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DEVELOPMENT OF AN EXPERIMENTAL CONSTRUCTION OF A DEVICE FOR CLEANING FROM SMALL PIECE OF CONTAMINANTS

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Abstract: In this article, the results of the work on the creation of the experimental construction of the improved small dirt cleaning device and conducting experiments on it are given. As a result of this research, an improved scheme of arrangement of working bodies and an effective mode of operation of the device for cleaning cotton from small piece of contaminants was developed.

Keywords: Cotton, small and big piece of contaminants, seed, belt pile, continuous mesh surface, device, aggregate, cleaning efficiency

Introduction. At present, cotton ginning enterprises use the UXK complex unit for cleaning raw materials from large and small piece of contaminants. It is known that impurities are divided into small and large types, and during cleaning, different technological processes are carried out in the devices according to these types. Large impurities are cleaned in the saw and furnace bar zone, and small piece of contaminants are cleaned in the pile drum and mesh surface area. Cleaned cotton raw material is sent to the ginning process.

Cotton raw materials may contain cotton leaves, husk residues, broken and broken seeds, and small mineral impurities. If the impurities in the cotton are not cleaned to the maximum during cleaning (usually the cleaning efficiency is 70-75%), the quality of the fiber produced after the subsequent processes may decrease [1]. Taking this into account, in the newly improved device for cleaning and small piece of contaminants, small piece of contaminants from the composition of cotton raw materials are prevented from being added to the air and passing to the next technological processes. The advantage of the newly proposed cleaning device is to increase the efficiency and reduce the mechanical impact on the raw material due to cleaning with a continuous mesh surface and belt piles.

The main working organs of the improved fine dirt cleaning device are mesh surface with continuous slits [2] (slots have no obstructions along the total area of the surface, the rings ensuring the strength of the wires are located on the lower surface of the mesh

surface and do not interfere with the dirt falling along the ring) and consists of a drum with pegs mounted on a belt element (Fig. 1).

The improvement of fiber quality by 15-18% in the improved small dirt cleaning device will bring considerable economic efficiency to the enterprise. The improved cleaning device consists of the following main parts (Fig. 1): 1. supply rollers, 2. scraping drum, 3. pile drums, 4. piles, 5. belt base of piles, 6. continuous slotted mesh surface.

The device works as follows: from the supply rollers 1, through the drum 2, the cotton raw material meets the pile drums 3, which are installed on the belt base 5. Drums with piles carry the mass of raw cotton and bring it to the mesh surfaces 6, and the cotton is thoroughly crushed as a result of the influence of the piles and the drag over the mesh surface. As a result of grinding, small piece of contaminants in the cotton raw material pass through the slits of the mesh surface.

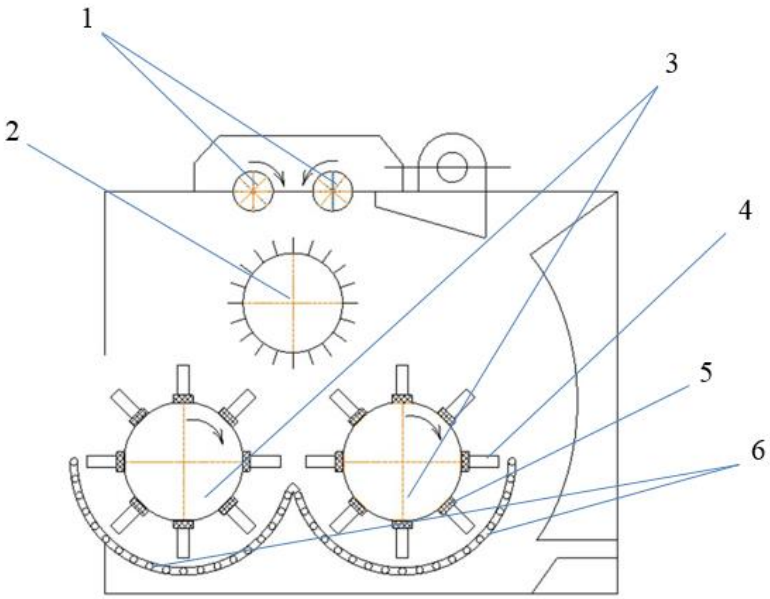

Figure 1. Technological scheme of the improved fine impurities treatment zone 1-supply rollers, 2-squeezing drum, 3-pile drums, 4-Pegs, 5-Pegs Strap Base, 6-Continuous Slotted Mesh Surface.

