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Research Article

TECHNOLOGICAL FEATURES OF THE WORK OF A DOUBLE-KNITTING MACHINE

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ABSTRACT

The light industry, and especially the textile industry, is increasingly attracting the attention of foreign investors. And this is no coincidence, because today a third of all workers employed in the industrial sector are concentrated in it.

Along with an increase in the share of processed cotton fiber, the leadership of the republic set before the workers of the textile industry a responsible task to improve the quality of products, increase export potential. This decision required the reconstruction and modernization of existing enterprises and the construction of new ones. One of the primary tasks in the field of light industry is the production of goods for the population, which leads to a fundamental improvement in both the quality and range of products, increasing their technical level and aesthetic expressiveness. It is planned to achieve high rates of development in the production of knitted goods. Knitting industry, taking into account the mastery of a number of product advantages, as well as efficient production technology,

KEYWORDS

Knitting industry, production of knitwear, double knitting machines, technologies for the production of knitted fabrics.

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INTRODUCTION

Increasing the output of modern knitwear, improving their quality and intensifying production require improving the raw material base, the rational and economical use of natural yarn, and the widespread use of chemical threads, since the cost of raw materials is 80-90% of the cost of the finished product. Therefore, nationwide and sectoral scientific and technical programs provide for work on the creation and implementation of knitted fabrics and products made from them with reduced material consumption through the use of various lightweight structures, chemical threads, progressive technological processes and new modern equipment.

Knitwear has characteristics that allow it to be used for the production of products for various purposes - household and technical. When changing the filling primary data during the production of knitwear, it becomes possible to regulate its various properties, for example, extensibility. The use of knitted materials and products tends to expand, while all new needs and requirements become stimulating to develop a qualitatively new range of materials and products based on fabrics with different characteristics. All of the above can be achieved through a combination of new types, both raw materials and weaves. In this case, both low-stretch fabrics are obtained, which are close to fabrics in their characteristics, and fabrics, the extensibility of which is 100% or more.

LITERATURE REVIVE

The issues of creating and providing knitwear with a patterned structure are set out in scientific studies by such scientists as V. Kumar, VR Sampath, Y. Kavusturan, E. Onofrei, SAFrydrych, HR Mattila, D. Farama, Bartkowiak Grazyna, Szucht Edwart, C. Candan, A. Mukhopadhyay and others.

In this area of science, fundamental works are known to obtain new structures of fabrics, expand the range of knitwear and study the technological parameters and physical and mechanical properties of knitwear prof. A.S. Dalidovich, Z.I. Shlyakhova, L.V. Shengelia, I.I. Shalova, L.A. Kudryavina, N.A. Kuzovkova Yu.S. Grechukhina, L.V. Shkunova, V.M. Lazarenko, V.A. Zinovieva, L.P. Rovinskaya, I.G. Tsitovich, B.B. Stroganova, E.I. Bitusa, V.A. Zavarueva, A.V. Truevtseva, M.M. Mukimova, N.R. Khankhadzhaeva, K.M. Kholikova, B.F. Mirusmanova, K.Z. Yunusova and others.

The issues of creating knitted products with hygienic properties, studying the deformation properties of knitted fabrics and products are considered in the research works of such scientists as prof. HA. Alimova, F.U. Nigmatova, S.Sh. Tashpulatov, V.S. Rybina, D.U. Aripzhanova. V.A. Kublyakov.

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MATERIALS AND METHODS

At this point in time, many fabrics are suitable for the manufacture and creation of knitted materials and products, incl. sports goods are made by means of elastic weaves, where mainly cross-knitting machines are used [2]. The creation of new warp-knitted elastic fabrics, as well as the study of their characteristics, are relevant tasks, because. allow enterprises that operate with the use of warp knitting equipment, can lead to an increase in the level of competitiveness of manufactured products. In the case when the question arises regarding the determination of the actual values of the main parameters of the loop structure formation of warp-knitted elastic knitwear, which turned out to be close to the theoretical ones, the difference between the actual and theoretical values ranges from 0-13%. That's why,

No less interesting are the works that consider methods for obtaining integrally molded parts of garments using polymer coatings, methods for assessing the dimensional stability of bulk parts of garments [3]. It is also noted that the manufacture of knitted knitwear is one of the main directions for improving the processes of manufacturing products.

The paper proposes a method for knitting a two-layer jersey of a new structure, taking into account the physiological heat-shielding comfort with a reduced consumption of raw materials [4]. Physiological comfort is determined during the physical activity of the body, and heat-shielding comfort is determined by the feeling of warmth (cold and moisture) during the evaporation or absorption of sweat released from the human body.

