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TECHNOLOGY OF PRODUCTION OF WOOL - SILK YARN

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Abstract

The article proposes a new method for producing wool-silk yarn, consisting in obtaining bicomponent yarn from wool fibers and fibrous waste of natural silk - silk spinning tow. This allows to expand the range of mixed yarn, improve its breaking characteristics, quality indicators and consumer properties, and also effectively use silk waste. The proposed method shows a technological scheme and equipment for the production of wool-silk yarn.

Key words

process, mixing, carding, roving, tape, fibers, silk yarn, wool, bicomponent.

The main directions of economic and social development of Uzbekistan define the tasks that are set for the textile industry: the essence of which is, first of all, increasing the processing of raw materials to finished, competitive products; improving their finishing; expanding the use of waste-free technology based on the use of automation and modern information technology.

To solve these problems, it is necessary to implement a set of measures to improve existing equipment and technology, develop and implement fundamentally new methods that will significantly expand the range of manufactured products.

Technological processes for preparing various components of raw materials for mixing, mixing and carding are the initial links in the complex process of preparing wool and mixed yarn [1].

These processes determine such important technological indicators of the quality of semi-finished products as uniformity in composition and arrangement of the fibers forming the roving or carding sliver, preservation of their original length and strength, effective cleaning from debris and dust, and other indicators that affect subsequent processes of yarn preparation and determine the properties of the resulting product.

Wool spinning can be performed by combed (worsted), semi-combed, and machine (cloth) methods. Before spinning, in addition to the usual operations, wool

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can be washed, dyed, and carbonized. Combed spinning of wool is used to obtain the finest, smoothest, and densest yarn. For this spinning method, the longest (55-120 mm) and, accordingly, somewhat longer chemical fibers are used. The principle of combed carding of wool is in many ways similar to the principle of combed carding of cotton [2-4].

Combed yarn is often subjected to twisting in two folds. The degree of compression of fibers in combed (especially twisted) yarn is the highest, which gives it the appropriate rigidity, leads to a decrease in pores between fibers, etc. The machine method produces woolen yarn, which is characterized by looseness, softness, has a large unevenness, internal porosity. This yarn is rarely subjected to twisting. For spinning by the machine method, wool and chemical fibers of shorter length are used than in combed spinning, but the wool may be of different thicknesses.

In this regard, a distinction is made between the production of fine wool yarn (from fine wool) and coarse wool yarn (from coarse wool). When producing wool yarn, carding is used on three carding machines, which together are called an apparatus. On the first of these machines, the fibers are combed, straightened, partially parallelized and cleaned of impurities. On the second machine, the same process occurs, but greater alignment of the tapes is achieved. On the third machine, called the roving machine, the wool is combed, and the resulting layer of wadding is divided into narrow ribbons, which are fed into twisting sleeves, stretched somewhat and twisted into loose roving. The resulting roving is fed to spinning machines. The yarn produced by this method is significantly thicker than the yarn produced by the combed method of spinning [5-8].

Semi-combed spinning of wool is used for semi-coarse and semi-fine wool of large but uneven length (with a high content of short fibers). Combed combing in this case turns out to be irrational and the fiber is subjected only to carded combing.

In its properties, semi-combed yarn occupies an intermediate position between combed and machine-spun yarn. Semi-combed spinning is used much less often than other methods of spinning wool. The composition of mixtures for combed yarn is of great importance.

Depending on the type of raw material, the spinning system (fine-combed or coarse-combed), and the purpose of the yarn, the following rules should be followed when preparing a mixture for the production of combed yarn [9-11]:

- short, defective and weak wool is not allowed;

- fine wool from 60K and above (fiber length not less than 55 mm), semi-fine 56-58K (fiber length 55-90 mm) should be used for blends in the fine-combed spinning system;

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- for combed yarn, the blend should include normal wool, the fibers of which have a low linear density and good uniformity in length;

- for high-quality yarn, it is permissible to mix merino wool of related qualities, mixing with cross-bred wool of the same qualities is permissible only in the production of semi-woolen yarn of medium and high linear density;

- in all processes during the processing of raw materials before mixing, in carding and after it, it is necessary to achieve the least damage to the fibers - preserving their length.

The work deeply explores the properties of wool and silk fibers, which made it possible to use the combed method of yarn production taking into account the specified requirements. A new method of producing wool-silk yarn is proposed, and a patent № JAP 04949 has been received for its novelty [12-14].

A new method for producing wool-silk yarn is proposed, consisting in obtaining bicomponent yarn from wool fibers and fibrous waste of natural silk - silk weaving tow, which allows to expand the range of mixed yarn, improve its breaking characteristics, quality indicators and consumer properties, and also effectively use silk waste. The essence of the proposed mixing method is to mix each component inside itself and to evenly distribute the fibers of each component throughout the mixture. As a result, the composition of the mixture becomes more uniform - each (even small) sample of the mixture will contain fibers of all components and, moreover, in a proportion corresponding to the recipe of the mixture. Such distribution is achieved as a result of mutual mixing of particles of individual components. When using the proposed method for obtaining bicomponent yarn from mixed fibers, the most homogeneous mass of the finished mixture is created, then by alternating layers of wool and silk fibers, a flooring is formed. After this, their final mixing is carried out using the combed wool spinning system in the following proportions: wool fiber 55-75% and silk fiber 25-45%. In this case, yarn with a linear density of 30-40 tex is formed from the mixed fibers.

