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The role of the seed comb in increasing the productivity of the saw gin

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ABSTRACT: Improving the efficiency of the equipment by improving the design of the working chamber seed comb of the fiber separator gin equipment used in the cotton industry. Identify the most preferred seed comb in several constructions created and recommend its application in production. The experiment was carried out in a gin machine 4DP-130 in the main corps gin shop in the conditions of JSC "Sofishishlokpakhtatozalash" of Jalal-Abad district of Andijan region. 3 different variants of the teeth of the seed comb were prepared, 1-tooth shape was prepared according to the existing design, 2-tooth shape was made in oval shape and 3-tooth shape was made in rectangular shape, and experimental tests were conducted. According to the results obtained, the experiment conducted on a seed comb with a rectangular shape of the teeth gave a high performance, increasing the productivity of the machine by 12-15%. Seed fluff was not adversely affected. Based on the analysis of the obtained results, it was found that in order to increase the productivity of the gin machine, the seed comb in the working chamber was preferred according to option 3, i.e. the rectangular shape of the comb tooth.

KEY WORDS:seed, cotton, working chamber, gin machine, seed comb, toothed saw, saw blade, grid, grid hole, cylinder, fiber quantity.

I. INTRODUCTION

The technology of early processing of cotton began to develop rapidly from the 19th century. Manual labor was used less and less, and techniques and technologies began to be created. The techniques and technologies of primary processing of cotton are different, the main task of which is to dry the moisture of cotton, remove impurities, separate the fiber from the seeds.
Cotton fiber is one of the main raw materials for textiles in the world, the quality of which is achieved by improving cotton ginning machines. According to world statistics and the “International cotton advisory committee (ICAC), as a result of a 2% reduction in the area under cotton in the world market, the demand for its products will reach 33.4 million tons” [1].

In developed countries, including the United States, Brazil, China, India, Pakistan, special attention is being paid to the development and improvement of resource-saving spare parts for cotton gins. In this regard, the development of new resource-saving techniques and technologies, reducing the cost of production and the development of competitive products in the world cotton market play an important role in the further development of the ginning industry. Extensive research is being carried out around the world to improve the techniques and technology of primary processing of cotton and to create their scientific basis. In this regard, including automation of the main machine of ginneries, increase of productivity, equipping the working chamber with resource-saving parts, determining their impact on durability, improving the operational reliability of the machine, development of mathematical models and their optimization. maintaining quality is important [2].

At the same time, it is necessary to develop a new design of resource-saving saws, justify its parameters, provide resource-saving parts that increase efficiency and reduce energy consumption.

The most important task of the current stage in the development of the primary cotton processing industry is the intensification of work on the rationalization of production and obtaining the possible high-quality fiber, most suitable for its further processing at spinning mills.

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The main technological machine of ginneries for processing gin is a medium-staple raw cotton, the main task of which is to separate cotton fiber from cotton seeds, provided that its natural properties are preserved.

The main directions in solving this problem remain the improvement of the quality of harvested raw cotton, the introduction of new, more advanced technological machines into the industry, the modernization of existing equipment and the choice of optimal modes of its operation. The quality of the products and the capacity of the plant largely depend on the operation of the main machine of the gin cotton plant [3].

The productivity of the saw gin, the quality of the resulting fiber and seeds depend on the rotational speed and structural movements of the mass of the raw roller.
The search for ways to increase the productivity of saw gins is carried out both in Uzbekistan and abroad. However, despite the great successes achieved by scientists of scientific organizations, as well as workers in industry, a significant increase in the quality of fiber and seeds has not been achieved.
One of the main organs of the gin is the working chamber, which separates the fiber from the seeds and expels the seeds from the working chamber. An important factor determining the result of ginning is the efficiency of seed extraction from the working chamber [4].

II. ACTUALITY OF THE TOPIC

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III.THEORETICAL PART

It is known that 1/3 of the fibers of the fly stick to the teeth and are dragged to the grate, passing between the holes of the grate, the cotton seeds stop at the surface of the grate and due to the mechanical action from the teeth, the fibers are torn from the seeds, and the rest of the fibers with seeds go back to the raw roller...

For a steady ginning process, you can write

$$\Pi = \frac{Q}{t_{cp}} A$$

Where, P is the fiber performance of the working chamber;
Q is the weight of the raw cushion;
t_{cp} is the average residence time of fiber and seeds in the working chamber;

A is a constant characteristic of the ginning process.

It follows from the formula that the productivity of the working chamber can be increased by increasing the weight of the raw roll or by decreasing the average residence time of the fiber and seeds in the working chamber.

