



Development of a New Discretization Drum

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ABSTRACT

In this article, based on the research of the discretizing drum of a pneumomechanical spinning machine, the problems of creating a discretizing drum of a new design, which can increase the speed of the discretization process, reduce the degree of breakage of fibres, and effectively clean the skein supplied with fibres from small impurities, are considered.

Keywords:

pneumomechanics, discretization, fibre, damage, fibre, strength, fibre toughness, fibre length, thread, tex, linear density.

Introduction

In recent years, significant changes have been taking place in textile enterprises. New scientifically based technological advances are being made in textile industries around the world. This breakthrough represents a growing collaboration between industrial scientists and engineers. In the following years, scientists are trying to express the appearance of spinning technology in a new way. It is recommended to develop many new spinning systems, such as rotors, to implement high-quality yarn spinning methods with less effort and cost. To reduce the unevenness of the yarn in the method of pneumomechanical spinning at high speeds, the yarn transfer funnel located in the spinning chamber of the BD-330 pneumomechanical spinning machine was installed as a belt, and experimental studies were carried out at different speeds under the same conditions. Based on the results of the

research, graphs of the unevenness of the linear density and breaking strength of the thread are presented. Based on experiments, it has been proven that unevenness caused by the increase in thread tension during pneumomechanical yarn spinning at high speeds can be reduced using a belt element funnel, and it serves to improve the quality of the yarn [1-5].

As a result of these studies carried out by scientists, a certain amount of improvement in the quality indicators was achieved due to the change in the parameters of the thread. It is desirable to carry out research in connection with spinning processes to improve the quality of yarns. In the design of the discretizing drum known to us, a metal sawtooth gear is wound around the cylinder along the screw line. The width of the discretizing drum is 25 mm, depending on the type of garnet, and the method of winding, approximately 10-13 rows

of garnet are needed for winding, and based on the linear density of the thread T , the following number of fibres is calculated (see Table 1): [6-8]

Table 1.

T_{tex}	25	33	50	100
H	0.5	0.8	1.7	5

So, under these conditions, if the fibres are separated into individual fibres in the production of 20-tex yarn, a complex of fibres is formed in the production of 100-tex yarn. The main disadvantage of this construction is the insufficient separation of fibres of different sizes in a discrete drum set [9].

Analysis shows that when a single-ply discrete drum rotates once, the gear tooth makes one contact with the supplied fibre tuft. As a result, complex fibres are separated in the provided pile, and the fibres are sent to the working zone in an incomplete state. The amount of such complex fibres can be reduced by half in the two-thread garnet wrapping method, and even more in the three-thread garnet wrapping method. It is known [10] that an increase in the angle of the set of fibres leads to an increase in the amount of average long fibres and short fibres.

The disadvantage of the multi-threaded garnet winding method is that the efficiency of separating foreign compounds (impurities) from the fibres decreases, and the degree of separation of fibres of different lengths into sufficiently separate fibres is low [12-16].

Discretization speed can be increased by increasing the number of teeth by 2-8 times by densely placing the teeth of the discrete drum set. But such dense sets can be used only for processing medium and small linear density braids with a mass equal to 5 g per 1 m, in other cases it is possible to observe an increase in the level of fibre damage and fibre jamming between the teeth of the set [17].

Discrete drums with a dense set of teeth can be used for processing wicks with a lower linear density and for the production of 50-tex yarn. In this case, it improves the quality of the thread being processed and the processing conditions. No knots are formed in the yarn and the yarn comes out smoothly [18-19].

As can be seen from the data presented above, the effectiveness of the discretization process is characterized by the maximum ability of the teeth of the gear to sink into the fibre strands being processed. V. E. Goncharenko, in turn, notes the need to take into account the condition of the teeth of the set. To increase the efficiency of the discretization process and the separation of dust contained in the fibre, a two-feed discrete drum of a new design was created. The height of the second gear of the discretizing drum in this new design is designed to be 0.3-0.5 mm less than the teeth of the first gear. Also, in order to increase the possibility of hooking individual fibres (for cotton fibres), the angle of inclination of the teeth of the first gear was chosen to be 20°, and the angle of the teeth of the second gear was 17°.

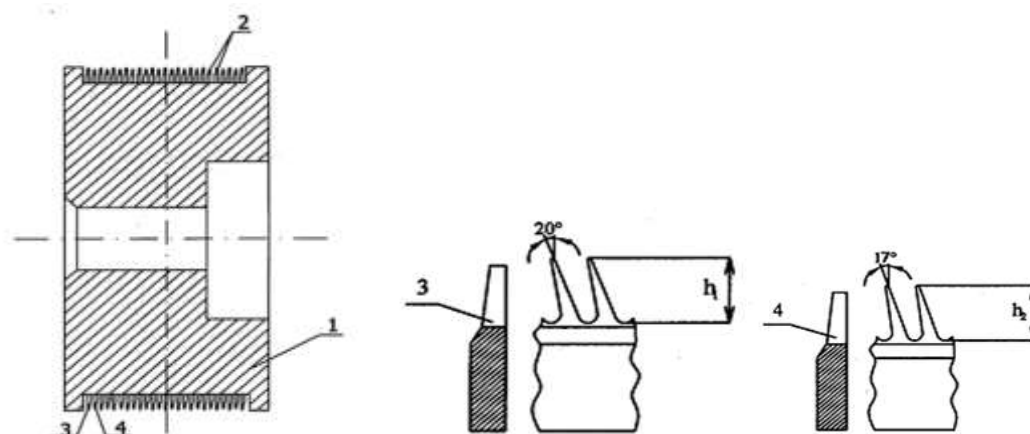


Figure 1. The discretizing drum of the pneumomechanical spinning machine

The discretizing drum of the new design is presented in Fig. 1: 1- general view of the discretizing drum in section; 2- the first and second inputs are structural elements of headsets. The discretizing drum consists of cylinder 1 and a two-tooth gear 2 that is installed on its surface. The height h_1 of the first gear teeth 3 is 0.3-0.5 mm higher than the height of the second gear teeth. Also, the front edge of the first gear set teeth 3 has a slope angle of 200, and the front edge of the second gear set teeth has a slope angle of 170.

The process of extracting fibres from the fibre bundle provided in the discretizing drum of the proposed new design is carried out as follows. The main part of the provided coil is supplied to the working zone of teeth 2 of the discretizing drum 1. To increase the discretization efficiency of the discretization drum and to carry out the discretization process evenly, the discretization drum (1) is a two-feed type, the first feed gear teeth (3), the second feed gear teeth (4) from the height h_2 ($h_1-h_2=0.3 - 0.5\text{mm}$) made higher. Due to the low centrifugal force acting on the short fibres, the short fibres are discretized with the help of the second input gear teeth 4. Fibres with a large value (high length and mass) and centrifugal force (high $h_1>h_2$) are mainly caught by the teeth (3) of the discretizing drum (1). The proposed discretization device allows ensuring the discretization efficiency and uniform passage of fibre products.

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