The main technological difference of the device from other cleaners is that the mesh surface is made of smooth steel wires, and due to the fact that the wires form continuous slits, the useful area of the mesh surface is almost doubled (54.2%), resulting in a significant increase in cleaning efficiency. In addition, due to the increased surface smoothness, it is possible to work easily without jams at the given maximum productivity, and due to the fact that the piles are mounted on a belt base, the condition of damage due to mechanical impact increases as the intensity of digging increases.

When the amount of defects and impurities in the fiber in the cotton ginning enterprise is within the set accounting norms, it is carried out on the basis of a certain cleaning plan for the processing of cotton raw materials. The choice of cotton cleaning

plan depends on its initial contamination, selective and industrial variety, and cotton cleaning is carried out in the next process.

Currently, the main technological equipment for cotton processing is the 1XK type cotton cleaner, the 1XK pile cleaner and the UXK cleaning unit. The use of such machines in the cotton ginning industry allows obtaining cotton fibers of the required quality [3-4].

Therefore, in practice, some selective types of cotton use machines that provide high cleaning efficiency and good performance, because the separation of different selective types of cotton from the fiber is different due to the high adhesion of dirt to the fiber.

The set rotation speed of the drums of raw material decontamination devices, the mode of operation, their constructions were used for the processing of industrial varieties of previously grown cotton. In addition, the recommendations given as a result of the research are used for previously grown cotton varieties, and differ with a number of parameters for new cotton varieties, such as productivity, ripening time, fiber length, seed size. One of the main decisive factors in the technological process of cleaning cotton raw materials is the size of the cotton seed. In the new selected varieties of raw material, the size of the cotton seed is reduced. For example, in the experiments on determining the size of cotton seeds of the selective variety "Porloq-1, 2", the methodology was carried out as follows: the sizes of 100 seeds were determined for testing. After measuring the test samples, the length and width of each seed were measured using a micrometer, then the width and length of the seed were divided into three groups, and the number of seeds in a certain group was determined [5-6]. The results of the experiment are presented in Table 1.

Table 1. Technological characteristics of the fibers of selected cotton varieties.

№	Cotton selective variety	Staple length, mm	Linear density, m·tex	Relative tensile strength, gf/tex	Microneur indicator	Type
1.	C-6524	33,5	159	25,8	4,2	4
2.	Namangan 77	32,4	176	25,0	4,1	5
3.	Omad	32,6	185	24,4	4,3	5
4.	Oqqo`rg`on 2	32,6	167	25,4	4,1	5
5.	Porloq-1	33	165	36	4,3	5
6.	Istiqlol-14	34,5	165	28,5	4,4	5

From the information given in Table 2, it can be seen that the number of seeds with a length of 0.0068-0.0072 m is 14%, the amount of seeds with a length of 0.0075-0.0081 m is 36%, 0.0083-0, The amount of seeds 01 m long was 50%. It should also be noted that the amount of seeds with a width of 0.0035-0.0040 m is 22%, the amount of seeds 0.0041-0.0045 m is 55%, and the amount of seeds 0.0050-0.0055 m is 23%. Is

Table 2. The results of measuring the dimensions of the seed.

Seed weight, g	Length, m	Number of seeds, pcs	Width of seeds in cross section, m	Number of seeds, pcs
	0,0068-0,0072	15	0,0035-0,0040	25
10,12	0,0075-0,0081	37	0,0041-0,0045	49
	0,0083-0,010	48	0,0050-0,0055	26
	0,0068-0,0072	14	0,0035-0,0040	22
10,16	0,0075-0,0081	36	0,0041-0,0045	55
	0,0083-0,010	50	0,0050-0,0055	23
	0,0068-0,0072	37	0,0035-0,0040	36
10,18	0,0075-0,0081	23	0,0041-0,0045	38
	0,0083-0,010	40	0,0050-0,0055	24

The results of the experiment showed that the size of Porloq selection cotton seeds was 15-18% smaller than the size of cotton seeds grown before [7]. This requires paying attention to the established technological parameters and procedures of cotton cleaning equipment. First, small seeds are more susceptible to mechanical damage than relatively large seeds, and secondly, the size of the grooves of the cleaning surfaces (currently around 6 mm) should be reduced. For this, it is necessary to quickly replace the working parts of the cleaning equipment and adapt it to the working mode. It follows from this that during the processing of cotton raw materials with relatively small seeds, there are cases where the seeds are squeezed into the slits with a large size or the raw material passes through the slits. When designing a new device, it is desirable to make the distance between the slots 5 mm or less.