In [5], a two-layer knitwear with a reduced consumption of raw materials for outdoor activities is proposed, in which one layer is made from a natural type of fibre, and the second layer is made from synthetic threads.

The manufacturing sector plays an important role in the development of the state economy. This fact is given special attention by Japanese scientists-statisticians [6-8]. With the acquisition of independence in Tajikistan, much attention has also been paid to the manufacturing sector. Among them, the textile industry has a special place. The development of the knitwear industry, an increase in the growth in the productivity of knitted fabrics and products is clearly expressed in the development of the economy of Uzbekistan.

For the design of any canvas, one must bear in mind, first of all, the possibility of manufacturing a different assortment of products on equipment of a certain type using patterned weaves with multi-coloured, as well as textured effects. When designing products, one should take into account the effect of the structure-forming elements of knitwear on the magnitude of the visual perception of the pattern. Therefore, the issues of pattern formation are issues of paramount importance [9].

The use of the needle selection method directly reveals the characteristics and repeat capabilities

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of the pattern formed on the canvas. In the case of considering the process of knitting patterned weaves, it becomes possible to select needles or other working bodies exclusively on flat knitting machines. The process under study can be carried out in a predetermined order for various purposes, for example, for complete loop formation, obtaining press sketches, reliably ensuring the non-working position of the needles, or for the purpose of transferring loops. This process takes place using the appropriate designs of selection mechanisms used on flat knitting machines.

In the case of using flat knitting machines, it is possible to transfer the loops from the side of the needles of the front needle bar to the side of the needles of the back needle bar and vice versa. In the same way, you can transfer the loops on adjacent needles using the needle bar of the same name. The first type of transfer is used in the case of obtaining a variety of patterned weaves, the second type is used to knit knitwear using openwork patterns, as well as to reduce the number of loops along the width of the material or product, where the narrowing process should take place. In the latter case, from one or more extreme needles, the loops are transferred to neighbouring ones.

Taking into account the increased interest in expanding the technological capabilities of flat knitting machines and obtaining various types of patterned knitwear, which have a number of valuable characteristics, the structure and structure of several derivatives of the eraser are designed - three-reinforced, four-elastic and five-reinforced weaves of knitwear, and also a technological regulation for the production of these weaves, which are performed only on flat knitting machines [10].

The process of knitting a double-sided weave (Figure 1.1) occurs as follows: when the carriage moves from right to left, if only needles with long heels work on the front needle bar (3, 7), then only needles with short heels work on the back needle bar (4, 8) .

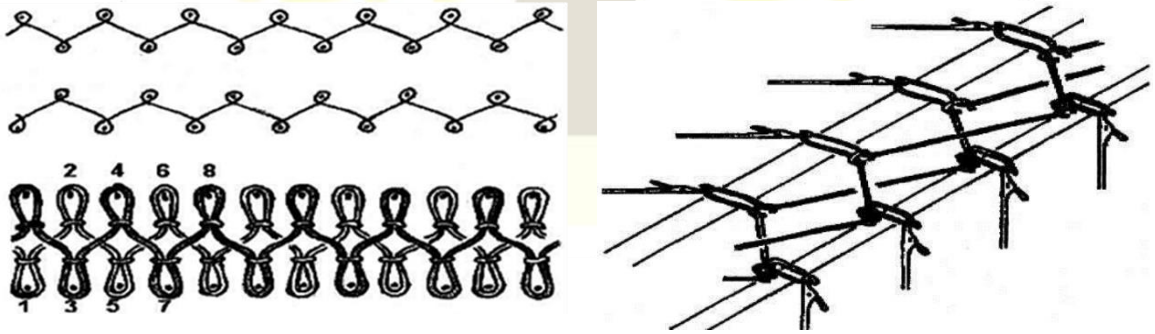

Figure 1. Graphical recording and production process of double-knit.

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Typically, the enclosing wedges can occupy three positions: "working", "pressing" and "semi-pressing". In all the given positions, the needles that fall under the action of the enclosing wedges function with the formation of smooth or press loops. In this regard, the names of the provisions under consideration are considered conditional. In machines and mechanisms of individual structures, the enclosing wedges, in addition to the indicated positions, can also occupy a "non-working" position. In the next row, only needles with a short heel (1, 5) work on the front needle bar, and only needles with a long heel (2, 6) work on the back needle bar. To do this, the same process is repeated, only in reverse, i.e. on the front needle bar, the lifting wedge will be completely turned off and the additionally installed wedge 9 for lifting the pushers will be turned on, and on the rear needle bar, the lifting wedge will be turned on halfway, and the additional installed wedge 9' will be turned off. Thus, the process of knitting a two-sided weave takes place on a flat knitting machine. One weave repeat consists of two rows. Similarly, the derivatives of the weave from the eraser are knitted - three-stranded, four-stranded and five-stranded weaves of tricotage according to rapport.

