

Analysis of research on separation of seed without fiber by a new method of sorting

Sohib Tojimirzaevich Rejabboev

s.rejabboev87@mail.ru

Hasanboy Ma'murjon-o'g'li Xalimov

xalimovxasanboy146@gmail.com

Namangan State Technical University

Abstract: The scientific article describes the design of seed sorting machines, which are the basis of the technology directly involved in this process, the advantages and disadvantages in operation, and a new design of the sorting machine is proposed.

Keywords: cotton, seeds, riot, dirty mixtures, grade, auger, sorter

Introduction

Among agricultural work, the cultivation of seed cotton and the preparation of seed cotton are the most complex and responsible. Harvesting is the most intensive and decisive stage in the creation of high-quality cotton seed stock. It differs from other cultivated crops in that the boll opens not all at once, but gradually, which makes it much more difficult to harvest cotton, especially seed cotton. The quality of seed cotton depends primarily on the location of the bolls in the boll, the presence of pests and diseases [1]. The bolls located in the middle and lower part of the boll, in the second and partly in the third cone, are the most valuable.

These bolls ripen well before the onset of cold weather, and from them Ripened fiber and seeds are collected. Seed cotton is accepted at the preparation points in accordance with the seed preparation plan and the results of testing in cotton fields. Upon acceptance, the consignment notes and their compliance with the test report are checked. The quality of seed cotton must correspond to the first grade according to Uz RST 642-95 and the moisture content can be no more than 8-9.5% by class. Seed cotton received from each farm is usually placed in separate bundles weighing 250-300 tons. Simultaneously with the acceptance of seed cotton, the OTK of cotton ginning plants takes samples from the cotton delivered by each farm for testing the ripeness and germination of the seeds in the seed cotton laboratory. The results of these tests are approximate and serve to select the best seed cotton batches in the required quantity to fulfill the established seed preparation plan. Elite Seed cotton is stored in new bags when received from farms. In order to prevent seed cotton of different qualities from mixing, only one batch of seed cotton of the same quality is stored in one warehouse [2]. In each warehouse where seed cotton is stored or on the site where the bales are placed, a card-passport is installed with the following indicators: batch number, selection variety, industrial variety, reproduction, variety, field group, warehouse number, batch weight, start and end of picking, manual or machine picking, and the name of the commodity expert. During storage, the temperature of the bale is measured every 10 days using a thermometer to monitor the seed cotton. If the temperature at a depth of 3 meters of the bale where the seed cotton is stored exceeds 30°C, such cotton is lowered for re-scaling for 2-3 months or is better treated to reduce its temperature.

The state standard establishes the permissible norms for the main indicators of seed quality by category: germination, fiber content, mechanical damage to the seed, moisture content, and varietal purity. Germination is the number of seeds that have germinated well under certain laboratory conditions and is expressed as a percentage. Seeds with a germination rate of at least 85% are used

for sowing. For uniform and uniform germination of seeds, the presence of fiber hairs, in addition to their usual hairs, is of great importance [2]. When seeds are sown in a seeder, their fibers become tangled, clump together, and clog the seed hole. As a result, the seeds are difficult to germinate, which leads to sparse emergence of seedlings. Therefore, the fiber residue in seeds should not exceed 0.8% of their weight for medium-fiber varieties and 0.4% for fine-fiber varieties.

There should not be many mechanically damaged seeds among the seeds, since such seeds quickly rot in the soil after planting. According to the standard, the content of mechanically damaged and crushed seeds in the seed grain is allowed to be no more than 5%. The moisture content of the seed grain is also of great importance. If it is too wet, its germination decreases, and during storage it rots. The moisture content of the seed grain should not exceed 9-10%. The seed grain must have a certain varietal characteristic. The varietal purity of the seed grain to be sown is determined by the number of seeds with hereditary signs and characteristics characteristic of a certain variety [1].

Scientific research and methods

Currently, sorting and cleaning equipment of various designs is widely used mainly for sorting seed grain. These include: SPS hairy seed grain sorters are designed to sort seeds in a horizontal air stream. Their use improves the seed quality of the seed by separating technical seeds that do not have full seed characteristics. The schemes of SPS seed sorters are shown in Figure 1. The SPS seed sorter consists of a frame 1 with a stone crusher 11, a separation chamber 8, hoppers 12 and 13 for collecting seed and technical fractions of seeds, an additional air chamber 14 and air suction pipes 15 and 16. The transfer of seeds from the hopper collector 2 is carried out through a feeder 3 and a sliding gate 4. Air is supplied by a spray fan 5 through a screw 6 and a pipe 7. The aerodynamic modes of the seed sorter are adjusted by means of dampers installed in front of the suction 17 and spray fans. The ratio of the output of seed and technical fractions of seeds is adjusted by adjusting the position of dampers 9 and 10. The air injection velocity into the separation chamber is 10.2...11.0 m/s for sorting medium-fiber cotton seeds and 13.0...14.0 m/s for sorting fine-fiber seeds, and the suction air velocity is 5.4...5.8 m/s. When the SPS sorter operates under such conditions, the separation of the heavy fraction into the stone crusher does not exceed 0.5% [1].

