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Technology for Production of New Structural Double-Layer Knitted Fabrics

Baxrom Yuldosh o‘g‘li Qoraboyev, Kamoliddin Zununovich Yunusov, Elyor Nurmamat o‘g‘li Juraqulov

Postgraduate student at the Tashkent Institute of Textile and Light Industry
Tashkent Institute of Textile and Light Industry, Candidate of Technical Sciences, Associate Professor
Postgraduate student at the Tashkent Institute of Textile and Light Industry

ABSTRACT: This article is devoted to the production of two-layer knitted fabrics of a new structure using the technological capabilities of round needle knitting machines. Today, indicators of the quality of external knitting are: shape retention, abrasion resistance and deformation properties. Improving the shape retention properties of knitted fabric, increasing resistance to abrasion and deformation increase the quality indicators and service life of outerwear in tailoring. It is difficult to achieve these improvements in traditional interlock knit fabrics without changing the weave type.

In the article, the sides of a two-layer knitted fabric are knitted separately on a satin stitch basis, and an additional thread is used to join the layers. As a result, a technology for knitting knitted fabric on round-needle interlock machines was developed. Based on this technology, a two-layer knitted fabric with a new structure was obtained, which improves quality indicators and expands the capabilities of interlock machines.

I. INTRODUCTION

In recent years, as a result of the implementation of a set of measures to develop the textile and clothing industry in Uzbekistan and support the investment and export activities of industry enterprises, 45 percent of the cotton fiber and yarn produced in the republic is processed. processed products, and the industry's annual export potential exceeds $3 billion [1].

The most important and pressing problems of the knitting industry are improving the quality of products, improving and updating their range. Theoretically, the solution to these problems lies in the further development of the theory of knitted fabric, the creation of new types of knitting, and the development of high-performance knitting processes with optimal knitting properties. From an economic point of view, to obtain two-layer knitwear, it is desirable to use mixed raw materials, since this allows the use of yarn with different fiber contents [2-3].

II. LITERATURE SURVEY

In order to weave and expand the range of fabrics intended for the production of outer knitwear, you need to know the basic requirements for this type of knitwear, as well as production methods. Double-row twill knitting is knitted from one or more yarns, with each yarn knitting all the loops in one loop row on both the front and wrong side of the knitting, and otherwise several loops (more than two loops) in a row [4-6].

In the analyzed work [7], the production of a two-layer knitted fabric using the main thread using the press-attach method was noted. In figure 1 shows the structure and graphical representation of a two-layer knitted fabric produced on a flat needle machine.

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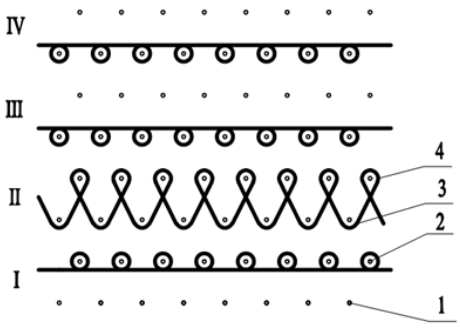

Fig. 1. Graphic designation of a two-layer knitted fabric.

A method has been created for producing a two-layer knitted fabric with high productivity and the quality indicators of the knitted fabric have been improved by changing the knitting process. In the first row of knitting on the back knitting needles 2 of the first row I knit a smooth weave, in the second row on the back knitting needles 2 loops 4 are formed, and on the front knitting needles 1 open loops 3 are formed. In the third rows III and IV, ironing fabric is taken, front knitting needles 1 using threads 4 form loops of the front row 3, while the purl knitting needles 2 are turned off from the working position.

A distinctive feature of the method is that transverse smooth lines are applied on both sides of the fabric. Improves the quality parameters of two-layer knitted fabric and increases the efficiency of the machine. In the analyzed work [8] scientists from the Moscow State Textile University named after A. N. Kosygin presented a method for producing a two-layer knitted fabric with a new structure. Both layers of knitted fabric are obtained on the basis of a derivative plain weave, which is connected to each other by interlacing loops in the fabric, the loops are twisted, and on every fourth loop column. In Fig. 2 shows a graphical representation of a two-layer knitted fabric attached using twisted pads to the resulting smooth fabric.

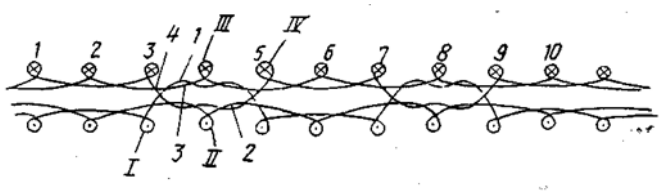

Fig. 2. Graphic recording of two-layer knitting.