Interlock weave is also knitted on double-loop circular knitting machines Interlock, which have wide technological capabilities. Using these possibilities, it is possible to develop and recommend various structures of knitwear based on interlock weaves on double-loop circular knitting machines Interlock without losing the basic physical and mechanical properties.

The studies show multilayer and quasi-multilayer weaves of knitwear for the purpose of producing clothes that have high heat-shielding characteristics, which will lead to an expansion of the effects of patterned purpose on knitted fabrics and traditional products due to the manifestation of volumetric relief patterns [11]. Such types of weaves are often used in technical knitwear, which is one of the most relevant and interesting trends today.

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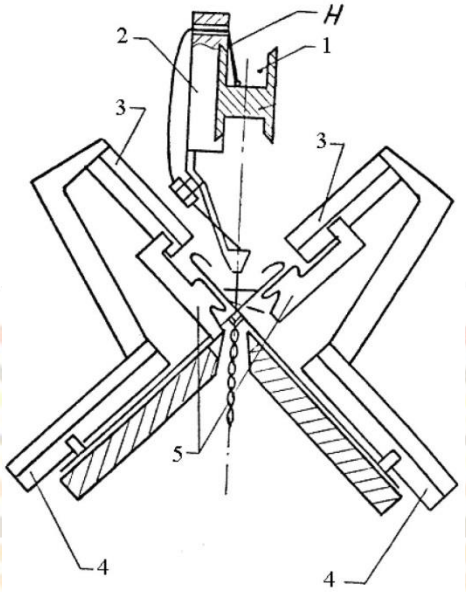

Figure 2. Knitting mechanism of flat knitting machines.

The work [12] considers the principle of operation of the knitting mechanism of flat knitting machines, which is aimed at improving the qualitative characteristics of the produced fabric. And the movement limiters 1 of the thread guides 2 were installed to fix them at a distance of up to two needle steps from the extreme needles in the working area, where the knitting process takes place and the knitting system 3 together with the carriage 4 along the needle bar is moved, the thread guide rails were made with grooves for the most threads, the thread feed mechanisms are installed directly in front of the thread guides, where the brace mechanism was made in the form of plates 5 (Fig. 2).

The proposed knitting mechanism improves the quality of the produced weave and expands technological capabilities. In order to increase the productivity, as well as, if necessary, the reliability of flat knitting machines, providing for the reverse movement of the carriage, an exclusively new knitting system of the carriage is proposed in [13]. Figure 3 is a schematic representation of the carriage knitting system.

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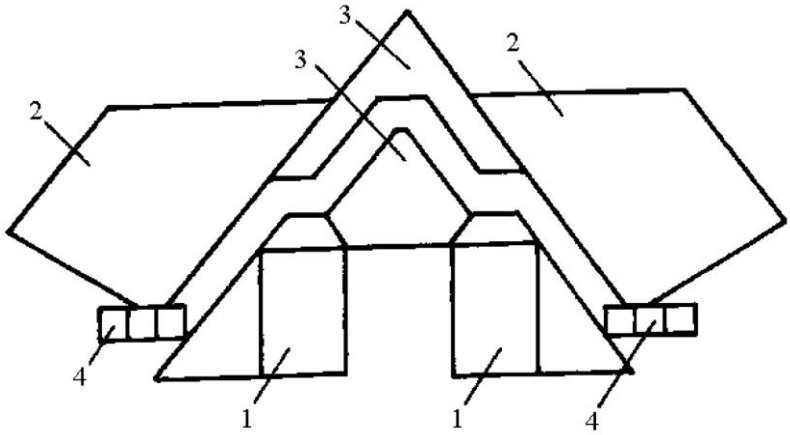

Figure 3. Carriage knitting system.

It is known that additionally installed wedges have a direct effect on the heels of the needles, then the signal sent to change the direction of the carriage is likely to be sharply formed when the latter passes the last knitting section of the material or product, as well as their details. Since in this case, the run-outs of the carriage will take on a minimum value, which will lead to an increase in the indicator - the productivity of the machine.

