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CHANGE INCREASE WORKER PROSTRANISTV TEETH ON CAPACITY OF THE PROCESS

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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 surfaces teeth saw depending on designs

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

Introduction

Currently, on the world market, cotton fiber is the main natural raw material for the production of textile industry products. According to the International Advisory Committee on Cotton (ICAC), China, the USA, India, Pakistan, Brazil and Uzbekistan occupy a stable leading position in the supply of cotton fiber to the foreign market [1]. The dynamic and stable development of the cotton-cleaning industry, the introduction of modern technological equipment at the enterprises of the industry, increasing the efficiency and rational use of production capacities are the basis for the production of competitive products and sales on the world market.

In the world practice, a large amount of research work is carried out aimed at the development of innovative equipment and technology, providing for the effective use of modern achievements of science and technology, modernization of existing equipment and their introduction into production. In this area, the development and improvement of a complex of technical means for the manufacture of the main parts of the working bodies of cotton processing machines with the greatest efficiency are of particular importance.

Comprehensive measures are being implemented in our republic to develop the cotton industry, upgrade and modernize cotton gin plants, increase the profitability of production and processing of raw cotton, as well as ensure the competitiveness of manufactured products. The Development Action Strategy of the Republic of Uzbekistan for 2017-2021 defines tasks, in particular, to "... increase the competitiveness of the national economy, reduce energy and resource costs, widespread introduction of energy-saving technologies ..." [2]. One of these tasks is the creation and improvement of technical means for the rational manufacture of saw blades of cotton processing machines.

The current stage of scientific and technical progress is characterized by rapid improvement of technical parameters of products, intensification of work processes, increased reliability and resource. Every five to seven years, new generations of machines are created, reflecting the achievements of scientific and technological progress. There is a rapid change of structural materials, new technological processes are being introduced.

Currently, the task is not only to develop the design and technological process, but also to optimize their parameters, including the design of the profile saw.

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

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

For practical work, an engineer needs to develop skills in creating simple and clear models of phenomena and real objects, discarding secondary factors.

If the technical requirements for the product indicate the probability of trouble-free operation P = 0.99, which means that one steel product may fail (on average) during the service life (operation time).

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

$$F = 1 - P$$

Finding the probability of failure or the probability of failure-free operation at the design stage of products is a very difficult task. Currently, the main method of assessing strength reliability is the determination of strength reserves.

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It is essential that the reliability, reliability dependence of structures, including the profile of the chain saw is associated with the definition of service life. In most cases, the service life refers to the operating time of the product under load or loading cycles [1]. New djinn and linter saws (Fig. 1) with a diameter of 320 mm have, respectively, the number of teeth 280 and 330. Saws used in cotton mills that have tooth destruction in the form of abrasive wear, plastic crumpling and breakdowns are cut down to a smaller diameter in the saw repair shop.

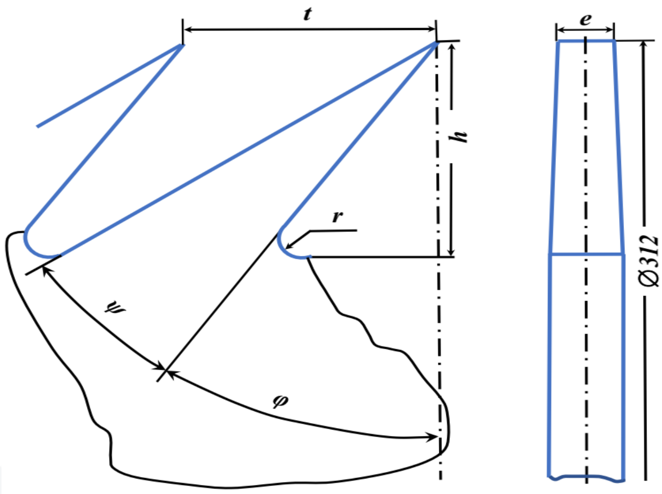
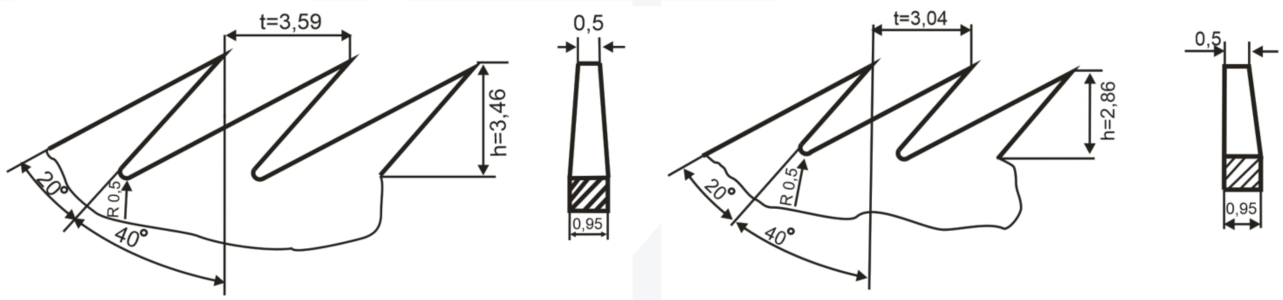


