Development of Structures of Double Patterned Weaves With Elements of Press Loops With A Geometric Pattern

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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. In the article, the analysis of the prospects for the development of double-patterned weaving constructions with geometric patterned press ring elements was highlighted.

Keywords: Double knitting machines, light industry, production of knitwear, patterned weave elements, press weave.

1. Introduction

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. The knitting industry, taking into account the mastery of a number of product advantages, as well as efficient production technology, is one of the most promising branches of the textile industry [1-4]

2. Materials and methods

The development of the production of knitwear will lead to the further application of new technologies and the expansion of the range of knitwear. In the fields of trade industry, as well as in the service sector, the main requirement is the production of knitwear, which is combined with high manufacturability and wide distribution, which will lead to low cost, with relatively acceptable consumer characteristics and parameters. In this regard, the solution of the above problems in the technological part of the production of knitwear is of particular importance and is necessary.

Currently, the range of knitwear tends to expand. It is enriched with new kinds and types of fabrics, in particular, fabrics made mainly on double knitting machines. In the production of this type of cloth, it is required to achieve a patterned texture of the product while maintaining operational, hygienic and aesthetic properties [5-9].

In the process of manufacturing knitwear with reduced material consumption, this direction is the most promising, provided that methods are developed that allow predicting the properties of knitwear and creating such structures that must meet the requirements of technical

aesthetics for their intended purpose and modern artistic and color design. Therefore, the improvement of the technology for the production of knitted fabrics with the use of patterned weave elements is relevant.

Purpose and objectives of the study. In view of the foregoing, the purpose of this work is to improve the technology for the production of knitted fabrics using patterned weave elements, on the basis of scientific generalization, to develop practical methods for obtaining patterned knitwear with the introduction of a transferred loop and a press loop into the structure of patterned elements on knitting machines.

2.1. Fundamentals of the formation of patterns of flat-knitting knitted fabrics. In order to realize the advantages of flat knitting machines, an artist-technologist needs to master the basics of knitting technology, know the patterning capabilities of machines, and the basic principles of pattern formation using selection mechanisms [10].

One of the most acute problems, especially in connection with the transition to market relations, is the problem of the assortment flexibility of production to changes in market conditions [11]. This problem can be solved by the widespread use of computer technology in the control of technological processes for obtaining canvases. Currently, abroad, computer technology has found its wide application in 3D format both in the technological and educational process, as well as in the analysis process.

On flat knitting machines, four methods of selecting needles are used: general, group, individual and combined. With general and group selection, needles are selected all at the same time or in groups. For group selection, needles with high, medium and low heels or needles with heels located at different distances from the needle head are used. Additional auxiliary elements are also used in the form of pushers equipped with heels of different lengths, or with heels located at different levels along the height of the pusher. All working bodies (needles and pushers) are pre-arranged on the machine in accordance with a given pattern. The general and group selection of needles is carried out on flat knitting machines with the help of machine locks.

To obtain a variety of patterns, individual selection of needles is used, performed using selection mechanisms containing a knitting program for a pattern. The executive bodies of such mechanisms are the selection plates and drums. In the combined selection of needles, two or three selection methods listed above are used simultaneously [12].

2.2. Formation and design of colored patterned structures of weaves on canvases. The principle of obtaining patterned weaves is that each of the threads of different colors is laid only on certain needles included in the work, in the order that depends on the pattern. At the same time, if a new thread is laid on the needles selected according to the pattern, then the old loops from these needles must be discarded; all other needles that are not involved in the work are idle without forming loops. Patterned knitwear from flat knitting machines, along with other types of knitwear, has become widespread. Patterned weaves, depending on the design of the selection mechanism available on the flat knitting machine, make it possible to obtain a variety of color patterns of simple and complex shapes. These drawings can be, in the simplest case, an alternation of colored stripes, a combination of various rectangles and squares,

2.3. Drawings of a small rapport. The simplest type of patterned fabric is needle jacquard, which is a patterned knitwear obtained without the use of a jacquard mechanism.

The color pattern on the needle jacquard is formed by combining elongated front loops with ordinary front loops of one of the smooth weaves: satin stitch, eraser, fang, semi-fang. A characteristic feature of needle jacquard patterns is the formation of pattern elements on the canvas, which can only have a rectangular shape and consist of a combination of colored rectangles or squares against a background of vertical and horizontal colored stripes.

Depending on the pattern, the width of the vertical stripes can be any. Their dimensions

are determined by grouping the needles of the two positions before threading the machine. The width of the horizontal stripes formed by periodically switching thread guides threaded with threads of different colors is set by the program of the coloring machine.

