

Technology of Obtaining Two-Layer Knitted Fabrics in A New Structure of A Flat Two-Needle Knitting Machine with Interlocking Needles

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Abstract

Using the technological capabilities of double-layer flat knitting machines, the technology for producing double-layer knitted fabrics of a new structure, produced by interlocking needles, has been studied.

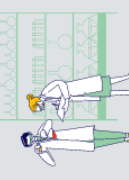
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INTRODUCTION

Development of knitwear production, scientific and technical acceleration in the future, using the achievements in science and technology in the field of programming and electronics, high-level organization of production, complex automation, new, high-performance textile machines in need of spiritual repair The work carried out in the directions of significantly increasing the production capacity by re-equipment, modernization of existing knitting machines, introduction of resource-efficient and waste-free technologies, wide use of information technologies is commendable.

The development of the knitwear production network is determined by world market trends, social needs and lifestyles of the population, strict requirements for product quality, development of the raw material base, etc. Based on scientific and technical achievements in the production of knitted products, the expansion of assortment types with new structures and high quality indicators is considered one of the important and urgent problems of the industry. Activation of economic bases within the industry and service requires the production of products with a well-defined technology and reduced cost. Therefore, the alternative (optimization) of the production technology of knitted products is of great importance. Top, warm underwear, children's clothes, as well as knitted fabrics intended for technical purposes, knitted fabrics with high purchasing characteristics show a certain interest.

In recent years, the range of knitted products has expanded significantly. In particular, it has been enriched with a new structured knitted fabric with a feathery, mixed and two-layer light surface and volume density, obtained on two-needle machines. On the basis of the above-mentioned knitted fabrics, in order to create knitted fabrics with a light surface and volume density of a new structure, knitted fabrics of the existing structure and methods of obtaining them on different knitting machines were analyzed. In order to expand the assortment of knitted products, to obtain fabrics with a light surface and volume density and to produce ready-made



knitted products from them, it is an urgent task to analyze the structure of two-layer knitted fabrics with the existing structure and the methods of obtaining them. Many researchers in our country and abroad are working on creating a new tissue structure with reduced consumption of raw materials.

In several works [1, 2], the possibilities of obtaining lightweight knitted fabrics on knitting machines were considered in detail.

At the modern stage of the acceleration of knitting production, obtaining knitted fabrics with reduced consumption of raw materials is in three directions:

- creation of lightened two-layer fabric on two-needle machines;
- easy single-layer weaving on single-needle machines; and,
- it is stated in the work that research is being carried out on obtaining lightened single-layer fabric on two-needle machines [1].

Many knitted fabric structures have been created with reduced raw material consumption on an incomplete fabric base, which can be obtained by turning off some needles on the machine disk or cylinder. Professor I.I. Shalov confirms in [2] that new types of knitted fabrics created in this direction are promising.

The expediency of obtaining knitted fabrics with low consumption of raw materials on the base of incomplete fabrics was determined in works [3,4]. At the same time, it should be taken into account that the surface density of knitting is affected not only by the percentage of disabled needles that do not participate in the work, but also by their grouping [5].

Changes in the linear density of kalava thread, when the length of the loop thread is the same, its technological and operational characteristics, loop indicators, fabric size and its surface density, I.G. Tsitovich and Yu.I. Boldyrev defined by [6]. In this case, it was proved that the change of the density of knitting, the value of the linear density of the yarn is proportional to its square root [7].

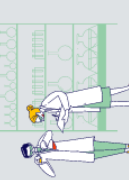
The inclusion of glad in the mixed knitted structure and rubber in the bi-elastic, and glad in the elastic, without changing the elasticity of the knitted fabric, allows to reduce the consumption of raw materials.

In order to partially fulfill the above-mentioned tasks, the technology of obtaining two-layer knitted fabrics of a new structure has been developed. 3 variants of two-layer knitted fabric samples of the new structure were produced on a Long Xing LXA 252 SC flat needle knitting machine.

In order to expand the assortment and improve the quality indicators, the technology of placing two-layer knitted fabric samples on the knitting machine needle with interlocking order was developed.

