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Influence to Optimization Geometric Parameter Saws on His (Its) Capacity to Work

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Abstract*: At present is absent the scientific motivation geometric parameter separating saws and rates to accuracy functional parameter. The Question to optimization geometric parameter saws is important and, in this connection, requires the immediate permit. In article is considered questions bound change of power acting worker of the surface's teeth saw depending on designs.

***Keywords*: the worker surface, saw, stability, toughness, improvement, stringy mass, qualitative factors, vice formation, pat cleansing production, preparing products, wear capability.**

I. INTRODUCTION

Currently, on the world market, cotton fiber is the main natural raw material for the production of textile products. According to the international Advisory Committee on cotton (ICAC), China, the United States, India, Pakistan, Brazil and Uzbekistan hold a stable leading position in the supply of cotton fiber to the foreign market. Dynamic and stable development of the cotton gin industry, introduction of modern technological equipment at the enterprises of the industry, increase of efficiency and rational use of production capacities are the basis for the production of competitive products and sales on the world market.

In world practice, a large volume of scientific and research works are carried out aimed at the development of innovative technology and technology, which provides for the effective application of modern advances in science and technology, modernization of existing equipment and their introduction into production. In this area, the development and improvement of a set of technical means for the manufacture of the main parts of the working tools of cotton-processing machines are of particular importance with the most efficiency [1].

In our republic, comprehensive measures are being implemented to develop the cotton industry, to re-equip and modernize cotton-cleaning enterprises, to increase the profitability of production and processing of raw cotton, as well as to ensure the competitiveness of produced products. The Strategy for the Development of the Republic of Uzbekistan for 2017-2021 defines the tasks, in particular, for... " Increasing the competitiveness of the national economy, reducing energy and resource expenditures, and widespread introduction of energy-saving technologies.... " One of these tasks is the creation and improvement of technical means for the rational production of saw disks of cotton processing machines [2]. The modern stage of scientific and technical progress is characterized by rapid improvement of technical parameters of products, intensification of working processes, improvement of reliability and resource. Every five to seven years, new generations of machines are created, reflecting the achievements of scientific and technological progress. Structural materials change quickly and new process plans are implemented.

II. EXPERIMENTAL PROCEDURES

The modern stage of scientific and technical progress is characterized by rapid improvement of technical parameters of products, intensification of working processes, improvement of reliability and resource. Every five to seven years, new generations of machines are created, reflecting the achievements of scientific and technological progress. Structural materials change quickly and new process plans are implemented.

At present, the task is not only to develop the design and technological process, but also to optimize their parameters, including to develop the design of the profile of the genie saw [3].

In modern technology, the importance of strength problems increases. This is due to the increasing complexity of technical products, the need to improve efficiency, quality, reliability and durability.

It is understood that the requirements for the strength and reliability of the structure are of paramount importance.

In order to practice, an engineer needs to develop skills to create simple and clear models of phenomena and real objects, discarding secondary factors.

If the technical requirements for the article indicate the probability of failure-free operation P = 0.99, this means that one article of one hundred may fail (on average) for life (operation time).

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When assessing strength reliability, the probability of failure is often determined

F=1-P

Finding the probability of failure or failure-free operation at the product design stage is a very difficult task. Currently, the main method of strength reliability assessment is to determine the strength reserves.

they are not subject to restoration (renovation) and are handed over for scrap.

Low repair life of saw (according to technical regulations, denim and linter saws are to be replaced after 96 and 48 hours, respectively) requires frequent cutting operation for a smaller diameter, which increases their annual demand of more than one million pieces for the cotton cleaning industry of Uzbekistan.