In order to analyze the reason for the low cleaning efficiency of technological machines, the dependence of the overall cleaning efficiency of the cleaner, which is equal to the number of working bodies of the cleaning section, was used, which has the character of geometric progression and is expressed by the following equation:

$$K_{\sum m} = K_1 \frac{1-q^m}{1-q}$$

where K1 is the cleaning efficiency of the first section, %;

q - denominator of geometric progression;

m - number of cleaning sections (working drums), pcs

In general, the amount of working bodies in the cleaner is not very large. Also, the monotony of the process not only reduces the cleaning efficiency of each subsequent section, but also leads to the deterioration of its appearance and the appearance of defects.

Thus, it is not advisable to use one type of working bodies in the cleaner. This idea is also based on experiences in the textile industry, where different working bodies are used in each pass of fiber processing (spinning, carding and carding), never the same machines are installed in a row [8].

In the cotton cleaning industry, the use of different working bodies for cleaning cotton, including the installation of pile drums on a belt base (rubber, metal, etc.) in the 1XK cleaners used for cleaning cotton from small piece of contaminants, has been studied

in various researches, and the impact of all proposed working bodies on the cotton being cleaned has been studied. works under In addition, in order to increase the useful area of the cleaning surface, one of the main working bodies in the zone of cleaning small piece of contaminants was recommended to be installed with continuous slits, and continuous slits were developed using 4 mm steel wires.

Also, it is desirable to consider the possibility of using an adaptive technological system, which is effectively used in various fields of mechanical engineering, and cleaning in an adaptive system depending on the selective and industrial grade, grade and initial dirtiness of cotton.

The trend of efficient use of every element and every area is promoted in the cotton ginning enterprise based on modern analysis. Therefore, increasing the efficiency of the main workers in cotton ginning and rational use of each resource should be one of the main tasks of research.

Based on the analysis of theoretical and practical research, the mesh surface, which consists of continuous slits formed by wires, provides maximum cleaning efficiency. As an advantage of the proposed mesh surface, it can be shown that the influence of mechanical damage to cotton raw material during processing and the maximum increase of useful surface are reduced. In addition, the use of a drum with belt-based piles, developed on the basis of modern research, provides the possibility of additional friction, which further increases the efficiency of self-cleaning.

The results of comparative tests are given in Table 3, which shows the results of testing the constructions of two options. The effectiveness of the process during cleaning is determined by the cleaning efficiency of the machine and the degree of damage to the seeds. According to the data given in Table 3, the new improved device had almost no significant effect on seed damage during operation.

Table 3. The results of production tests on the improved version of the cotton cleaner

Indicator name	**Results of studies carried out on the existing device**	**Results of studies conducted on an improved device**
The initial state of cotton raw materials		
Cotton moisture, %	8,5	8,5
The amount of impurities in cotton, %	3,0	3,0
The state of raw cotton after cleaning		
Cotton moisture, %	8,3	8,3
The amount of impurities in cotton, %	0,55	0,218
Cleaning efficiency of the machine, %	80	92
Mechanical damage to seeds, %	2,5	1,25
Amount of free fiber, %	0,21	0,192

In order to ensure the accuracy and reliability of the experiments, all the compared tests were carried out using the method of five repetitions under the same production conditions based on the standard. Experiments were carried out using S-6524 and Nam-77, the first variety and the first grade cotton raw materials.

Summary. Samples of initial indicators of cotton raw material were taken from the gin, and samples for determining the quality indicators of raw cotton were taken after the gin.

In addition, during the tests, the state of "false ginning" (separation of the fiber from the seed) was also controlled in the device. Free fiber is an indicator that is evaluated during the cleaning process. The less free fibers the waste contains after treatment, the more profitable it is for production. It should be noted that free fibers are more or less mixed with waste after the cleaning process. From the research results in Table 3, it can be seen that the output of free fibers in the existing device in the enterprise is 0.21%, and in the improved device, this indicator is 0.192%. This can be seen by the operation of the device in "soft mode" and thus a significant reduction of mechanical effects.

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CONTENTS