For mixing, worsted wool fiber and fibrous waste of natural silk are used - silk spinning tow or silk mass (after sericin boiling), obtained by uncontrolled unwinding of the linear density of threads from defective cocoons. They are stored in separate warehouses. To create the most homogeneous mass of the finished mixture, a flooring is formed by alternating layers of wool and silk fiber, which makes it possible to obtain bicomponent wool-silk yarn on standard equipment using the combed system of wool-spinning production and to develop a new range of mixed yarn with high strength and with an external silky effect - shine. The technological scheme and equipment for the production of wool-silk yarn according to the proposed method are shown in the diagram.

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In the production conditions of Kosonsoy Tokimachi LLC, a new method was tested and a batch of wool-silk yarn with a linear density of 30 tex, containing 70% wool and 30% silk - fiber with breaking characteristics: relative breaking load – 18,8 (theoretical 19) cN/tex, breaking elongation - 23,9%. Samples of fabrics from the new range of wool-silk yarn were produced. Conclusions. Based on theoretical and experimental research and evaluation of the quality of fibers in the mixture, mixing methods and a method for producing wool - silk yarn were developed. Patent No. IAP 04949 was received for the novelty of the method.

A pilot batch of wool-silk yarn with a linear density of 30 tex with a relative breaking load of 18,8 cN/tex (theoretically 19 cN/tex), breaking elongation of 23,9% was produced. A sample of wool-silk fabric with a surface density of 145 g/m 2 was obtained.

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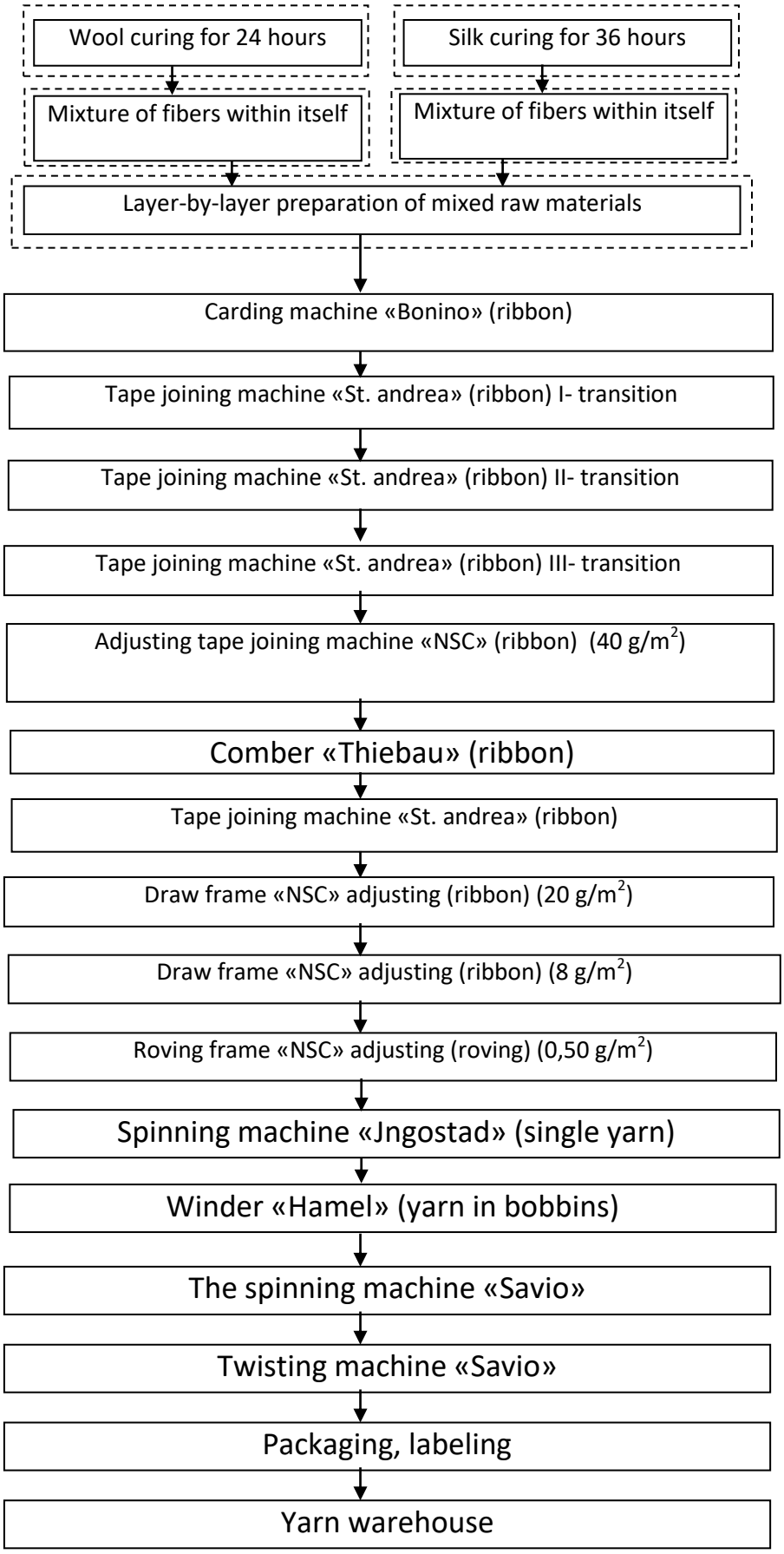

Scheme. Technological scheme and equipment for the production of wool-silk yarn.

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