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STUDY OF THE INFLUENCE OF DISCRETE DRUM HEADSET TOOTH PARAMETERS ON FIBERS

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Ushbu maqolada diskret tolalar oqimiga barabancha garniturasi parametrlarini turli qiymatlarida ta’siri tahlil qilingan. Diskretlash jarayonida tolalarga tashqi kuchlar ta’siridagi xarakati o‘rganildi va undagi burchak tezligi va tishlar qadami xisoblandi hamda grafiklari keltirilgan.Diskretlovchi barabancha garniturasi tishlari bilan tolaning tutib turish shartlarini tahlil qilish asosida garnitura arra tishlarining qadamlari aniqlash tenglamalari olingan.. Diskretlovchi barabancha xarakat tezligining o‘zgarishi, tishning old uchlari yuzasiga nisbatan og‘irlik kuchi va markazdan qochma kuchning, ishqalanish koeffitsientiga, arra tishlar tomonidan ushlangan tolalar massasiga bog‘liqlik tenglamalari olingan. Ularning ratsional qiymatlari tavsiya etildi: $\vartheta_1 = 25m/s$; $\vartheta_2 = 30m/s$; $\vartheta_3 = 35m/s$.

Kalit so‘zlari: garnitura, arra tishlari, yigiruv kamerasi, diskretlovchi barabancha, tish qadamlari, ishchi kamera, tishli garnitura, integral.

В данной статье анализируется влияние различных значений параметров барабанной установки на поток дискретных волокон. В ходе дискретизации исследовано движение волокон под действием внешних сил, рассчитаны угловая скорость и шаг зубьев и представлены графики. Уравнения зависимости изменения скорости движения дискретизирующего барабана, силы тяжести и центробежной силы относительно поверхности передних концов зубьев, коэффициента трения и массы волокон, захваченных зубьями пилы были получены. Их рациональные значения были рекомендованы: $\vartheta_1 = 25m/s$; $\vartheta_2 = 30m/s$; $\vartheta_3 = 35m/s$.

Ключевые слова: шестерня, зубья пилы, прядильная камера, дискретизирующий барабан, ступени зубьев, рабочая камера, зубчатый механизм, интегральный.

This paper analyzes the effect of different drum set parameters on the flow of discrete fibers. During discretization, the movement of fibers under the influence of external forces was studied, the angular velocity and pitch of the teeth were calculated, and graphs were presented. Equations for the dependence of changes in the speed of movement of the sampling drum, gravity and centrifugal force relative to the surface of the front ends of the teeth, the coefficient of friction and the mass of fibers captured by the saw teeth were obtained. Their rational values were.

Key words: gear, saw teeth, spinning chamber, sampling drum, tooth stages, working chamber, gear mechanism, integral.

Introduction

One of the main processes in pneumomechanical spinning is the separation of the fiber mass complex into individual fibers using a discretizer. The discretizing drum consists of a feeding table mounted on a condensing funnel [1,2]. The fiber wick passes through this condensing funnel. The table is pressed against the supply cylinder by means of a spring, and as a result, the necessary tension is created to pull the discretizing

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drum. The supply cylinder transfers the pulse to the discretizing drum with a gear set [3,4,5]. Disking drum teeth separate the continuous fiber stream into individual fibers and clean the fibers from waste defects. The fibers coming out of the supply pair are separated from impurities and removed by the teeth of the drum set [6,7,8,9]. When the drum rotates, it carries the dirty waste to the waste separation channel, and the fibers are directed along the transport channel to the working surface of the spinning chamber. In this case, the fiber is oriented and straightened during its movement.

Research Methods and the Received Results

In the discretization process of a pneumomechanical spinning machine, not only the external forces acting on the fibers, but also the parameters of the saw teeth of the set play an important role [10,11,12]. An important task is to analyze the parameters of the saw tooth when transferring the fibers to the working chamber [14].

In turn, ensuring parallel movement of fibers in the working chamber of the discretizing drum of pneumomechanical spinning machines depends on the parameters of the discretizing drum and the step of the gear [15,16] saw tooth and the surfaces between the teeth (Fig. 1). This makes it possible to increase the quality indicator of the thread and improve the quality of the product.