Fig. 1. Diagram of the tooth profile of the genie saw according to GOST 1415-48.

The technical standard provides for 5-fold cutting of teeth (Fig.2) on saw blades with a decreasing diameter: 320, 300, 290, 280, 270 and 260 mm [8]. After working off saws with a diameter of 260 mm on linters to restoration (renovation) they are not subject to and are being scrapped.



a) b)

Рис. 2. Геометрические параметры зубьев пильных дисков для джинов (а) и линтеров (б)

The short overhaul life of the saws (according to the technical regulations, the genie and linter saws must be replaced after 96 and 48 hours, respectively) requires a frequent cutting operation for a smaller diameter, which increases their annual demand of more than one million pieces for the cotton gin industry of Uzbekistan.

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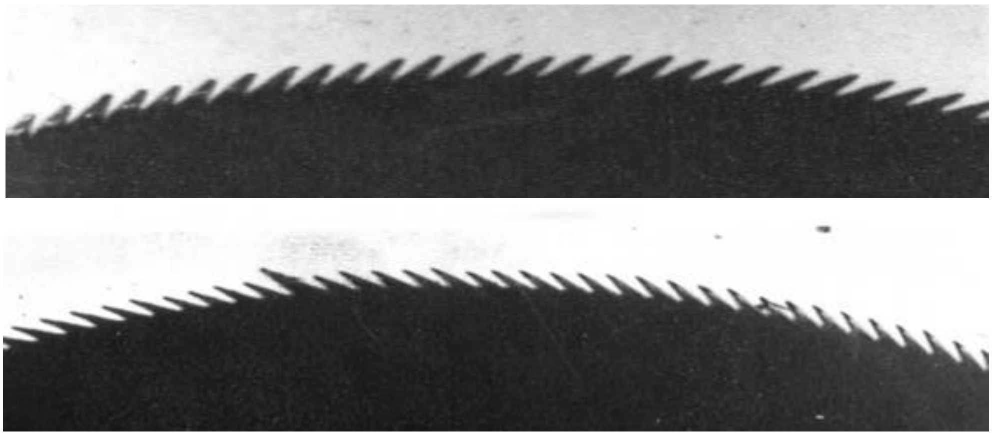

Fig. 3. Fragments of the intended saw blade

The performance of gins and linters, their energy consumption, as well as the quality of products (cotton fiber, lint, seeds) largely depends on the efficiency of the saw repair shops. Operations for the preparation of saws and saw cylinders in the saw repair shop of cotton mills include such types of work as sorting, sharpening, cutting, straightening, calibration and grinding. To perform these operations, the saw repair shop must be equipped with saw cutting machines, saw blades, machines for removing (grinding) chamfers from the teeth of saws. It is necessary to have a sufficient number of cutting tools, a set of gauges and templates for quality control and geometry of saws.

