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Producing Yarn from Mixed Fibers

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ABSTRACT: This article describes a method for producing a multicomponent yarn from blended fibers through an experimental study of the rational formation of the preparation of raw materials, i.e. blended flooring providing a technical result, consisting in expanding the range of blended yarns, improving breaking characteristics, quality and consumer properties, with the effective use of wool fibers with fibrous waste of natural silk and synthetic polyester fiber.

KEYWORDS: Cocoons, fibers, silk, wool, polyester, spinning.

I. INTRODUCTION

All over the world, the technology for the production of composite materials is developing more and more. The properties of natural and chemical fibers complement each other, which makes it possible to obtain high quality products from their mixtures. Graft copolymerization, as a way to change the properties of natural polymers, has been successfully used by researchers for a long time[1-3].

The production of bicomponent yarns from blended fibers involves mixing natural fibers and obtaining yarns with a linear density of 20 tex. As natural fibers, worsted woolen fiber and unstapled silk spinning are used, which are mixed by forming a flooring by alternating layers of wool and silk fibers, and using a combed system of wool spinning technology, yarn is formed with a linear density of more than 15 tex, while the fibers are taken at the following ratio, wt. %: wool fiber 55-75% silk spinning 25-45[4].

This work presents the results of electron microscopic images of defective cocoons, single unwinding and the exit of cocoon filaments. Cocoons are not cut, they are spun on the MRO machine in the form of a silk mass without control of the linear density of the silk, and it is used only as a raw material for spinning silk [5].

Methods of effective use of fibrous silk waste, production of bicomponent yarn, properties of cotton and types of fibrous silk waste for the production of bicomponent yarn are presented. It is shown that the fibrous waste of silk has plastic and elastic deformation, tensile elongation and strength higher than that of cotton. Confirmed that physical and mechanical properties obtained from bicomponent materials are higher than cotton materials[6].

II. METHODOLOGY

In this work, the state of development of nanotechnology of textiles and schemes of the multilevel structure of the structure of natural fibers are given. The results of research at the nanoscale of fibers, as well as the system of "self-assembly" of fiber particles and dyes in the process of obtaining a stable multi-colored material color are indicated [7].

The state and development of the nanoindustry in textile technology are given. Results of an experimental study on the modification of synthetic fiber with a nanoparticle of natural silk and the effectiveness of using medical silk gauze. And also, improving the hygienic properties of synthetic threads by modifying them with natural silk nanoparticles. Methods for producing nanoparticles from fibrous waste of natural silk are disclosed, as well as methods for producing modified fiber nitron[8].

A method of producing a multicomponent yarn from mixed fibers by means of an experimental study of the rational formation of raw material preparation, i.e. blended flooring providing a technical result, consisting in expanding the range of blended yarns, improving breaking characteristics, quality and consumer properties, with the effective use of wool fibers with fibrous waste of natural silk and synthetic polyester fiber.

This technical result in a method for producing a multicomponent yarn from three types of mixed fibers is achieved: first, a layer-by-layer rational three-component flooring (rice) of fibrous material is formed in the mixing chamber, then the selection of the flooring is carried out vertically, accompanied by mixing the selected pieces of fibrous material with each other. In this regard, the operation of the mixing machine must be organized periodically.

It is important to substantiate the composition of the fibers in the blend. Our experimental studies have shown that when increasing in the composition of chemical fibers in the technological process, it creates a high electrification. An increase in the proportion of silk fibers significantly increases the cost of yarn. During an experimental study with the composition of the flooring the following percentage:

Wool fiber - 40

Polyester fiber - 40

Silk fiber - 20

In the transitions of the technological process, due to the increase in polyester, electrification was observed, and with an increase in the proportion of polyester to 50%, the fibers began to repel each other, and the electrification of the mixture became more frequent. The normal technological process proceeded with the composition of the mixture of fibers, in%: wool - 50-60%; polyester - 25-30%; silk - 10-25%.

Each increase in the share of silk fiber, for example by 10%, gives an increase in the cost of yarn by almost the same amount.

Therefore, the rational composition of multicomponent yarn is set by us in%:

Wool fiber - 50-60;

Polyester - 25-30;

Silk - 10-25.

In order to prepare for mixing, worsted wool 64K with a linear density of 0,32-0,36 tex is used; fibrous waste of natural silk unstapled silk-weaving straps with a linear density of 0,11-0,17 tex; polyester staple fiber with a linear density of 0,32-0,37 tex with a comparable length of wool fiber, which makes it possible to obtain a semi-component (wool + polyester + silk) yarn with a linear density of 15-30 tex.

For mixing, the entire length of the fiber is used - silk spinning (65-70 mm), the corresponding length of woolen and polyester staple fibers, which makes it possible to develop a new range of polycomponent yarns with high strength and with an external silky effect on standard equipment using a combed system of wool spinning technology.

When, during an experimental study, a compact flooring with a mass of 0.5 tons consisted of 15 layers, in which the components of the same name are repeated 5 times. In the figure, the numbers 1, 2, 3, 4, 5 mark the areas of the component flooring consisting of all layers (sections I-I and II-II) in the composition of each vertical selection there will be 15 doses from 3 components of the mixture, i.e. each component in each selection of a portion of the mixture is vertically repeated 5 times, this allows mixing of the fibers of each component inside itself and in the entire mixture.

In production conditions, if a component flooring weighing 1 ton then consists of 30 layers, in which the components of the same name are repeated 10 times. And if there is a selection of the mixture vertically 100 times, then the number of fiber folds inside the components will be equal to 1000, which completely exclude the possibility of the appearance of a "carving across the floor" defect.