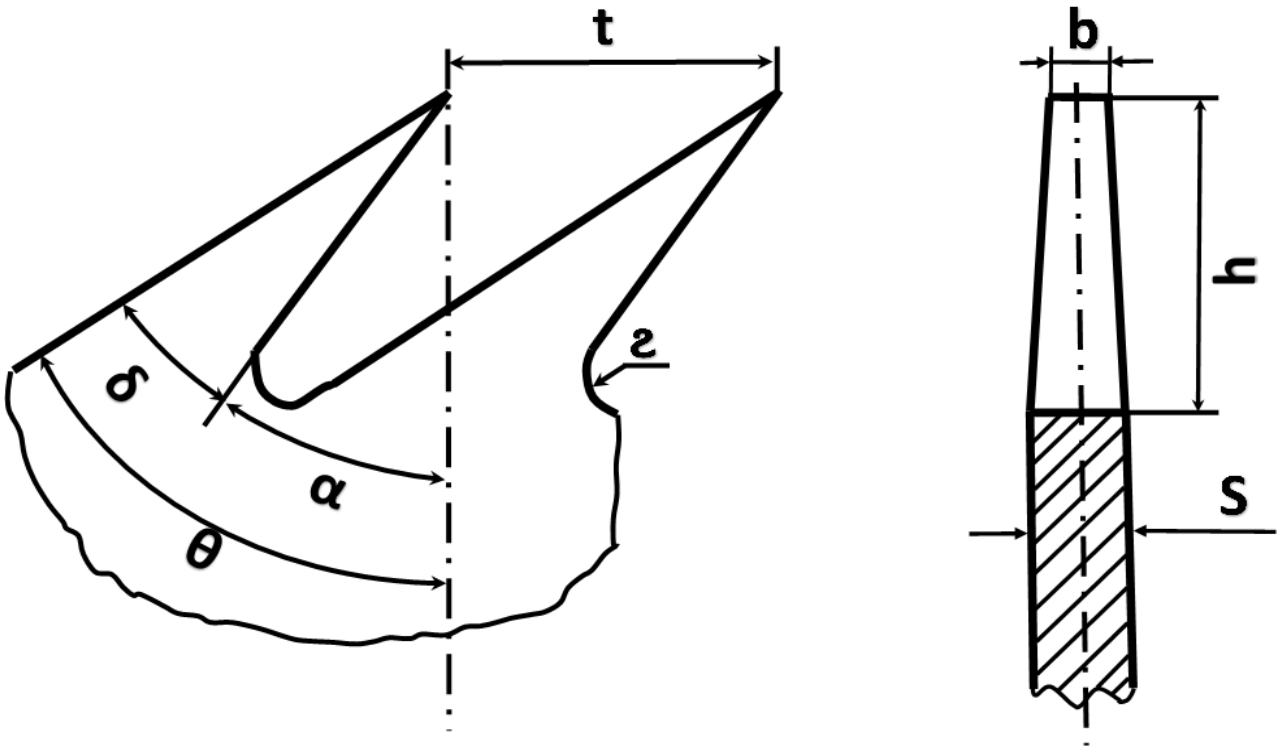


Fig. 1. Profile tooth diagram of genie saw according to GOST 1415-48

Performance of gins and linters, their energy

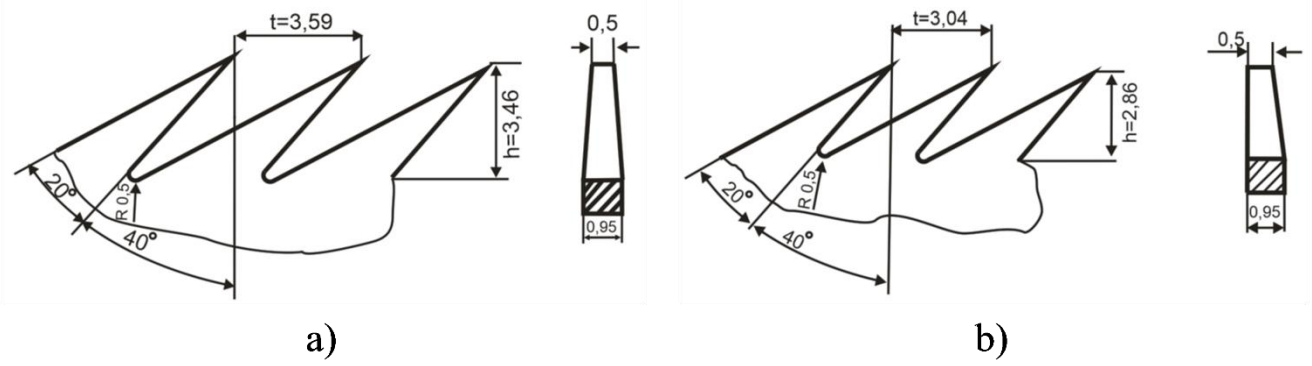


Fig. 2. Geometric parameters of saw disc teeth for gins (a) and linters (b)

It is essential that reliability, failure-free dependence of structures, including the profile of the genie saw, is related to the determination of service life. In most cases, service life refers to the time of operation of the article by load or loading cycles [4]. The new denim and linter saws (Fig.1) with a diameter of 320 mm have a number of teeth 280 and 330, respectively. Saws used on cotton plants, having tooth breakage in the form of abrasive wear, plastic collapse and breakage, are subjected to cutting for smaller diameter in saw repair shop. The technical standard provides for 5-fold cutting of teeth (Fig.2) on saw disks with decreasing diameter: 320, 300, 290, 280, 270 and 260 mm [8]. After development of saw with diameter of 260 mm on linters

consumption, as well as quality of produced products (cotton fibre, lint, seeds) depend to a large extent on the efficiency of saw repair shops. Operations to prepare saw and saw cylinders in the saw repair shop of cotton plants include such activities as sorting, sharpening, cutting, rigging, sizing and grinding. In order to perform these operations, the saw repair shop must be equipped with tooth processing machines, saw points, machines for removing (grinding) chamfers from saw teeth [4]. It is necessary to have in sufficient quantity cutting tool, set of gauges and templates for quality control and saw geometry.