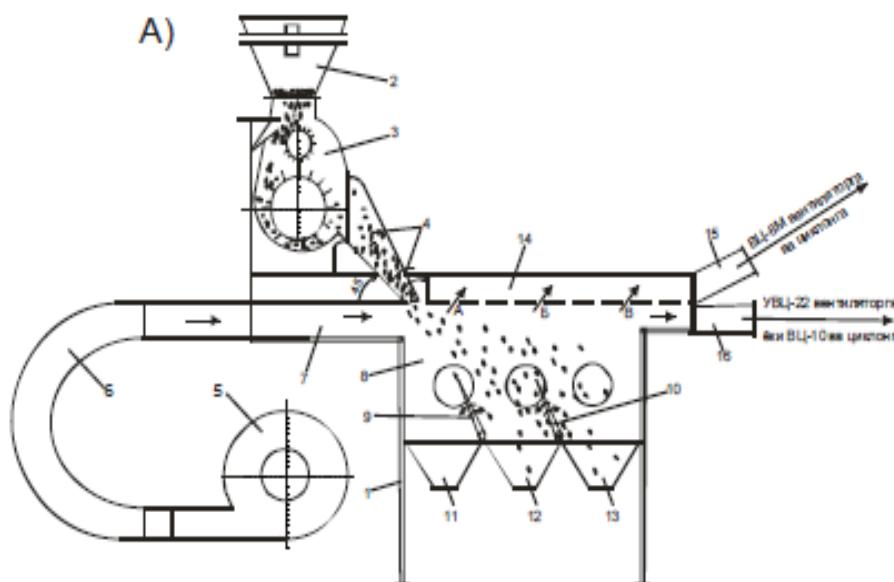


Fig. 1. SPS sorter

1-frame; 2-collection hopper; 3-feeder; 4-sliding chute, 5-VC-8 spray fan 6-screw; 7-pipe; 8-separating chamber; 9- and 10-separators, 11-stone crusher; 12-seed fraction hopper, 13-seed technical fraction hopper, 14-additional air chamber, 15- and 16-air suction pipes, 17-UVC-22 fan.

Dehulled and low-hairy seed is prepared by mechanical dehulling. Mechanical dehulling, in turn, can be carried out using single or double dehulling technology. The production of hairy seed consists of the following main processes: cleaning the seed from impurities and external impurities, sorting, treating, packaging and placing in bags. Also, technical seed, sorting waste and waste from cleaning and sorting of seeds containing short fluff are also collected. Cleaning and sorting of seed from dirt and external impurities is carried out in the vertically installed ChSA seed cleaning and sorting unit in the technological process presented in Figure 2 above.

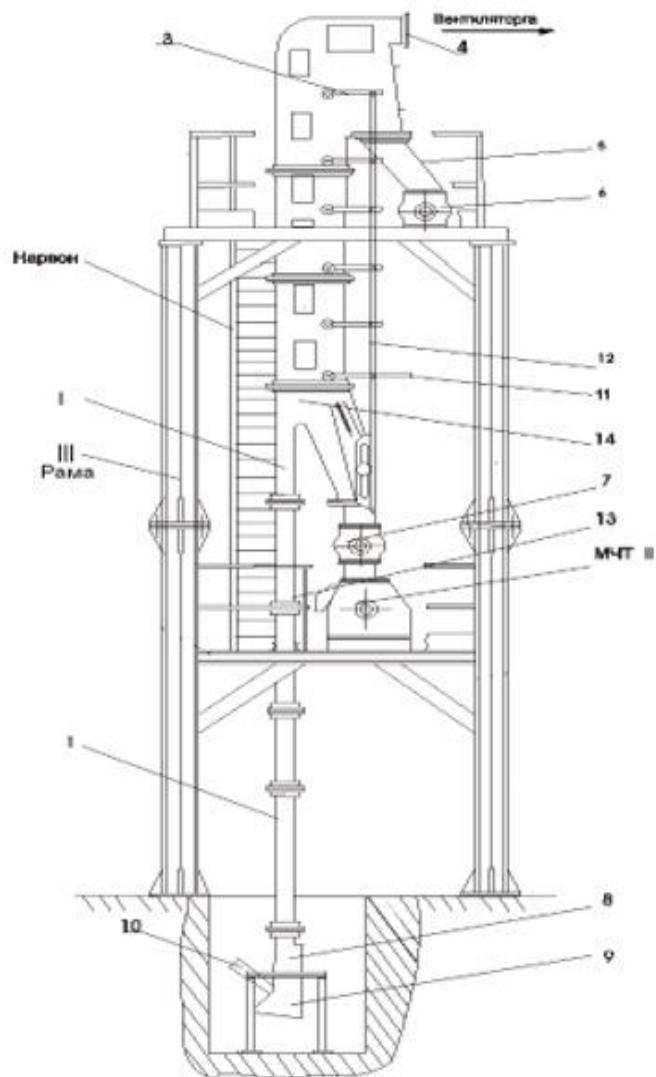


Fig. 2. Scheme of the pneumatic cleaning and sorting unit of the CSA for hairy seeds.

