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Experimental Study of Motion Modes of Discrete Drum with Different Input

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Annotation: The article presents an analysis of the dynamics of interaction of a single fiber with the sampling drum of a headset during pnevmomechanical spinning. The regularity is investigated and the equation of the movement of fibers on the surface of the tooth of the sampling drum headset is obtained. It was found that the dependences of the movement of fibers along the tooth at different angles of inclination, the distribution of fiber tension along the arc, and the distribution of fiber speeds in the region of the sampling arc have an increase property. As a result of the analysis of the tension and speed of the fibers, it was found that with the increase in the sampling zone, the tension force and speed of the fiber increase.

Keywords: Fibers, Sampling, Angle, Friction Force, Friction, Speed, Radius, Fiber Complex

A number of experimental studies have been conducted on discretization devices of spinning machines [1]. However, studies on the alternative and justification of one-, two- and three-feed discretizing drums and their speed regimes for complex fibers have not been conducted. It should be noted that in the previous studies, the speed of the discretizing drum was assumed to be constant in the case of no load.

Therefore, our experimental studies are aimed at determining the following:

- laws of movement in different modes of the discretizing drum;
- comparison of speed modes of discretizing drum in different number of inputs;
- studying the loading of one, two and three input discretizing drums.

We have developed an experiment methodology to solve the above research problems. Increasing the speed of the discretization drum leads to an increase in the discretization efficiency. However, at the same time, the change in speed can have a negative effect on the quality indicators of the fiber during the fiber separation process. In addition, with the increase in productivity, the loading of the discretization drum increases to a certain extent [2].

a b

Figure 1 is a general view of the device that studies the load level of the discretization drum
a- front view, b- side view

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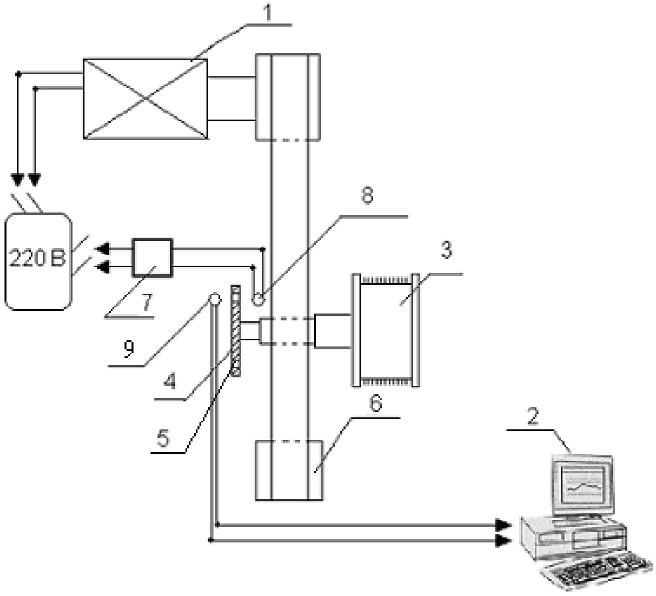

Figure 2. Scheme of operation of the device for measuring the discretizing drum speed using an optical sensor

1- Electric motor
2- Computer
3- Discretizing drum
4- Disc
5- Holes
6- tension roller
7- Power unit
8- LED
9- Photocell

In conducting experiments, an optical sensor was used to study and determine different speed regimes of a discrete drum.

A special program was developed that electronically records the changes in the discretizing drum speed. To study modes of interaction of the discretization drum with fibers, a special stand installed in the educational and production laboratory of the Department of "Spinning Technology" of TTESI was developed. An overview of this device is shown in Figure 1. The device includes an electric motor, drive and driven pulleys, a drive belt, a discrete drum, and a drive shaft from the drive belt [3].

The installation scheme of the device with an optical sensor is presented in Fig. 2. As can be seen from this figure 2, the electric motor 1 is powered by 220V current, the rotary motion from the electric motor 1 is transmitted through the drive 61 and the drive pulleys 6, the belt passes through the shafts of the discretizing drum 3. A disk 5 with a special hole is installed on the shaft of the discretization drum, a photocell 9 is installed opposite it, and a light-emitting diode 8 is installed on its front side. The optical sensor works as follows [48, 49]. It is well known that optical sensors are designed in such a way that they have an internal resistance, the loss of which resistance causes the sensor to signal. The internal resistance of the sensor is quenched by trapping light [4]. This process is called light modulation. When direct light hits the optical sensor, the internal resistance of the sensor decreases and the sensor captures the light by emitting a signal. That is, the sensor captures each modulation and sends a signal to the computer with the help of a special program [5,6,7].

A disk 5 with special holes 4 was used to obtain light modulation. A light source of 8 light-emitting diodes is installed on one side of the disc. An optical sensor 9 is installed on the other side of the disk 4. At each point of intersection of the light rays with the hole 5, the light modulation detected by the optical sensor-photoelement 9 is obtained. The number of holes 4 in the disc 5 is counted and set by the computer program, which in turn processes the data when receiving the signals, takes into account the number of holes in the disc 5, and thus gives readings at each moment of time. The signals provided by the sensor 9 are transmitted to the computer 2, from which data is obtained in the form of graphs. Using the resulting graphs, it is possible to

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determine the rotational speed values of the discretization drum 3 in different operating modes. Experiments were conducted in one-, two- and three-pass versions of the discretization drum in load and unloaded operating modes. For the reliability of the obtained results, the speed of the discretization drum was measured using a stradaboscope measuring tool. The same results were obtained when comparing the velocities obtained with the stradaboscope and the optical sensor to the discretizing drum unloaded condition. It should be noted that the various vibrations and noises that occur do not affect the accuracy of the optical type sensor [8,9,10,11,12,13]

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