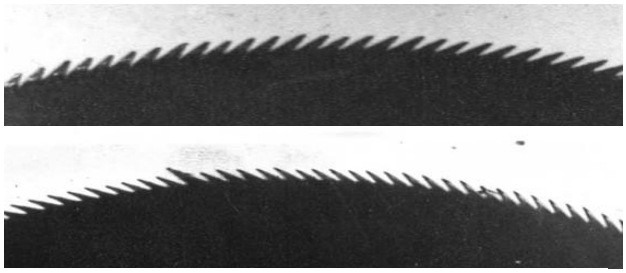


Fig. 3. Fragments of cut saw disk

Performance of gins and linters, their energy consumption, as well as quality of produced products (cotton fibre, lint, seeds) depend to a large extent on the efficiency of saw repair shops. Operations to prepare saw and saw cylinders in the saw repair shop of cotton plants include such activities as sorting, sharpening, cutting, rigging, sizing and grinding. In order to perform these operations, the saw repair shop must be equipped with tooth processing machines, saw points, machines for removing (grinding) chamfers from saw teeth [4]. It is necessary to have in sufficient quantity cutting tool, set of gauges and templates for quality control and saw geometry.

space of the teeth significantly affects the quality and productivity of the gining. It follows from the above conclusions that the improvement of the profiles of the teeth of the denim saw in depth to study the force of the working part of the teeth acting in the process of operation and to justify the parameters, recommend the optimal version of the profile of the dening saw.

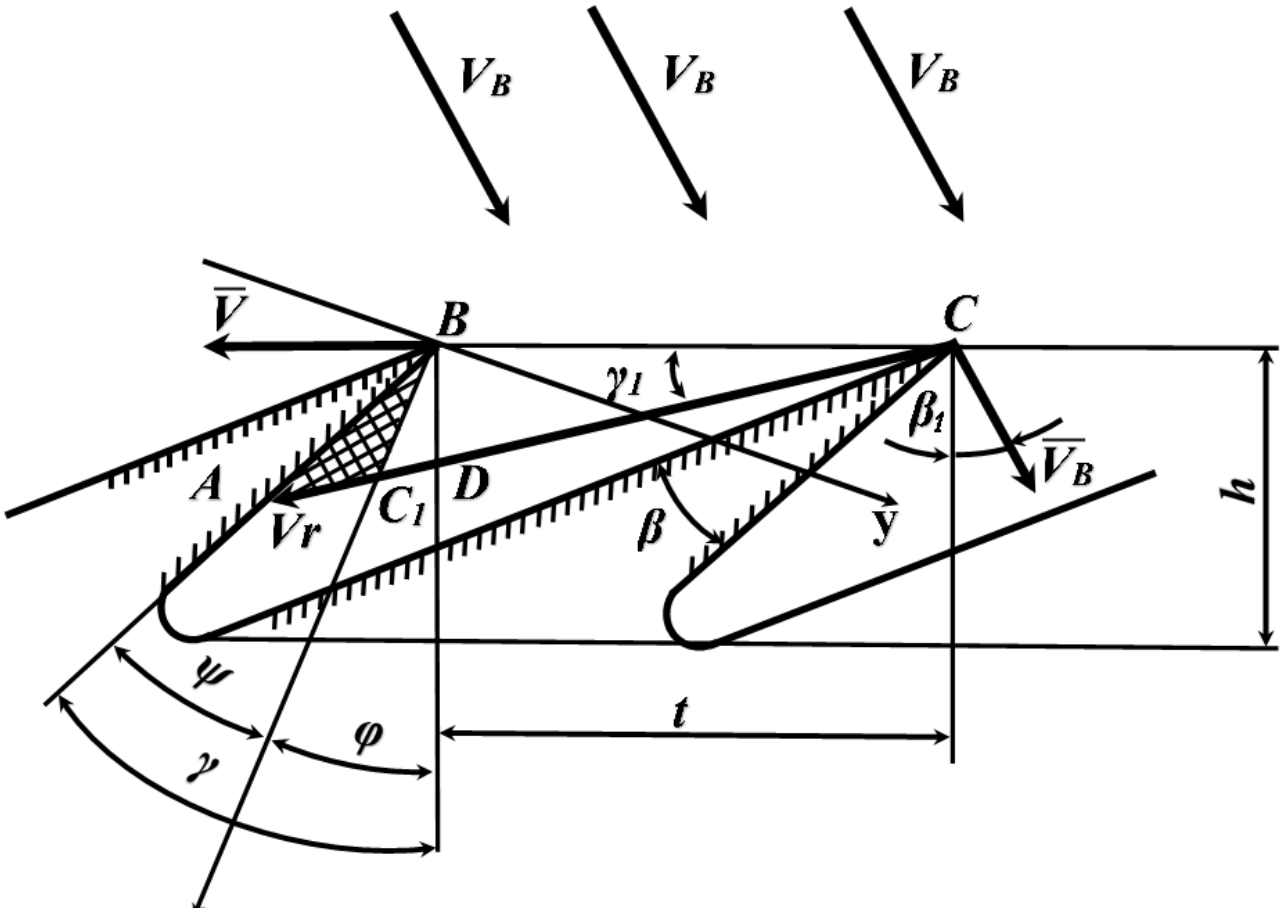
Levkovich V. A. in these works for the first time theoretically justified the process of gining on saw gins and solved a number of theoretical and practical issues related to genie saw and construction of rational tooth profile [4]. The main findings of the studies were as follows:

1) In order to increase productivity and improve quality, it is necessary to:

Apply a straight-border tooth profile and a size corresponding to the “Harvnietter” gin tooth profile.

From this point on, the question of tooth shape was theoretically and practically considered correct, i.e. a tooth with straight faces is considered the most rational (Fig. 4.). But further development of science and practice confirmed the insufficiency of Levnikovich 's conclusion B. A.

2) The saw tooth grabs, breaks off the seeds and pulls the



Rice 4. Force of acting force in process of gining on working surfaces of teeth.

III. RESULT AND DISCUSSION

The influence of the inclination of the front face of the teeth for any pitch values of the teeth has little effect and is evident to the extent that this inclination affects the degree of dismembering of the fiber strands being torn off the seeds. However, due to the complexity of the processing, it is impractical to apply an inclination of the front face of the teeth of more than 40 °, and an increase in the working fibres behind the grate, and this coordination of the saw tooth operation phase affects the productivity - the more fibre capture and breaks the saw tooth from the seeds per unit time, the higher the performance of the gin.

3) The theoretical number of fibers captured by one genie saw tooth is:

$$i = \frac{P_z \cdot 1000 \cdot p}{z \cdot n \cdot 60}$$

From where:

$$P_z = \frac{i \cdot n \cdot 60 \cdot z}{1000 \cdot p}$$

Where: P_z - saw capacity in kg fibre per hour;
p -the amount of fibers in 1 gram;
z -number of teeth on the saw;
n -saw shaft RPM per minute;
i -number of fibers captured by one tooth.

After substitution comes the final formula of saw gin performance:

$$P_z = k \cdot A \cdot s \cdot z \cdot n$$

k-tooth cavity filling factor;
A-the result of all constant values;
s-area of the hollow of tooth.

On the basis of the above formula, the productivity is independent of the cotton grade and there is a function of tooth area, number of teeth and number of rotation of the saw roll (Fig. 5). Obviously, the value of the tooth cavity and the number of teeth per saw are linked to each other, it is necessary to find the optimal ratio of these values [5]. The tests carried out show that the best result of gining by quantitative and qualitative indicators is obtained at the number of teeth in 280 per 12 saw.

4) Saw teeth are loaded with trapped fibers unevenly and not all of them participate in the work.

5) In order to better integrate the tooth with the cheese roll, which will contribute to an increase in fiber capture, and therefore productivity, the saw tooth needs to be made acutely.

On the basis of this model (Figure 5), which opens a significant reserve in the possibility of filling the teeth cavities with fibre, it is possible to use saws with reduced pitch of teeth (at their number on a saw more than 280). The use of such saws provides sufficient productivity while significantly reducing the interaction forces, and hence improving fibre quality and reducing seed damage

