IMPROVING PRODUCT QUALITY BY IMPROVING THE WORKING BODY OF THE SPINNING MACHINE

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It is important to have a high level of competition in the world market of yarn and fabrics, modern advanced technologies, the creation of equipment that allows rapid change in quality and quantity of textiles, the need for high quality and competitive products and further improve the quality of textiles. At present, 24-25 million tons of cotton fibre are produced annually worldwide. In developed countries, such as the United States, Japan, Germany, Italy, and China, some progress has been made in the production of yarns with high quality and physical and mechanical properties, which increase the efficiency of the textile industry production of new resource-saving equipment,

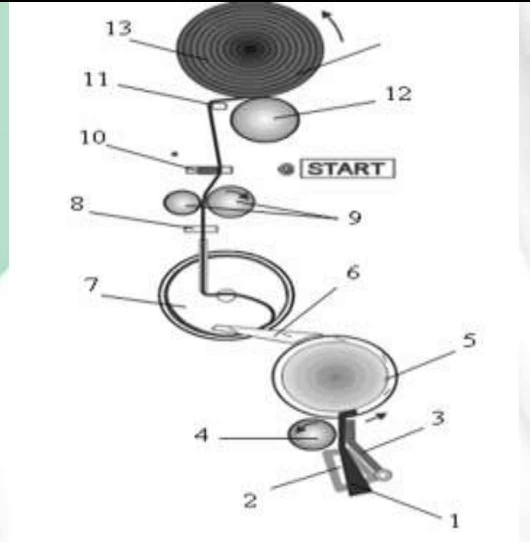
In the new development strategy of Uzbekistan for 2022-2026, in particular, "Continuing the industrial policy aimed at ensuring the stability of the national economy and increasing the share of industry in GDP, increases industrial production by 1.4 times ....." [1]. Important tasks such as In fulfilling these tasks, it is important to double the output of the textile industry.

The production of high-quality competitive products based on the use of high, cost-effective technologies is also the most important task of the textile industry. The quality of textile products largely depends on the smoothness, cleanliness and durability of the yarn. This goal can be achieved through the introduction and use of modern equipment operating based on more advanced technological principles [2].

In recent years, one of the most common methods among spinning methods is the pneumomechanical method. In many countries, the share of pneumomechanical spinning is 70-80%. Pneumomechanical spinning yarns are used in the production of shirt fabrics, tarpaulins, knitwear, footwear and furniture fabrics, etc.

The ability to use yarn produced by pneumomechanical spinning depends on the properties of this yarn, which allows it to be successfully processed and provides good consumer properties of the products made from it. One of the conditions for obtaining high-quality yarn is the continuous and even supply of sufficiently separated parallel fibres to the spinning chamber, the efficiency of the sampling process and the separation of fine impurities from the spinning chamber.

Improvements in pneumomechanical spinning technology continue to this day all over the world, which serves to create a new generation of spinning machines. It is also important to modernize and improve the individual components and working bodies of the machine, the cost of the modernization process is several times cheaper than the cost of purchasing modern equipment. Our research aims to improve product quality by improving the working body of a pneumatic mechanical spinning machine. Pneumomechanical spinning machines are two-way and consist of the following main working parts: supply node, discrete drum, spinning chamber, thread pulling and winding mechanism.



1 - Supplied wicker;
2 – densifier;
3 - supply table;
4 - the supply cylinder;
5 - Discrete drum;
6- confuzor (transport channel);
7 - Spinning chamber;
8 - Yarn quality control sensor
9 - Traction shafts.
10 - thread breakage sensor;
11 - Yarn rope;
12-packing shaft;
13- Bobina;

Figure 1. Technological scheme of pneumomechanical spinning machine

In a pneumomechanical spinning machine, the yarn is baked in a spinning chamber. The conical inner surface of the spinning chamber is so smooth that the fibres gradually slide to the surface of the groove under the influence of centrifugal force on this surface and accumulate in it. Fibres enter the chamber under the influence of air.

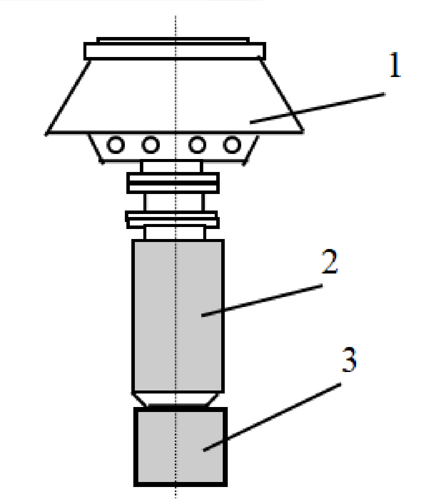


Figure 2. Pneumomechanical spinning chamber

Regardless of the shape of the spinning chamber and its rotational speeds, cooking occurs uniformly. It should be noted that in the spinning chamber there are two technological processes - cyclic addition and cooking.
The production of quality competitive products based on the use of high, cost-effective technologies is also the most important task of the textile industry. The quality of textile products largely depends on the smoothness, purity and strength of the yarn. This goal can be achieved through the introduction and use of modern equipment based on more advanced technological principles [3].
The large number of factors influencing the quality of yarns obtained from pneumomechanical spinning machines indicates that this process is a complex technological process. Nowadays, among the quality indicators of yarn, its purity is one of the main quality indicators. Among the main factors affecting the quality of yarn in a pneumomechanical spinning machine, we can also include the working and technological parameters of its suction pipe.
The pneumomechanical spinning machine waste suction pipe will consist of a multi-sided metal pipe that does not change along the cross-section along the entire length of the machine. This is at the end of the machine