Currently, scientific and scientific-practical research is being carried out, which are related to the study, modernization and expanded use of the technological aspects of flat knitting machines, which are included in the technological regulations of modern operational activities. The use of computer technology in machines and equipment facilitates the task of individual selection of needles when forming a pattern on materials and products using different colors, as well as determining the size and repeat of the pattern being formed. This leads to the achievement of varying degrees of saturation, as well as the lightness of the color gamuts of the pattern being formed, visually creating a certain emotional expressiveness perceived by the designer.

As for flat-knitting (fang) semi-automatic and automatic machines, they are widely used for knitting both basic (backs, shelves, etc.) and finishing (collars, pockets, inlays, etc.) structure-forming parts of upper-purpose products .

Both automatic and semi-automatic machines are very useful for developing detailed parts - shelves, backs, sleeves, etc. upper products by semi-regular methods based on woolen, semi-woolen, cotton, mixed and other types of yarn.

Prof. Mukimov M.M. and Abdullaev R.N. a method has been developed and proposed for the production of plush knitwear by means of a flat-fang machine. The peculiarity of the method lies in the fact that for this small and noticeable changes were made to the design of the flat-fan machine [18]. The main thread guide NP was used to lay a plush thread (Figure 4), and an

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"additional" thread guide NG was installed to lay a ground thread.

The thread guide NG is moved towards the guide rail and then the thread is laid exclusively on the needles of only one needle bed, the plush thread guide NP can lay the thread on the needles of both needle beds.

The locks of the front needle bar Ip were equipped with drop wedges 3 (Figure 5) in order to drop the plush broaches, and the locks of the rear needle bar Ip were left without any change. In order for the discarded plush broaches to get into the spatial zone located between the needle beds, a guide H was installed.

The knitting process of the plush jersey is carried out on the machine as follows. At the beginning of the initial position, the loops are located exclusively on the needles of the rear needle bar. And in the case of moving the carriage from right to left, the needles of both needle beds are raised at the stage of closing the lifting wedges 1 and lowered by the wedges 2. In the process of lowering, the needles, as well as the front and rear needle beds, will capture the plush thread.

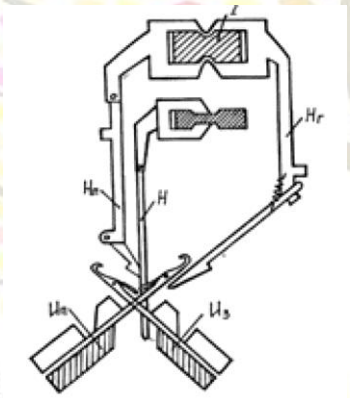

Figure 4. Filament feeding scheme.

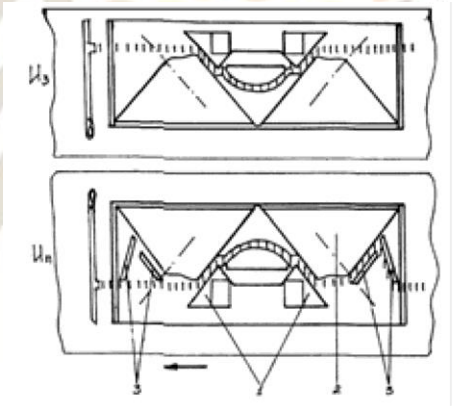

Figure 5. Needle locks of a flat-fan machine

Subsequently, a ground thread is laid on the needles of the back needle bed using the Ng thread guide. For this purpose, the thread guide is installed with the backs of the needles of the front needle bar. In this case, one loop row can be obtained on the needles of the back needle bar. As for the needles of the front needle bed, you can get open loops on them.

Subsequently, with further movement of the carriage, the needles of the front needle bed move along the wedges, dropping their open loops (plush broaches), which the guide H (Fig. 6) will lower between the needle beds. Dropping wedges are in a movable state and in connection with this, locks with similar wedges can be used to develop a ribbed weave.

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By moving the carriage from left to right, the second row is knitted. At the beginning of the knitting process with brushes, the valves of the needle bar of the front part will open. The length of the plush broaches is adjusted by changing the depth of the needle of the front part of the upper leg, incl. and the distance between the needle beds.

The study of the proposed method for the production of plush weaves in laboratory conditions showed the possibility of obtaining plush knitwear on a flat-fang machine without significant changes in the design of the loop-forming system. Knitting plush knitwear on a flat-flange machine, compared with the manufacture of such products from linen, reduces waste by 10-15%.

