

## DISCRETIZATION IN PNEUMOMECHANICAL SPINNING MACHINE PROCESS AND ITS EFFECT ON PRODUCT UNEVENNESS

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### Abstract

In this article, the influence of the constructive elements of the discretizing drum on the quality indicators of the product was studied. The prospect of increasing the spinning speed and productivity of pneumomechanical spinning machines is considered to be the main condition of the process of yarn formation, to separate the processes of cooking and winding, and to implement them through separate working bodies.

**Keywords:** headset drum, gear headset, external screwdriver, headset, discretizing drum, discrete device.

### 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 feed table mounted on a condensing funnel. The fiber wick passes through this condensing funnel. The table is pressed against the supply cylinder with the help of a spring, and as a result, the necessary tension is created to pull the discretizing drum.

The feed cylinder conveys the pile to the discretizing drum with a gear set. 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. 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, the fiber itself is oriented and straightened during its movement. Cleaning of fibers from dirty waste directly depends on the design parameters of the waste suction channel of the spinning device.

Disadvantages of the discretization process are that depending on the quality of the roving, the fibers cannot be spun well enough, the fibers are mechanically damaged, their shrinkage is observed, and the spun fibers are separated into waste.

This reduces the quality and strength of the thread. In the spinning industry, discretization drums are mainly used for the discretization process.

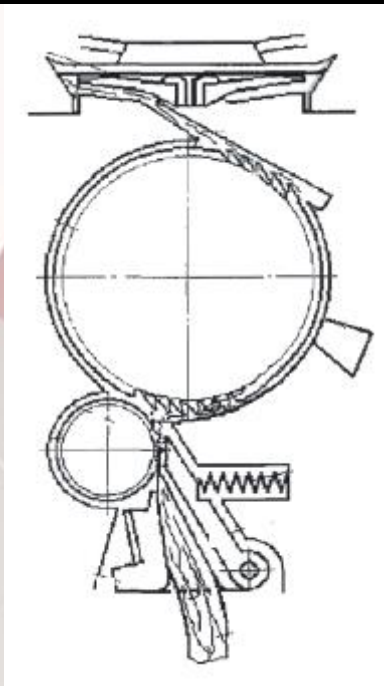


Figure-1. Discrete device

We cut out the teeth of the discretizing drum set depending on the effect on the fiber bundle. According to research [1], if the distance from the compression line of the fiber skein to the entry of the teeth of the discretizing drum set is equal to  $1/4$  of the length of the processed fiber, the break is not observed.

The depth of immersion of the teeth of the set depends on the profile of the surface holding the fiber pile. This surface profile is eccentric to the surface of the pick-up drum, allowing the squeegee to increase its size under the belt force and at the same time reduce the impact of the pick-up drum gear teeth.

The use of profiles with such a protective surface allows combing the fiber bundle along its entire length. This, in turn, increases the possibility of cleaning headsets[2,3].

Ashnin N.M. [4] noted in their work that the fiber properties depend on the parameters of the headset. He found that there is a correlation between the parameters of the headset and the properties of the fiber. The most important of them are tooth density, pitch and angle of inclination.

In the opinion of the author, it is recommended to increase the tooth density and the angle of inclination in order for the fibers to get better. Sevostyanov A.G. It is noted that the degree of thinning and thinning of the fiber product plays an important role in the structure of the yarn and the alignment of the fibers.

Inadequate fiber penetration into the rotor shaft causes damage to the fiber pile and its structure.

In the researches of German scientists Gerd, Peuter [5], from the discretization process of pneumomechanical spinning machines, it became known that with increasing discretizing

drum speed from 5000 to 9000 rpm, the force acting on the fiber does not change in practice, but changes with increasing the height of the set and changing the angle of inclination from negative to positive.

That is, it can be added that as the speed of the discretizing drum increases, there is an increase in waste collected in the chamber. Contamination of the chamber leads to a decrease in thread strength and an increase in fluffiness. The tips of the teeth are beveled so that the teeth of the set can sink well into the fiber bundle.

Depending on the conditions of operation and preparation of the gaskets, there will be areas on the tips of the teeth that create conditions for the reaction created by the fiber product.

In his research, Stahlecker [6] states that it is desirable to use discretizing drums with a high number of teeth when processing yarns of medium linear density. In this case, unevenness in the thread is reduced. This is explained by the flat arrangement of fibers on the surface of the drum.

It can be concluded from the above-mentioned researches that in the analysis of the headsets, it is positive to study them together with fiber properties (for example, fiber length, front edge angle, tooth pitch, etc.).

Merkulova T.A. In the studies of [7,8], in the more accurate assessment of the technological characteristics of headsets, the percentage of mixing was considered high. In order to constantly improve mechanisms and units of pneumatic spinning machines, to increase their speed modes, taking into account the used fiber and the range of products obtained from it, leading companies in the world are designing new types of sets.