New structures of two-layer knitted fabrics were woven using a linear density of 30 tex x 2 polyacrylonitrile (PAN) yarn on a flat double-needle knitting machine. These two-ply knit fabrics differ in their weave structure, rapport and needle placement.

Therefore, the two-layer knitted fabric samples of the new structure were knitted on a flat double-needle knitting machine as follows.



At first, we ensure that the position of the knitting needles is located in an interlocking manner, making extensive use of the technological capabilities of the knitting machine. After that, the location of the needles is inspected and checked. After all technological solutions are provided, the machine will be ready for sampling.

During the process, the production sequence of the I-row of two-layer knitted fabric (variant I) consisting of four rows of general rapporti press and glad rings is covered. According to it, the carriage of the flat needle knitting machine moves from left to right. In this process, the odd needles of the front needle are moved up by the incomplete completion process due to the half-off of the lifting loop, and the single needle is wound half loops, and the even needles of the rear needle are raised to the full completion process due to the lifting loop being in working position, and the single needle for the back layer is wound to form its own loops. At the end of the process, half loops are formed on the front knitting needles, and full loops are formed on the rear knitting needles. At the same time, the even needles of the front needle and the odd needles of the back needle do not participate in the loop formation process due to the fact that the lifting thread is not in working condition only for selected needles. As a result, the first line of two-layer knitted fabric with a new structure was created. When knitting the II row of the knitted fabric, the carriage of the machine moves from right to left. During the process, the even needles of the front needle are moved up due to the lifting loop being in full working position, and one needle wraps its loops, and the odd needles of the rear needle, due to the lifting loop being turned off in half, complete the incomplete completion process, forming single needle loop half loops for the back layer. At the end of the process, full loops are formed on the front knitting needles, and half loops are formed on the rear knitting needles. Due to the fact that the lifting loop is not in the working position only for selected needles during the process, the odd needles of the front needle and the even needles of the back needle are not shown in the loop forming process and do not form a loop. As a result, a second row of two-layer knitted fabric with a new structure is formed according to the position of the needles located opposite each other.

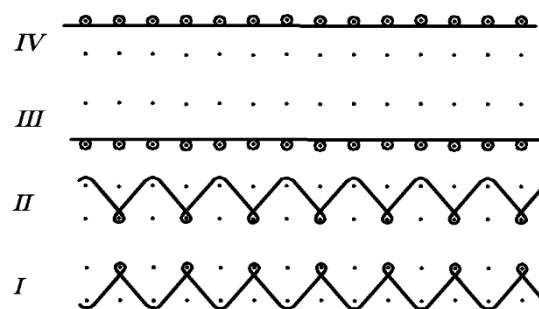
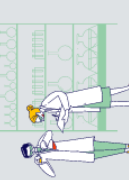


Figure 1. A graphic record of a double-layer knitted fabric (variant I) of a new structure with needles in an interlocking order.

In the production of the third row of two-layer knitted fabric, when the carriage moves from left to right, all the needles of the front needle are raised to the finishing process due to the working position of the lifting loop and form the glad row for the front layer, while the needles

of the rear needle are not raised to the finishing process due to the non-working position of the lifting loop, and the loop in the back layer the generation process is not performed. When knitting the fourth row of fabric, the reverse process is performed. That is, the front knitting needles do not participate in the completion process of loop formation and do not move up, and the rear knitting needles move up to the completion process and form their glad loop row (Fig. 1). As a result, a two-layer knitted fabric with a new structure was produced as a result of the alternating rows of glad and press loops and the placement of the needles opposite each other. The two-layer version II knitted fabric of the new structure was knitted in the following sequence.