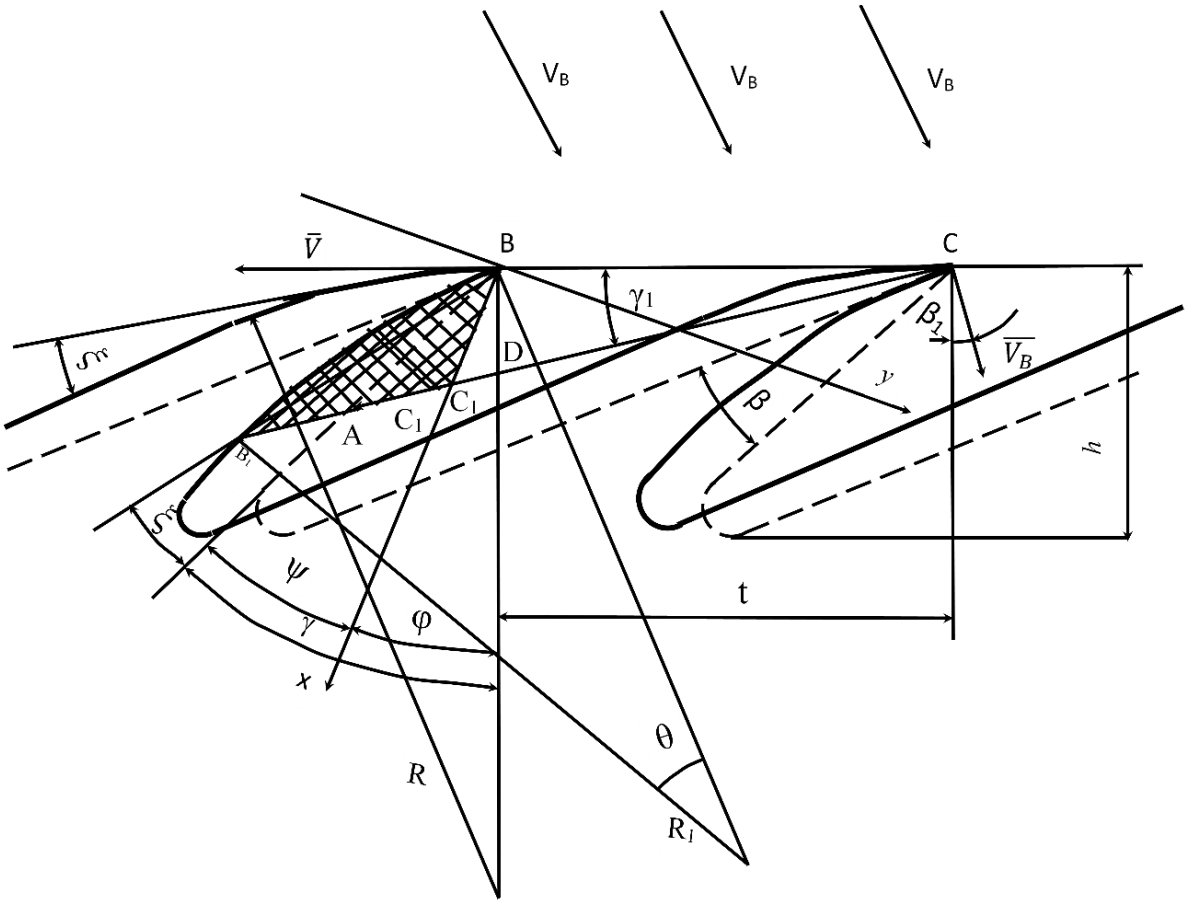
IV. CONCLUSION

In all the theoretical analyses carried out, in which the saws during bench tests showed increased gripping capacity, and on natural gins - marginal productivity, at the same time there was also a decrease in fibre quality. The high gripping capacity of the teeth and saw in general is accompanied by increased force on the processing product, which causes a decrease in fibre quality and damage to seeds.

Saw with diluted teeth was characterized by the highest performance indicators, and from the point of view of fibre quality these saws showed the worst result. The work of such saws caused increased vice formation and, above all, defects such as fiber skin and mechanical damage to seeds.

-Foils with increased pitch of teeth, i.e. with reduced number (less than 280), as well as saws with diluted teeth, provided increased efficiency and reduced fibre quality. However, the decrease in fiber and seed quality was less noticeable.

-Foils with reduced pitch of teeth, i.e. with increased number (more than 280), provided efficiency of gining process, meeting requirements of modern cotton cleaning production, with marked improvement of quality of produced fibre and seeds.



Rice 5. Influence of acting force in process of gingering on working sections of teeth.

This can be explained by the fact that the potential ability to capture tooth cavity fibers, even with small dimensions, is sufficiently high to provide a gingering with high productivity.

At the same time, the use of small teeth leads to the decompression and increase of the number of fibre strands to be torn from the seeds, as well as the reduction of the pressure of the teeth on the seeds. This qualitative change in fiber capture and removal, due to the weakening of the interaction force factor, reduces the formation of a defect such as fiber skin and reduces mechanical damage to seeds.

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