where the waste is attached to the collection cabinet. However, each spinning device of the multi-sided waste pipe machine has holes for connecting the waste separating glass pipes with the waste suction pipe. The exhaust pipe is connected to a central fan to create a flow of exhaust air.

It is known that waste has a negative impact on the properties of the yarn and its ability to be processed in later stages [4].

The above-mentioned waste suction pipeline design has the following shortcomings [5]:

as the number of sections of the machine increases (up to 20 sections) [6], the amount of waste also increases, resulting in a decrease in the vacuum for transporting the waste. That is, as the amount of waste increases, their resistance to transportation also increases, and at the same time leads to a decrease in energy consumption, which leads to a decrease in airflow;

as a result of a decrease in the efficiency of waste suction, a deterioration in the quality of the yarn is observed. This situation is explained by a decrease in the transport of waste, especially in the last sections of the machine, as a result of a decrease in the suction airflow (vacuum).

Based on scientific research, the possibilities of increasing the efficiency of waste transportation in the waste pipeline by ensuring the uniformity of the vacuum (suction) level along the entire length of the waste pipeline have been studied. To solve this problem, a versatile waste suction pipe design in the shape of a truncated pyramid is proposed. The beginning of this new structural section is (2 ÷ 2.5)% larger than its end [7,8].

This new design is shown in the first figure, which shows the general view of the 1st suction pipe and the views of the 2-AA section.

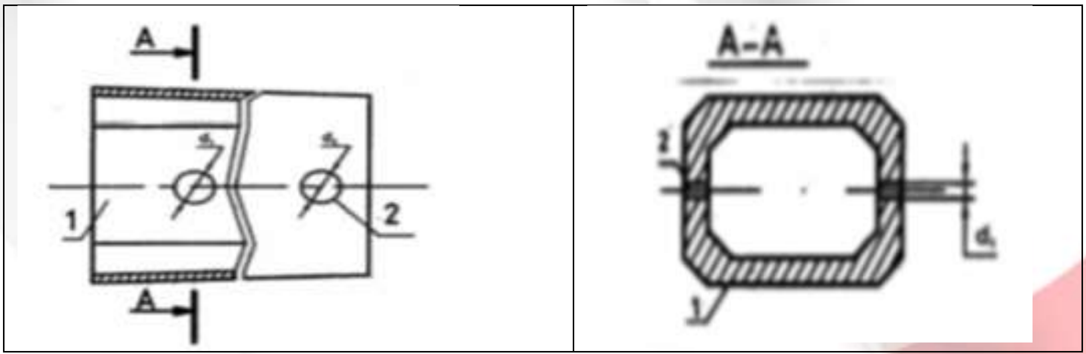


Figure 3. View on the 2-AA section of the suction pipe in a pneumomechanical spinning machine

The waste suction pipe is made of a polygonal (hexagonal), variable cross-section in the form of a truncated pyramid with holes in the two side walls. In the proposed new structure, waste transportation is carried out as follows.

The waste separated from the fibrous mass is delivered to the waste pipe by means of pipe 1 (shown in the drawing), through a hole 2 located in the side walls of the waste pipe, and by means of an air stream to the waste collection cabinet.

The waste suction pipe is also made with a variable cross-section

$$\frac{S_1 - S_2}{S_1} \cdot 100\% = 2.0 - 2.5\%$$

Here, S1 is the cross-sectional area of the starting section of the suction pipe section, and S2 is the cross-sectional area of the end section of the exhaust pipe section. Thus, it is possible to ensure that the airflow remains variable along the entire length of the section. This condition ensures that the spinning machine draws uniformly from all 16 holes of the two sections of the waste suction pipe 1. Studies have shown that the exhaust suction stroke decreases by 1.8 ÷ 2.8% (the pressure created by the fan varies from 980 to 1030 Pa).

In addition, the holes of the waste suction pipe 1 were made in 2 different diameters.

$$\frac{d_1 - d_2}{d_1} \cdot 100\% = 2.0 \div 2.5\%$$

Here, d1 is the diameter of the hole at the beginning of the section of the suction pipe; d2 is the diameter of the hole at the end of the section.
Thus, the same airflow is provided to the waste pipe through all the holes 2 along the entire length of the waste pipe 1.

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