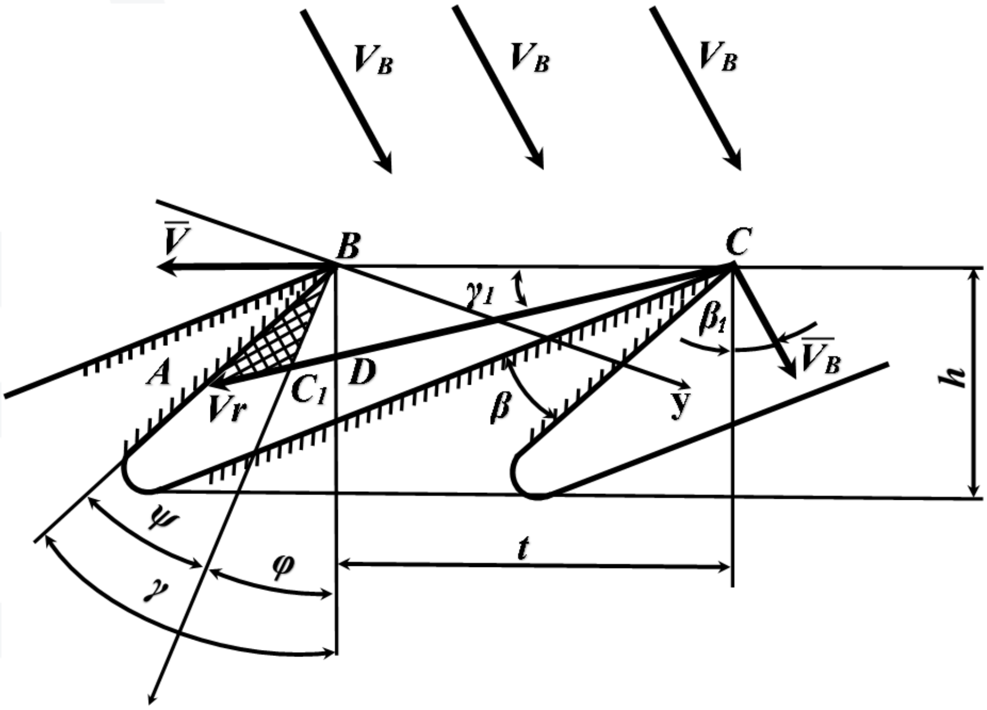

Figure 4. Force acting forces in the process of gining on the working surfaces of existing teeth

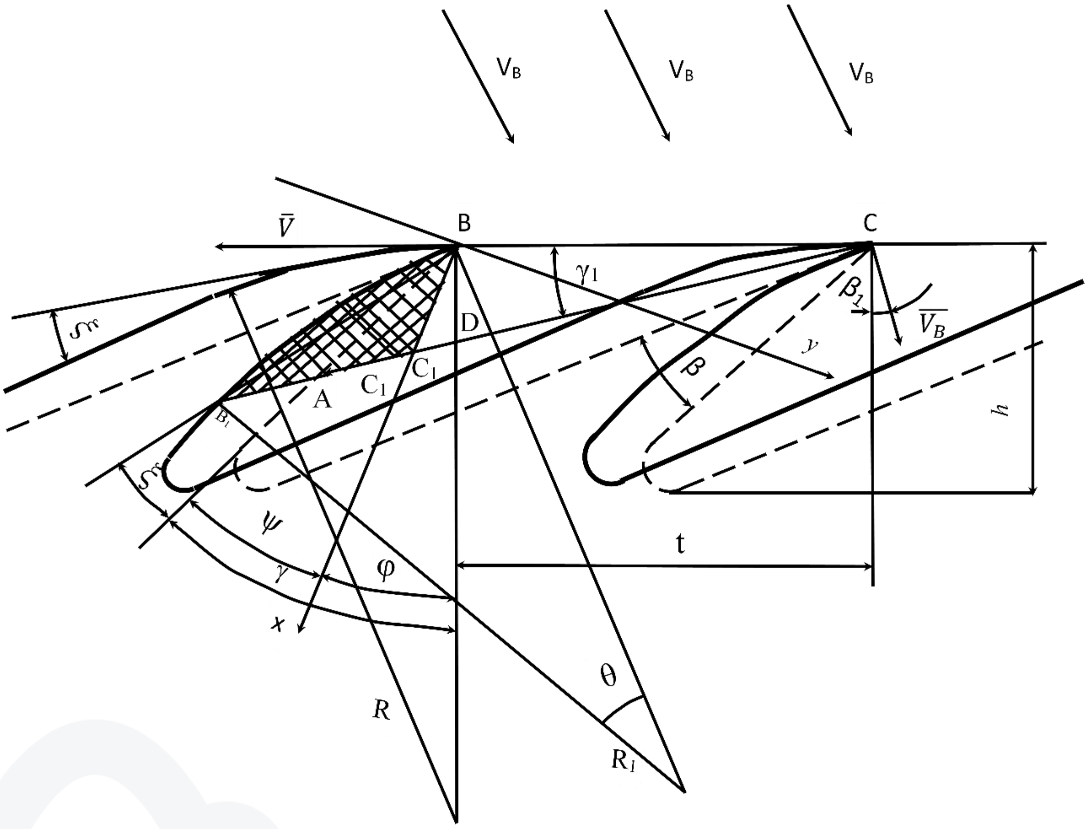

Figure 5. Influence of the influencing forces in the process of gining on the working space of the teeth of the proposed