The authors studied the effect of additional wetting of fibrous materials during pneumomechanical spinning. Wetting the fibers in the supply zone has a significant effect on the orientation and alignment of the fibers, improving the appearance of the yarns and increasing their strength. [9] in the work, the author recommended the transfer of saturated steam through an ellipse-shaped hole instead of moist air. With increasing humidity, the tensile strength and elongation of cotton increases. In addition, the force of friction between the fibers also increases. The disadvantage of this method is that the cleaning and cleaning efficiency is reduced in wet fibers, and it can be added that excessive moisture can cause rusting of the gaskets. This can lead to a decrease in the quality of the product.

The author [10] recommended the device for strengthening the coil and connecting the coil to eliminate the causes of disruption of technological processes in the supply zone. From the analysis, it became clear that it is recommended to study microprocesses at the discretization node.

Now let's look at some of the world's work on improving the discretization zone. German scientists have recommended a cylindrical roller with a gear set rotating parallel to the discretizing drum in a pneumomechanical spinning device.



This bundle placed the individual fibers in the path of travel, and it served to transfer the fibers into the transport channel in an optimal orientation. The rotation speed of the roller is greater than the rotation speed of the discretizing drum and the speed of movement of fibers with air [11].

In order to improve the orientation, straightening, and parallelization of similar fibers, the authors recommended installing two additional combing segments in the discretization zone. The problem of removing short fibers, dust and impurities during the discretization process was covered in, and it was solved as follows in the pneumatic spinning machine. The discretizing drum is made porous, with holes for air to pass through the walls of the cylinder. A cleaning device is installed inside the drum, which contains a pipe for suction and compressed air transmission. Therefore, the transmission pipe is placed in front of the suction pipe in the direction of rotation of the drum. The Schlafhorst firm recommended the use of aerodynamic effects in fiber braiding.

Some foreign machine tools use shafts with rings as discretizing drum. Saw tape, needles and x.l. installed.

Another discretizing drum design. The cylindrical surface of the needle is mounted on the roller body. The roller is embedded in a cylindrical surface and can move relative to it.

As a result, the angle of inclination of the needles changes. In the process of screw action of the drum, short fibers can accumulate on its working surface, reducing the quality of the thread. German scientists proposed the following construction for collecting the separated fibers from the surface of the saw blade. It is a porous discretizing drum with an internal volume and ducts connected to a source of compressed air. These channels are placed between the needles in the radial direction inside the roller.

Some designers recommend moving the discretizing drum through a belt drive in a pneumomechanical spinning machine by a separate motor. Due to this, it is observed that if the rollers are used separately, the rollers will not work smoothly.

1)The efficiency of the discretization process of the pneumomechanical spinning machine depends on the influence of a large number of factors. According to they can be qualified as follows.

- 1.Raw material - impact of raw material on product discretization.
2. Effect of technological processes and their elements
3. Technical - these include the condition of the machine's working bodies and the quality of their preparation.

One of the main properties of fiber is length and thickness. The discretization process is seriously affected by the lengthwise unevenness of the fibers. In this case, short fibers reduce the unevenness of the pile, which reduces the instability of the flow of fibers from the spinning rotor. A large amount of bent fibers in the supply product will have a bad effect on the quality of the yarn.

Fibers of different thinness do not greatly affect the discretization process, if there is a difference in the fiber structure, the fibers will have enough roughness when they pass to the spinning rotor.

Technological factors depend on the condition of the machine and the type of service provided to it. Obtaining high-quality thread depends in many ways on the right selection of accessories for the discretizing drum.

The main parameters of the gears include height, tooth height, base thickness, tooth pitch, angle of inclination of the working edge, tooth tip width, tooth width and thickness. The correct selection of accessories should be made in such a way that it is necessary to take into account the properties of the raw materials to be processed and the specifications of the next technological process in the weaving, finishing, sewing or knitting industry.

The discretization process is greatly influenced by the correct adjustment of the working bodies at the discretization node. These include the optimal selection of the spacing of distribution boards, voltage and speed modes. With an increase in the frequency of rotation, the separation of fibers from the sets, the transport of fibers improves, at the same time, the durability of the thread and the service life of the set bearings are reduced.

At the same time, energy consumption increases. The frequency of rotation affects the length of the fiber and the linear density of the yarn. Usually, when processing yarns with low linear density, the discretizing drum is selected with a low frequency of revolutions. When processing short fibers, it is recommended to choose a high rotation frequency.

## Conclusions

In pneumomechanical spinning machines, it is important to choose the density and configuration of discretizing drum set teeth correctly, but this is not a sufficient condition for obtaining quality yarn. In addition to the above, the condition and quality of the working parts of the machine greatly affects the quality of the thread.

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