1- pneumatic pipe, 2- sorting chamber, 3- dividers, 4- air suction pipe, 5- light seed chamber, 6 and 7- vacuum valves, 8- intake joint, 9- air inlet pipe, 10- seed discharge pipe, 11- lever, 12- pullers; 13- seed outlet pipe.

The CSA pneumatic cleaning and sorting unit serves to separate seed seeds into seed and technical fractions in a vertical air stream, as well as to clean them from heavy and light impurities. The pneumaticsorter consists of a pneumatic pipe and a sorting chamber.

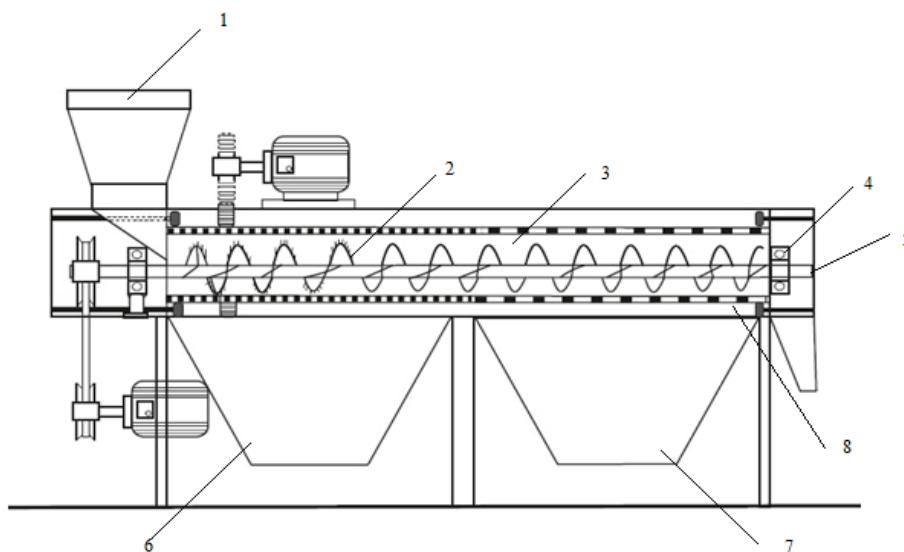


Figure 3. New seed sorting device.

1-inlet pipe, 2-screw conveyor, 3-working chamber, 4-bearing, 5-shaft, 6-pocket for small impurities, 7-pocket for completely separated seeds from the fiber, pipe for sending to the second linker, 8-pipe for separating poorly collected seeds with fiber, 9-mesh drum.

In the device we propose, unlike the previous device, a screw conveyor is located inside the mesh drum. The conveyor shaft is designed in a different way. In order to increase the efficiency of the sorter, clean the grains from fine dirt, and retain the grains containing fibers, the auger and the mesh drum are made to rotate simultaneously with the auger in the opposite direction, and the diameter of the mesh surface holes is made variable along the length of the sorter, at the beginning it is equal to $d_1=4\text{mm}$, at the end it is equal to $d_3=8\text{mm}$, and pockets are also placed along the length of each hole.



Figure 4. Device for sorting and cleaning seed grains.

1-screw conveyor, 2-mesh drum, 3-small impurities, 4-pocket for seeds completely separated from fibers.

The seed sorting device consists of inlet and outlet pipes, screw conveyor, and mesh surfaces. In order to simplify the design of the sorter in the proposed device, the screw conveyors are made to match the dimensions of the seeds with fibers.

Conclusion

Cultivation of high-yielding seed cotton, obtaining a high yield and improving the initial processing of seed cotton begins, first of all, with the preparation of seed cotton with no defects in its composition, suitable for sowing next year. In this case, sorting and cleaning of the seeds separated from the fiber according to their size, ripeness, and degree of fullness are of great importance. If the seeds brought for seeding are not sorted and cleaned at the required level, the germination coefficient

decreases, which leads to a decrease in the yield. In the device proposed by the authors, the mesh drum and the screw rotate in opposite directions at the same time, ensuring complete cleaning and sorting of the seed seeds. Preliminary experiments have shown that the device can be operated effectively.

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