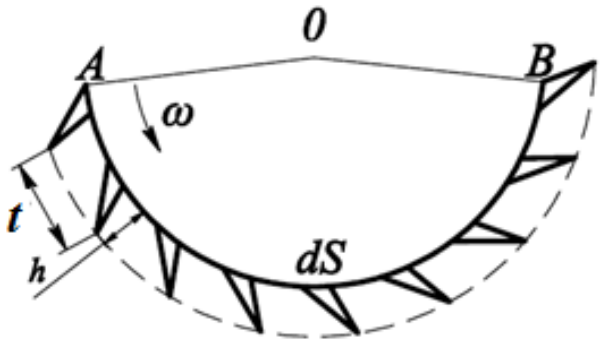

Fig.1. Schematic diagram of fiber size variation between tooth pitches

In the theoretical study, the total surface was analyzed. This surface is the gap between two teeth of a sawtooth gear, and the movement of fibers passing through this surface is studied. The movement flow of fibers on the total surface between the given tooth pitches was analyzed in terms of volume change [17,18]. We derive an equation that depends on the parameters of the sawtooth set, the change of the capacity between the teeth to the spinning chamber over time, that is, the change in the size of the fibers.

$$dV = h \cdot \mathrm{t} \cdot \vartheta \cdot \mathrm{d}\tau \qquad (1)$$

(1) by integrating the expression, we derive the expression of dependence on the surfaces and size of the pitch of the saw teeth

$$V = h \cdot t \cdot \vartheta \cdot \tau + \mathrm{C}_1 \qquad (2)$$

(2) from the expression C_1 we determine the integral constant using the initial condition, that is, we determine the size of the fiber flow when entering the initial discretizing drum.

$$V_{\tau=0} = 0 \Rightarrow \mathrm{C}_1 = 0$$

This is equality (2) we express.

$$V = h \cdot \mathrm{t} \cdot \vartheta \cdot \tau \qquad (3)$$

(3) Analysis of the graphs using the Maple program is presented depending on the variable parameters of the expression. Here h - tooth height, t - tooth pitch, ϑ - linear velocity τ - fiber flow transfer time

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to the spinning chamber, R - discretizing drum radius $dS = \vartheta \cdot d\tau$ - the distance from the spinning process to the spinning chamber $\vartheta = \omega \cdot R$ - linear velocity of fibers in rotational motion. It is necessary to calculate the parameters in exact values to ensure the effect of the discretizing drum of the pneumomechanical spinning machine on the pile and the parallelism of the fiber flow. The graphs of tooth height, pitch, width and thickness of the base depending on the volume of fibers on the surface are presented (Fig. 2).

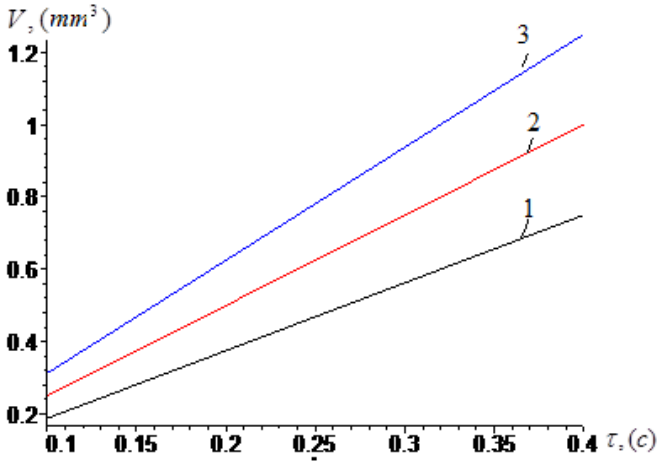

Fig.2. The size of the flow of fibers is different from the pitch of the teeth $t_1 = 2.5mm$; $t_2 = 3.5mm$; $t_3 = 4.5mm$; **time-dependent graph of values.**

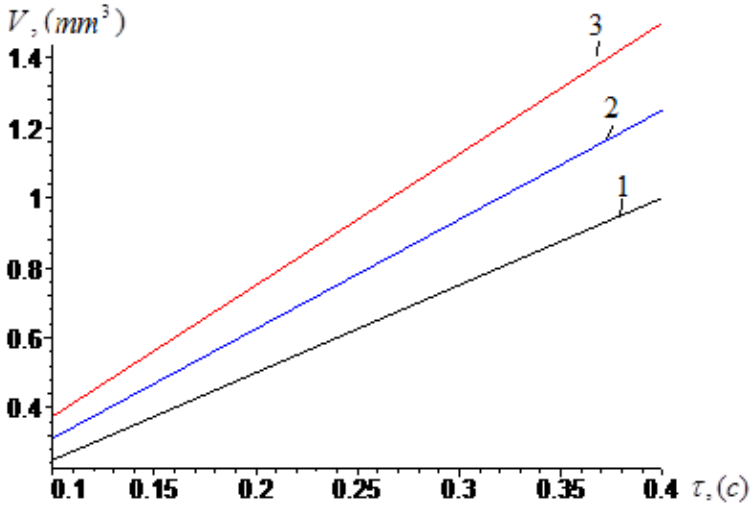

Fig.3. The fiber flow discretizes the size of the drum with different linear speeds $\vartheta_1 = 25m/s$; $\vartheta_2 = 30m/s$; $\vartheta_3 = 35m/s$ **time-dependent graph of values**

Besides (3) The linear speed of the discretizing drum in the expression is analyzed in graphs by determining the expression of the dependence of the surface between the teeth.

$$S = \frac{V \cdot (\varphi - \varphi_0)}{t \cdot \omega \cdot \tau} \qquad (4)$$

(4) From the equation, the dependence of the discretizing drum angular speed on the twist angle and tooth steps during continuous spinning to ensure the parallelism of the fiber flow and transfer to the chamber is presented in the graphs.