In the production of the first row of fabric, the carriage of the knitting machine moves from left to right. During the process, the selected pair of needles of the front needle is lifted up by the finishing process due to the lifting loop being in working position, and a single needle is spun to form the glad rings. And the odd needles of the back needlework are raised to the incomplete completion process due to the half-off of the lifting thread, forming half-loops by winding one needle for the back layer. As a result, glad rings are formed by winding one needle on the even needles of the front needle, and half rings are formed by winding one needle on the odd needles of the back needle. Also, due to the fact that the parallel lifting thread is not in working condition only for the selected needles, the odd needles of the front needle and the even needles of the back needle are not raised to the completion process and do not participate in the loop formation process. When knitting row II of the knitted fabric, the carriage of the machine moves from right to left. In this case, all the needles of the front needle do not go up and do not participate in the loop formation process due to the fact that the lifting needle is not in the working position, and all the needles of the back needle complete the process due to the fact that the lifting needle is in a fully working position, forming a full glad ring row for the back layer. When knitting the third row of fabric, the opposite of the process of knitting the second row is performed. That is, when the carriage moves from left to right, a full glad line is formed on all the needles of the front needle, while the needles of the back needle do not participate in the process of forming a loop without rising to the completion process. In the formation of the fourth row of knitted fabric, as a result of the movement of the carriage from right to left, the odd needles of the front needle are lifted up by completing the partial completion process due to the half-turning off of the lifting loop, and one needle passes through the half loops, and the double needles of the rear needle move up to the full completion process due to the lifting loop being in working position. for the back layer, one needle is spun to form glad rings. As a result, half loops are formed on the odd needles of the front needle, and full loops are formed on the even needles of the back needle. In this case, the even needles of the front needle and the odd needles of the back needle are not involved in the loop formation process due to the fact that the lifting thread is not in working condition only for the selected needles. In the production of the fifth row of two-layer knitted fabric, the carriage moves from left to right. During the process, all the needles of the front needle are raised to the finishing process due to the working position of the lifter, forming a glad line for the front layer. And the rear pinion does not rise



to the finishing process due to the fact that the lifter is not in the working position, and the ring formation process is not performed.

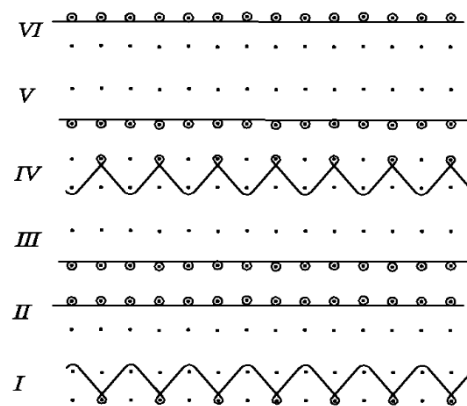


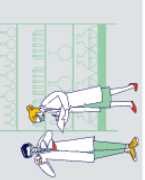
Figure 2. A graphic record of a two-layer knitted fabric (option II) in a new structure.

When knitting the sixth row of fabric, the front needle needles do not participate in the completion process of forming a loop and do not move up, and the rear needle needles move up to the completion process and form their glad loop row (Fig. 2).

As a result, a two-layer knitted fabric with a new structure was produced as a result of the rapporti consisting of six rows of glad and press ring rows alternating and placing the needles in an interlocking order against each other.

The production sequence of the double-layer option III knitted fabric sample in the new structure is as follows.

The total rapport of the two-layer knitted fabric consists of eight rows, and the carriage of the knitting machine moves from left to right when knitting the first row of the fabric. During the process, the selected odd needles of the front needle are lifted up by the finishing process due to the working position of the lifter, and a single needle is spun to form the glad loops. A pair of needles does not rise to the completion process due to the fact that the lifting loop is not in the working position and does not participate in the loop formation process. The double needles of the back needle are raised to the incomplete completion process due to the half-off of the lifting thread, forming half-loops with a single needle. In this case, due to the fact that the lifting loop is not in the working position, the odd needles of the back needle do not rise to the finishing process and do not participate in the loop formation process. As a result, on the front needle, a full loop row is formed by spinning one needle for the front layer, and on the back needle, a half loop row is formed for the back layer. When knitting the II row of the knitted fabric, the carriage moves from right to left and performs the same sequence of processes as in the first row. In single crochet production, rows of loops are formed by moving one needle forward. When knitting the III row of the knitted fabric, the carriage of the machine moves from left to right. All the needles of the front needle do not go up and do not participate in the loop formation due to the fact that the lifter is not in working condition, and all the needles of the back needle complete the process due to the fact that the lifter is in full working position,



forming a row of glad loops for the back layer. When knitting the third row of fabric, the function of the needles changes. Now, when the carriage moves from right to left, if all the needles of the front needle have a full glad row, the process of forming a loop on the needles of the back needle will not be performed.