2.4. Large rapport drawings. The formation of color patterns of large rapport is possible only on flat knitting machines equipped with selection mechanisms. A complex arrangement of patterned pushers allows you to get a variety of patterns with several vertical axes of symmetry.

In the process of performing the work, the technological capabilities of both circular knitting and flat knitting machines were deeply investigated and studied, new variants of pattern repeats were developed [14]. In the variants, elements of the motif of a geometric ornament with the corresponding symmetrical repetition of rapport are selected and used.

Symmetry is a property of a figure (or an ornamental motif) superimposed on itself in such a way that all its points occupy their original position. Symmetry is characteristic of both organic and inorganic nature. In the visual arts, symmetry is widespread, being one of the important means of constructing an art form. Symmetry finds its greatest use in ornamentation, usually being present in any ornamental composition or its elements. Symmetry is one of the most common forms of manifestation of the rhythmic beginning in the ornament. In the theory of ornament, it has a special place. Consider the main types of symmetry used in the composition of ornaments. These types of symmetry, which are symmetrical transformations of figures in the process of forming various motifs and compositions,

Antisymmetry. A figure painted in one color can be equal to a figure painted in another color. A positive relief form (bulge) can be equal to a negative one (deepening). This kind of equality is called the opposite equality, or antisymmetry. To depict equal and anti-equal figures, black and white colors are used. Therefore, two-color black-and-white or other colors of figures can serve as models of antisymmetric figures. Antisymmetric figures are widely used in the ornamentation of fabrics and knitted fabrics. The possibilities of antisymmetry in ornamental compositions are very large. The artist can use them taking into account coloristic, technological and other compositional solutions.

Similarity symmetry. A figure of a certain shape can undergo transfers with a simultaneous decrease in the size of the figure itself and the gaps between the figures. Such transfers are characteristic of similarity symmetry. Option 2 - using two types of symmetry - antisymmetry and similarity symmetry.

3. Results and discussion

When analyzing the composition of monorapport ornaments, we will not consider all the numerous geometric shapes in the form of which they can be represented, but only those that are characteristic of ornaments made on knitting machines. This is a square and a rectangle, less often a rhombus and a regular hexagon. These figures can be divided into equal parts.

Among the numerous compositions of monorapport ornaments, three main types can be distinguished:

- symmetrical solution - with symmetry elements, but without translation (transfer);
- asymmetric solution;
- symmetrical solution - with translation and a certain number of rapports.

As mentioned above, a separately executed motif can also be attributed to mono-rapport ornaments.

In [15-18], the concept of absolute and relative volumetric lightening of the web structure is introduced. The absolute volumetric relief is the difference between the bulk density of the base fabric and the experimental one. Relative relief is the ratio of absolute volumetric relief to the bulk density of the base web, expressed as a percentage. It should be noted that in each knitwear structure there are resources for reducing material consumption, based on the optimal choice of structure parameters, depending on the length of the thread in the loop. However, the parameters of knitwear,

among others, depend on the conditions for the formation of the structural effect, which were not taken into account in the considered works.
In the process of doing the work, 4 variants of the pattern were developed for working out on flat knitting machines [18-20]. In the variants, the corresponding symmetrical repetitions of the rapport are selected and elements of the motif of a geometric ornament are used.
The 1-variant of knitwear is knitted with an eraser weave on both needle beds, on certain needles, according to the rapport, a press loop is formed with one outline, i. e. with index 1. The rapport of the pattern consists of 19 rows, 27 needles of the front and back needle beds are involved in width. On fig. 1 shows the structure of the weave.
2 - the knitwear variant is knitted with an eraser weave on both needle beds, on certain needles, according to the rapport, a press loop is formed with two sketches, i. e. with index 2. The rapport of the pattern consists of 23 rows, 27 needles of the front and back needle beds are involved in width. Figure 1 shows the weave structure and Figure 2 shows the graphic
record.

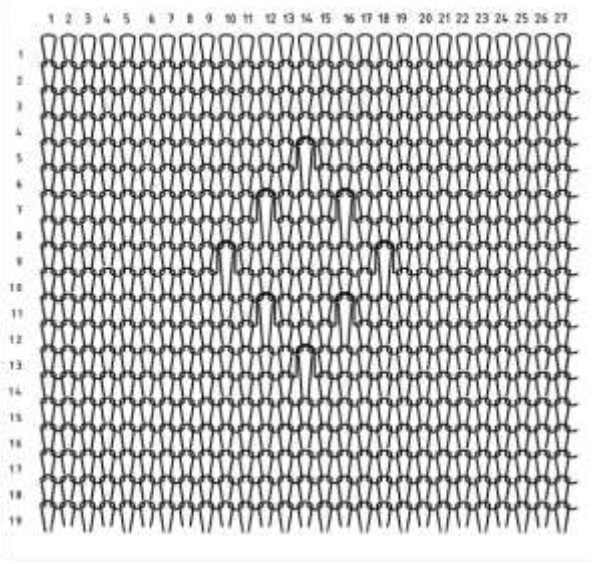

Figure 1. Option 1 -press weave structure with index 1.