The technical solution is achieved in such a way that, prepared for mixing, the fibers of the three components stored in separate storage sheds first form a layer-by-layer three-component flooring in the mixing chamber, then the component flooring is selected vertically and the pieces are mixed in the selected portions, not only pieces of different components are mixed together, but also scraps of one component from its most diverse parts. After each mixed flooring, an even better mixing of scraps of different components with each other and scraps of one component from the most different parts of its entire mass is achieved. The more the number of vertical selections of the component (or mixed) flooring in the process of mixing the fibrous material, the greater the total number of folds, the more homogeneous the fibrous mixture and the high quality of the yarn from it, eliminating the "carving across the floor" defect.

Existing machines can be used to produce a new assortment of multi-component yarns (wool + polyester + silk) without the need for additional designs. At present, the process of preparing mixtures in combed wool spinning

plants, all processes are automated and programmed, an important factor is the rational selection of the formation of the flooring layers.

Mixed installations are in operation, which include batch mix machines. The main bodies of all acting in. Currently, the mixing machines are scattering devices, mixing chamber and sampling device.

Mixing machines may differ from each other structurally, but they all work according to one general principle: first, a reasonable component flooring of the entire fibrous composition of the material included in the batch of the mixture is formed in the mixing chamber; then the selection of the flooring is carried out vertically, accompanied by the mixing of the selected pieces of the fibrous composition of the material with each other. Accordingly, the machines run periodically.

III. RESULTS AND DISCUSSION

The fibers of the three components prepared for mixing, stored in separate storage sheds, are first formed in the mixing chamber by layer three-component flooring, then the selection of the flooring is carried out vertically, accompanied by mixing the selected pieces of fibrous material with each other, while ensuring the frequency of operation of the mixing machine, the fibers are mixed with mass the following percentage ratio: wool fiber - 50-60; polyester fiber - 25-30; silk fiber - 10-25; using a combed wool spinning system, a polycomponent yarn with a linear density of 15 - 30 tex is formed from mixed fibers. The diagram of the flooring of mixing the components between the sub and the entire mass of the mixture is shown in the figure.

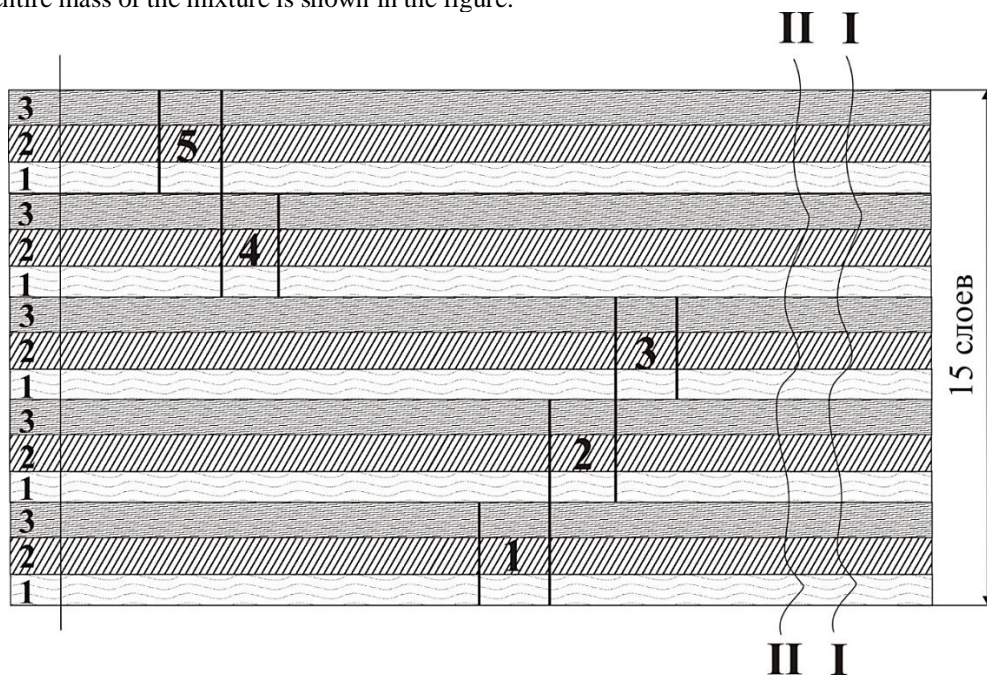


Fig. The scheme of the flooring of mixing components together and the whole mass of the mixture

Table
Characteristics of the fibers and yarns used

Indicators	fiber			Yarn with raw material composition, %		
	wool	polyester	silk	Шерсть Полиэфир шелк		
Lineardensity, tex	0,32-0,36	0,32-0,37	0,11-0,17	15	20	30
Coefficient of variation in linear density, %	-	-	-	1,7	2,3	3,2
Relative breaking load, cN / tex	10-15	36-48	27-33	39,2	34,5	31,3
Breakingelongation, %	22-26	30-55	17-19	35,2	31,4	29,8
The number of twists, cr / m	-	-	-	660	660	660
Twistvariationcoefficient, %	-	-	-	1,1	1,4	1,5

IV. CONCLUSION

The characteristics presented in the table confirm the technical result that the new range of polycomponent yarns have high relative breaking characteristics (31,3-39,2 cN / tex) than wool-silk (20,5-23,8 cN / tex), which reduces number of breakage of polycomponent yarn during its processing by technological transitions.

Mixed wool-polyester-silk fibers are used to form a polycomponent yarn with a linear density of 15 - 30 tex.

The presence of the polyester component significantly increases (by 60-70%) the strength of the yarn than the wool-silk one, and the inclusion of silk fiber improves the external consumer appearance of the material with the shiny effect of natural silk.

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