Based on this model (Fig. 5), which reveals a significant reserve in the possibility of filling tooth cavities with fiber, it seems possible to use saws with a reduced tooth pitch (with their number on the saw more than 280). The use of such saws provides sufficient productivity with a significant weakening of the force factors of interaction, and consequently an increase in fiber quality and a reduction in seed damage.

Conclusions:

- In all the theoretical analyses carried out, in which the saws showed increased gripping ability during bench tests, and maximum performance on full-scale gins, a decrease in fiber quality was simultaneously observed.

The high gripping ability of the teeth and the saw as a whole is accompanied by an increased force effect on the processed product, which is the reason for the decrease in fiber quality and seed damage.

- The saw with the separated teeth was distinguished by the highest performance indicators, and from the point of view of fiber quality, these saws showed the worst result. The operation of such saws caused increased vaporization and, above all, such defects as skin with fiber and mechanical damage to seeds.

- Saws with an increased tooth pitch, that is, with a reduced number of them (less than 280), as well as saws with divorced teeth, provided an increase in productivity and a decrease in fiber quality. However, the decrease in fiber and seed quality was less noticeable.
- Saws with a reduced tooth pitch, that is, with an increased number (more than 280), ensured the productivity of the gining process that meets the requirements of modern cotton gin production, with a noticeable increase in the quality of the fiber and seeds produced. This can be explained by the fact that the potential ability to capture the fibers of the tooth cavities, even with small dimensions, is sufficiently high to ensure gining with high productivity.

At the same time, the use of small teeth leads to the unbundling of the strands of fibers torn from the seeds and an increase in their number, as well as a decrease in the pressure of the teeth on the seeds. Such a qualitative change in the capture and separation of fibers, due to the weakening of the force factor of interaction, leads to a reduction in the formation of such a defect as the skin with fiber and to a decrease in mechanical damage to seeds.

-. The influence of the slope of the front face of the teeth for any values of the pitch of the teeth has a negligible effect and manifests itself to the extent that this slope affects the degree of dismemberment of the fibrous strands torn from the seeds. However, due to the complexity of processing, it is impractical to apply an inclination of the front face of the teeth more than 40 °, and an increase in the working spaces of the teeth significantly affect the quality and productivity of gining. . From the above conclusions, it follows that the improvement of the profiles of the teeth of the djinn saw is to study in depth the force affecting the working part of the teeth in the process of operation and justify the parameters, recommend the best option for the profile of the djinn 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 the genie saw and the establishment of a rational tooth profile. As a result of the research , the following main conclusions were reached:

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

Apply a tooth profile with straight borders and a size corresponding to the profile of the teeth of the Harvnieter gin.

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

2) The saw tooth captures, detaches from the seeds and pulls the fibers behind the grate, and these two phases of the saw tooth affect productivity – the more fibers the saw tooth grabs and tears off the seeds per unit of time, the higher the productivity of the genie.

3) The teretic number of fibers captured by one tooth of a gin saw is equal to:

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

where from:

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

where: P is the productivity of the saw in kg vol. per hour;
p is the number of fibers in 1 gram;
z is the number of teeth on the saw;
n is the number of revolutions of the saw shaft per minute;
is the number of fibers captured by one tooth.
After substitution comes the final formula for the performance of the saw gin:

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

k – coefficient filling of the tooth cavity;
A-is the resultant of all constants;
s-is the area of the tooth cavity.
Based on the above formulas, the productivity does not depend on the cotton grade and is a function of the tooth area, the number of teeth and the number of rotations of the saw shaft (Fig. 5.). It is quite obvious that the size 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. The experiments conducted show that the best result of gining by quantitative and qualitative indicators is obtained when the number of teeth is 280 per 12 saws.

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

2) For better insertion of the tooth with a raw roller, which will contribute to an increase in fiber capture, and therefore productivity, the saw tooth must be sharp.

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