body 3 is made of a polyethylene pipe 8, on its surface four-lane screw grooves with a depth angle "g" and width "t" are directed, and it is fixed to the shaft 12 with the help of flanges 9 and side discs 11. In four-lane helical channels, one channel is left in relation to each other, electrodes 13 of opposite direction are wound and connected to a high voltage source through current transmitters 10.

Having such a design of the device ensures the rational placement of the seeds of melon and other similar crops on the surface of the working body and increases the sorting quality.

The guiding device 2 is made of a flexible dielectric material, and it places the seeds to be sorted in the grooves between the electrodes 13 with opposite directions, preventing them from jumping off the surface of the working body 3. This has a positive effect on the technological process of self-sorting.

The principle of operation of the device is as follows. When it is connected to the network, the working body 3 and the brush 6 are rotated. At this time, the melon seeds to be sorted are supplied from the loading hopper 1 through the sliding board 7 to the surface of the working body 3 at the same rate. The seeds are placed in the grooves between the electrodes 13 of opposite direction with the help of the device 2, and are polarized under the influence of the electric field generated between them. As a result, the seeds are attracted to the working body 3 by the force of the electric field generated between the electrodes 13. In addition to the electric field force, the seeds are also affected by centrifugal force, gravity, inertia, reaction and frictional forces. Based on the mutual ratio of the acting forces, depending on their physical and mechanical properties, the seeds are cut off from the surface of the rotating working

body 3 at different angles and separated into the seed or technical fraction using the appropriate fraction of the reception hopper 4, that is, the dividing plane 5. The seeds stuck to the surface of the working body 3 are removed using a brush 6.

Since the seeds are rationally located in the grooves between the electrodes 13 with opposite directions, by changing the value of the voltage applied to them and the state of the dividing plane 5, it is possible to sort melon seeds of various kinds and other similar seeds in the proposed device.

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