Rings I and II of the first layer, obtained on the basis of a smooth fabric derivative, are connected in the fabric by covering the protrusions of rings III and IV of the second layer, obtained on the basis of a smooth fabric derivative. The 1st ring of the I ring covers above the 3rd ring of the ring, and the 4th ring of the IV ring covers under the 2nd ring the column of every fourth ring column. Based on this fabric, a number of knitted and mixed knitted fabrics can be made.
In order to expand the technological capabilities of two-needle knitting machines and improve the resource-efficient technology for producing assortments of two-layer knitted fabric, T. K. Allamuratova presented a method for producing two-layer knitted fabric [9-12]. The threads that make up knitwear reduce the flexibility, stretchability and curling of the fabric. In the analyzed work, samples of two-layer knitted fabric were knitted on an Italian flat-needle machine PROTTI-242 class. 14 with a cotton layer ratio of 20 tex3. A graphic representation of the fabric is presented in Fig 3.

The work achieved a reduction in raw material consumption, an increase in heat capacity, preservation of the shape and performance properties of the fabric due to the introduction of high-strength rope thread into a two-layer knitted fabric. Reducing the extensibility of the knitted fabric and increasing dimensional stability were achieved by adding arch yarn to the composition of the knitted fabric.

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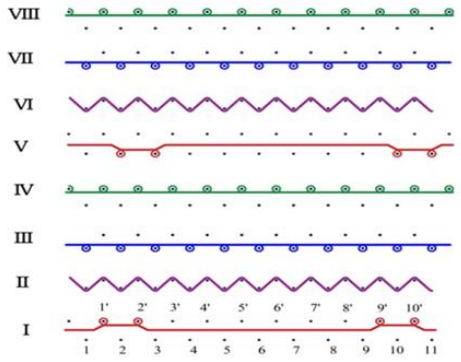

Fig. 3. Graphic designation of a two-layer knitted fabric with argoch yarn.

In order to increase the properties of knitting and improve its appearance [13] presents a technology for producing a two-layer knitted fabric by introducing additional yarn between the front and back loops of two-layer knitting. It is recommended to knit two-layer ribbed knitwear on flat-needle machines. Below is a graphic designation of a two-layer elastic knit in Figure 4.

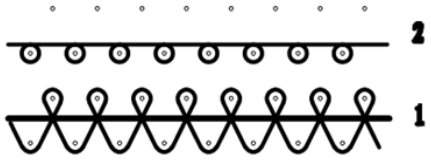

Fig 4. Graphic design of a two-layer ribbed knit.

When the machine carriage first moves from left to right when knitting with a double-row rib, the loop formation system forms pressing half-loops on the front knitting needles and hidden loops on the rear knitting needles. An additional warp thread is inserted between the row of loops formed by the second loop formation system and the yarn guide. As the carriage moves from right to left, it forms a series of rows of loops on the front spokes. By introducing a warp thread into a two-layer ribbed knitwear, a decrease in stretch in width is achieved, and a decrease in stretch in length is achieved by knitting press half-rings. In order to reduce the consumption of raw materials when knitting and at the same time increase its size and thickness, a method for producing double elastic knitwear is presented in [14]. Double rib knitting is achieved by knitting two elastic bands in one warp. In this case, between each ring post of one type of tire, ring posts of another type of tire are woven with alternating direct and reverse loops (Fig. 5).

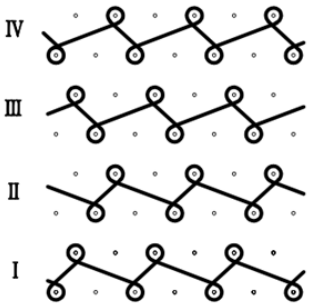

Fig 5. Graphic design of double ribbed jersey.

In works [15-17] to obtain a two-layer knitted fabric on a flat-needle machine, a smooth fabric is knitted sequentially on the front and rear needles of the machine. In the following weaving process, two plain weaves are joined together using a connecting thread. For it, needles weave a series of rubber fabric from a connecting thread. Due to the absence of half-loops in a two-layer knitted fabric, which are formed when connecting threads, the surface density of the knitted fabric decreases and its quality increases. Figure 6 shows a graph of a two-layer knitted fabric produced on a flat needle machine.

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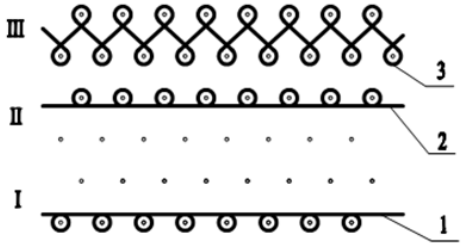

Fig 6. Graphic recording of two-layer knitting.

The absence of connecting threads for each row in the resulting knitted fabric, the use of low linear density as connecting threads makes it possible to obtain a two-layer knitted fabric with a lower surface density [18-20].

III. EXPERIMENTAL STUDY

As a result of the analysis of the available literature and conducted scientific work, it was established that samples of double-pencil knitted fabric were obtained mainly on machines with flat needles and partially with circular needles.
In order to expand the capabilities of round-needle interlock knitting machines and improve the method for producing a two-layer knitted fabric, based on the above works, a method for producing a two-layer knitted fabric based on rad was developed. The two-layer Glad-based knitted fabric was woven on high-performance binding machines. When making samples of knitted fabric on a circular knitting two-needle interlock machine, threading the working knitting needles is carried out in the sequence shown in the graphic below. A graphic record of knitting is presented in figure 7.