It is necessary to accelerate the separation of the fibers from the seeds by increasing the amount of fiber adhesion to the saw teeth or the interaction of the fibers with the saw blade teeth to reduce the time the seeds stay in the working chamber. To do this, it will be necessary to change the volume of the working chamber or increase the speed of the saw cylinder. Such a constructive change in the working chamber adversely affects the quality of fibers and seeds [6].

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Studying the above, we focused on the design of the seed comb, which is part of the design of the working chamber. The main role of the seed comb is in the control of seed drop when leaving the working chamber through the holes between the comb with the grate surfaces. The hole size is 18-22 mm and bare seeds pass through them. Studying this process, we concluded [6] that with such a walk, all bare seeds fail to pass. Some of the seeds that did not have time to pass back go to the raw roller and the fiberiness of the raw roller decreases, and, consequently, the productivity of the gin also decreases.

Considering the above disadvantages, we propose to increase the productivity of the gin by changing the design of the seed comb, which has an additional slot for the output of bare seeds. Several designs of the seed comb have been developed, changing the shape of the comb teeth. For this, the total length of the seed comb was divided into 3 parts and the shape of the comb teeth was alternately changed. The shape of the comb teeth is oval in the 1st version, and the quadrangular in the 2nd version. Experiments were carried out at the Sufikishlak cotton ginning plant in Andijan region. The new design of the seed comb is shown in figure 1 - a general view, in figure 2 individual designs are rearranged showing the profile of the comb.

1- operating structure, 2 - oval design, 3 - rectangular structure.

Fig.1. General view of the structure of the modernized seed comb

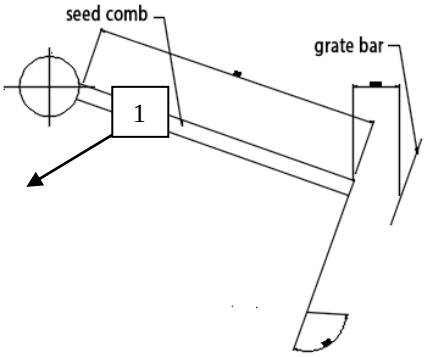

Fig. 2. Operating structure

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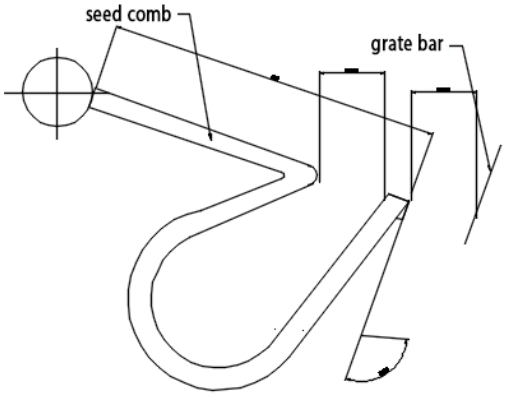

Fig. 3. Oval-shaped structure

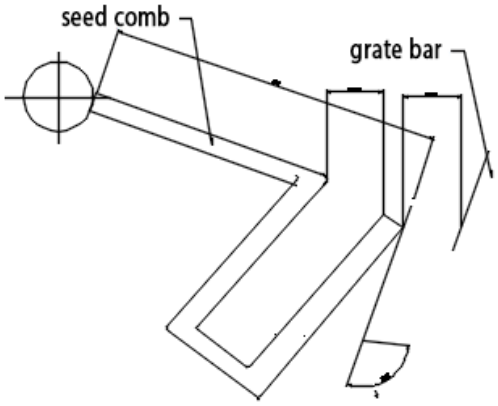

Fig. 3. Rectangular construction.

The experiments were carried out in production conditions on 4DP-130 gin with 1st grade cotton of the 1st grade and cotton of the An-36 selection. The results of the experiments showed that the best readings were given by the quadrangular shape of the seed comb.

IV. CONCLUSION AND RECOMMENDATION.

Based on theoretical and experimental research on the development and justification of the parameters of the new design of saw joints, the following conclusions and recommendations were formed:
Resource for saw gin - and the design of energy-saving saw blades has been developed;
the relationships of changes in radial oscillations are developed considering the geometry and mass of the saw joints, as well as the materials from which they are made;
The maximum values of the compressive strength of the saw between the saw and the angle of rotation of the saw cylinder shaft are determined considering the generalized and distributed forces;
Variable connections of the movement of the saw blades between the saws were developed, the critical frequency of rotation was determined considering the technological resistances of the saw cylinder.
Although a number of works have been carried out to improve the design of the main technological machine of the saw blade, the improvement resources have not been fully used due to the creation of a new structure in the form of discs and rings, especially in terms of increasing the reliability of saw blades.

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