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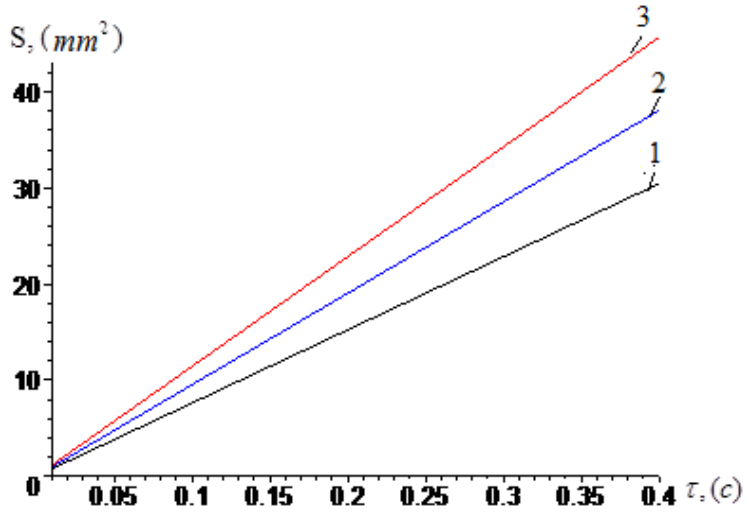

Fig.4. Different frequencies of rotation of fiber flow on the surface $n_1 = 6000\text{min}^{-1}$; $n_2 = 7000\text{min}^{-1}$; $n_3 = 8000\text{min}^{-1}$ to time in values dependence graph.

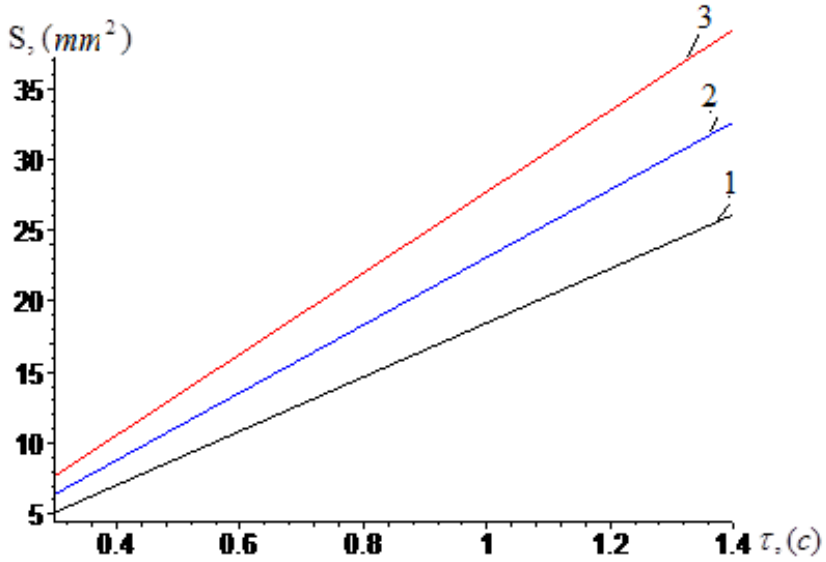

Fig.5. The movement of the fiber flow on the surface is different from the step of the teeth $t_1 = 2.5\,mm$; $t_2 = 3.5\,mm$; $t_3 = 4.5\,mm$ time-dependent graph of values

Conclusion

From the graphs it can be said that the linear velocity of the discretizing drum $\vartheta_2 = 30 m/s$ in the value of the tooth pitch $t_1 = 2.5\,mm$ in the value, the volume capacity of the reading fibers between the tooth steps is given in the exact values of the parameters of the saw tooth set in the transmission to the working chamber. The effect of the defined rational parameters on the fibers in generating a discrete current from the fibers and ensuring uniform transmission of the generated discrete current to the spinning machine is shown in the graphs. The analysis of the surface between the teeth during fiber transfer causes the flow between the teeth to not become denser at the value of the discretizing drum's angular speed, which in turn has a positive effect on the quality indicators of the yarn.

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