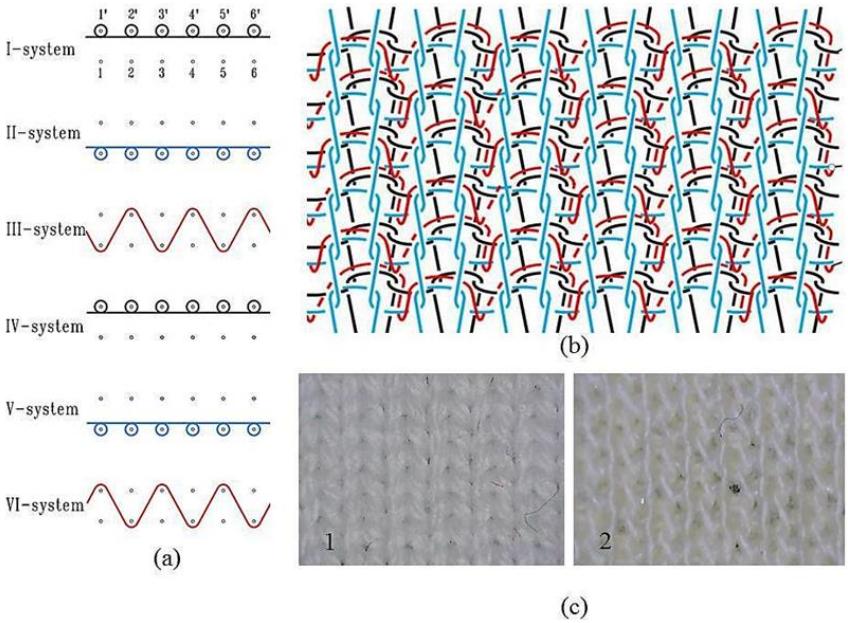

Fig 7. (a) Graphic designation of a two-layer knitted fabric, (b) General structure of two-layer knitted fabric, (c1) Knitted fabric produced on a flat needle machine, (c2) a new structured knitted fabric produced on a round needle machine.

In System I, the rainbow weave element is knitted on needles 1',2',3',4',5',6' on a disc needle to form the purl loops of the knitted fabric. In the IInd system, on needles 1, 2, 3, 4, 5, 6 of a cylindrical knitting needle, an element of satin fabric is knitted, forming loops towards the front side of the knitted fabric. In system III, the connecting thread forms half-loops on the knitting needles 2', 4', 6' of the disk needle and on the knitting needles 1, 3, 5 of the cylindrical needle. In System IV, the yarn forms an even weave on the wrong side of the fabric, as in System I. In System V, the thread forms an even

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weave on the right side of the fabric, as in System II. In the VIth system, the connecting thread forms half-loops on the knitting needles 1', 3', 5' of the disk needle and on the knitting needles 2, 4, 6 of the cylindrical needle.
The machine cylinder and the disc needle lifting system provide the convenience of outputting a serial count and preparing the machine for knitting when initiating a two-layer repeat of a knitted fabric fig 7(a).

IV. ANALYSIS OF RESULTS

An analysis of the scientific work showed that a two-layer knitted fabric based on rad has the peculiarity of changing quality indicators depending on the type of thread in the layers. This increases the possibility of using the fabric. In addition, two-layer knitting reduces the degree of shrinkage of the knitted fabric, since the layers of the fabric are knitted on a rad basis, and the connecting thread is thrown onto the elastic.

Although the reviewed scientific works have improved the heat retention properties, stretchability and heat retention of two-layer knitwear, when using two-layer knitwear for lightweight outerwear, there is a need to conduct research on creating lightweight samples of two-layer knitwear. knitwear with a simultaneous decrease in these properties. An important role is played by the use of new technology for producing two-layer knitted fabric on small-class machines.
When knitting in two layers, it is very important to study the relationship between knitting parameters and the properties of yarns with different fiber contents.

From the analyzed literature reviews, we can conclude that the method for producing two-layer knitting on flat-needle knitting machines uses yarn with a linear density suitable for the class of the machine. Layers of 20 tex3 cotton are knitted on a flat needle machine. This leads to an increase in the surface density of the tissue.

Another of the above problems is the comfort level of knitwear, i.e. stretchability, and at the same time meeting the standard requirements of reversible deformation. The high surface density and thickness of the knitted fabric create discomfort for outerwear. Analyzing the existing problems, it is advisable to knit two-layer knitted fabrics for light outerwear on small-class round needle machines Fig. 7(c). These samples of two-layer knitwear are lighter than existing fabrics, i.e. have lower surface density, thickness and bulk density.

V. CONCLUSION

Due to the production of two-layer knitted fabric obtained on the basis of Glad, an expansion of the range of lightweight outer knitted products has been achieved. Problems of creating new assortments of two-layer knitted fabrics, their effective use, using the technological capabilities of knitting machines in enterprises specializing in the production of knitted products, and the production of competitive, high-quality knitted products that can replace imports and meet the requirements. the problems of the domestic and foreign markets have been partially resolved.

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