Another way of knitting plush knitwear on a flat-fang machine is also possible, in which the needles of one needle bed are replaced by pins.

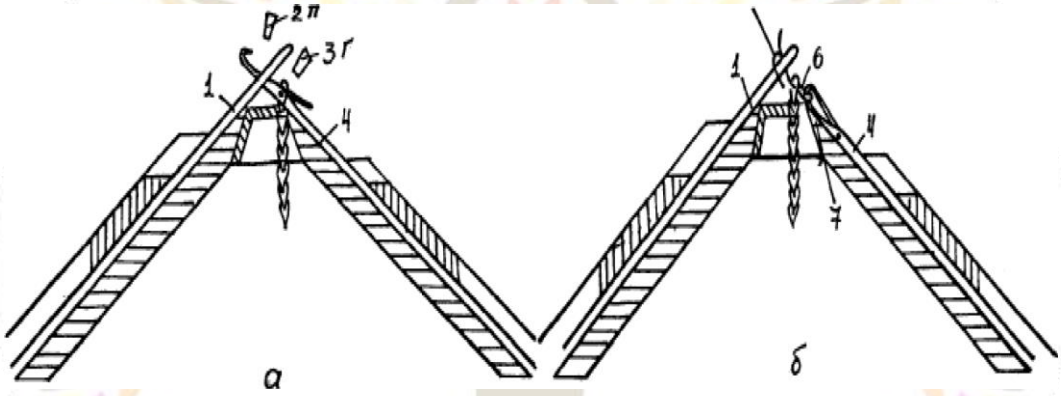

Figure 6. - The process of knitting knitwear with a plush weave.

To do this, reed needles 4 should be placed in the water needle bed (Figure 6, a), and pins 1 instead of needles in the other. Two thread guides feed their threads, being at some distance from each other. The main threader lays the plush thread on the needles and on the pins, and the additional threader lays the ground thread, only on the needles.

From the beginning, reed needles 4 are put forward and the thread guide 3 moving in front lays a ground thread on them. Then the pins 1 are extended and the thread guide 2, moving behind, will lay the pile thread, both on the needles and on the pins. With the receipt of the thread, the reed needles 4 are lowered, and further the process of culling the threads laid on them takes place, and the pile thread will be culled on the pins 1, and also its loops 5 (Figure 6, b) are longer than the loops 6 based on the ground thread, which are culled on the breaking teeth 7. Pins, after receiving a plush thread, stand upright until loops are formed using reed needles. Subsequently, the pins will be lowered and throw off the loose plush loops (increased loop pulls).

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When the carriage reverses, the pins and needles rise together to the conclusion and the knitting row. Simultaneous formation of plush loops by dropping plush broaches to the water loop-forming system significantly increases the productivity of the machine, but at the same time increases the length of the loop-forming system of the needle bed with pins.

The developed and proposed technology for the production of piece knitwear with plush weave makes it possible to expand the range, improve product quality and, from an economic point of view, save raw materials by reducing waste. For this, the necessary conditions for the production of piece knitwear with plush weave on a flat knitting machine are analysed and determined.

Continuing research on the study and use of the technological capabilities of knitting equipment, it should be noted that in the works of Mukimov M.M., as noted above, a huge number of new weave structures are given [19-26]. At the same time, they describe in detail the method of knitting, based on technological capabilities, the arrangement and operation of the working bodies of the machine. Expanding the technological capabilities of two-way circular knitting machines, it is recommended to create a second line of culling with ordinary needles, when, when producing double-sided plush knitwear, both needle beds alternately knit loops, which achieves a uniform depth of culling required to obtain a uniform length of broaches on both sides of the double-sided plush.

To date, all modern flat knitting machines equipped with program control operate according to the regular knitting method, i.e. Knit 3d products. At the same time, waste is up to 5% and is reduced to 15-20% compared to the cut method for the manufacture of knitwear, where waste is up to 20-25%. Day by day, the operations of the sewing process are gradually removed more and more from the technology of manufacturing knitwear using semi-regular and regular methods (the list of websites is given in the list of used literature [26-37]).

CONCLUSIONS

Based on the analysis, the results of studies aimed at improving the quality of knitwear by changing its structure and the effective use of raw materials in knitwear production are summarized. By analyzing the directions for expanding the range and improving the structure of knitwear, it has been established that special attention should be paid to the development of effective technologies for obtaining structures of weaves with the addition of patterned elements. The insufficiency of science-intensive developments of methods for obtaining patterned knitwear with improved quality indicators and reduced material consumption has been established.

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