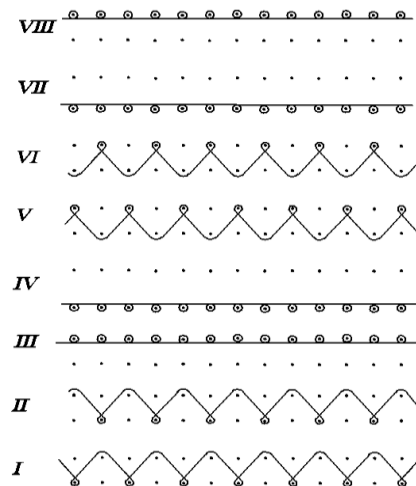
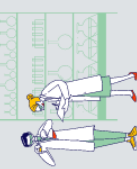


Figure 3. A graphic record of a two-layer knitted fabric (variant III) in a new structure.

When knitting the fifth row of knitted fabric, the carriage moves from left to right, the double needles of the front needle are lifted up by the partial completion process due to the half-turning of the lifting loop, and one needle is interlaced to form half loops, and the odd needles of the rear needle move to the full completion process due to the lifting loop being in working position. rise and form glad rings by winding one needle for the back layer. As a result, half loops are formed on the even needles of the front needle, and full loops are formed on the odd needles of the back needle. In this case, the odd needles of the front needle and the even needles of the back needle are not involved in the loop formation process, due to the fact that the lifting thread is not in working condition only for the selected needles.

When knitting row VI of two-layer knitted fabric, the carriage moves from right to left and performs the same sequence of processes as in the fifth row. In this case, rows of loops are formed by moving one needle forward in the production of the fabric.

In the production of the seventh row of two-layer knitted fabric, if the carriage moves from left to right and forms a glad row for the front layer on all the needles of the front needle, the loop formation process is not performed on the needles of the back needle. When knitting the eighth row, the carriage moves from right to left, as a result, the front knitting needles do not participate in the completion process of loop formation and do not rise up, and the rear knitting needles rise to the completion process and form their own glad loops (Fig. 3). At the end of the process, as a result of alternating glad and press ring rows consisting of an eight-row rapport and placing the needles in an interlocking order, a new pattern of two-layer knitted fabric was produced.



These produced fabrics created the basis for the expansion of double-layer knitted fabric assortments in the knitting industry and the development of resource-efficient technologies. It will be appropriate to use these fabrics for outerwear assortments.

References

1. Бабинец С.В., Кирина М.А., Котикова Е.И. и др. Рациональное использование сырья в трикотажной промышленности: Обзорная информ. Сер. Трикотажная и текстильно-галант. пром-сть. - Ц.: ЦНИИТЭИ легпром, 1985, вып. 1 - 52 с.
2. Безкостова С.Ф., Позднякова Н.Н, Ровинская Л.П. Трикотаж комбинированных переплетений. С.П. 1999 г.
3. Космынин А.П., Рогозина А.М., Набутовская Г.А. Новый ассортимент трикотажных полотен с кругловязальных машин / ВНИИТП. - М., 1983. – 5с.: Деп. В ЦНИИТЭИлегпром 05.05.83, № 746 ЛП. - Д83.
4. Набутовская Г.А., Рогозина А.М., Космынин А.Н., Аксенов З.А. Ассортимент и технология изготовления облегченных трикотажных полотен // Совершенствование технологии трикотажного производства. - М.: ЦНИИТЭИ легпром, 1981. - с.3-8.
5. Разработка трикотажных полотен для верхних изделий с минимальной материалоемкостью: Отчет о НИР/Омский институт бытового обслуживания. Руководитель Смирнова Н.А. ГР 02840027325. Омск, 1984. -88 с.
6. Цитович И.Г., Болдырева Ю.И. К расчету параметра одириного кулирного трикотажа // Изв.вузов. Технология легкой промышленности. 1992. №3-4. С. 65-69.
7. Цитович И.Г., Болдырева Ю.И. Оценка показателей, влияющих на экономику производства одинарных и двойных трикотажных полотен // Изв.вузов. Технология легкой промышленности. 1992. № 3-4. С. 69-74.