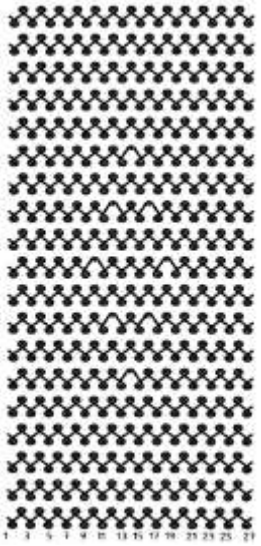

Figure 2. Option 1 - graphic recording of the press weave with index 1.

3 - the jersey variant is knitted by weaving an eraser on both needle beds, on certain needles, according to the rapport, a press loop is formed with three sketches, i. e. with index 3. The rapport of the pattern consists of 25 rows, 27 needles of the front and back needle beds are involved in width. Figure 3. shows the structure of the weave and figure 4 shows a graphical record.

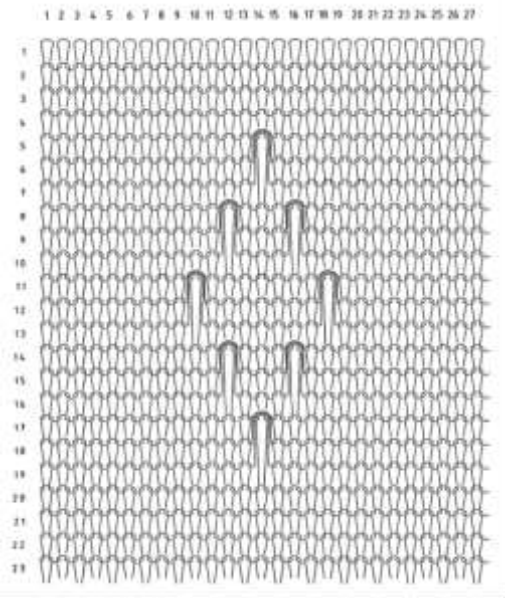

Figure 3. Option 2 - the structure of the press weave with index 2.

Figure 4. Option 2 - graphic recording of the press weave with index 2.

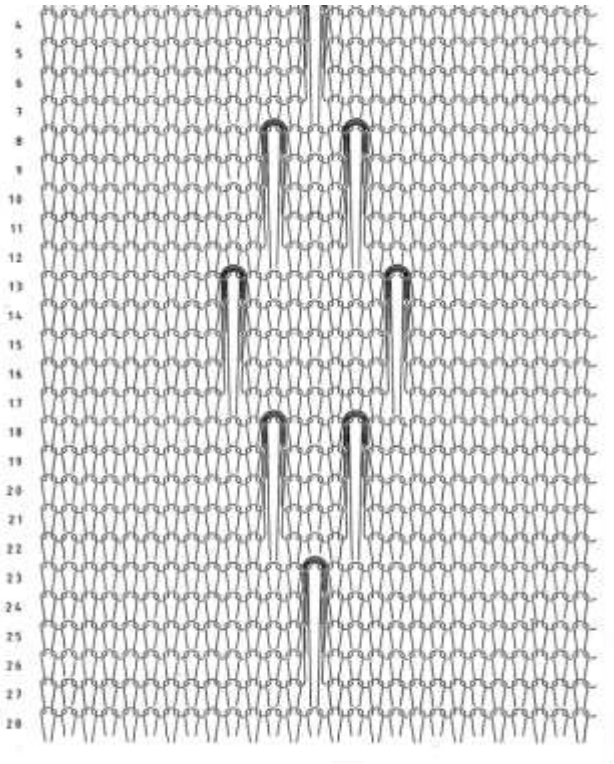

Figure 5. Option 4 - press weave structure with index 4.

Figure 6. Option 4 - a graphical record of a press weave with an index of 4.

The 4-variant of knitwear is knitted with an eraser weave on both needle beds, on certain needles, according to the rapport, a press loop is formed with three sketches, i. e. with index 4. The rapport of the pattern consists of 28 rows, 27 needles of the front and back needle beds

are involved in width. On fig. 5. shows the structure of the weave and in fig. 6 is a graphic record.

Thus, the above is a description of the knitting process of the newly developed weave structures with a press weave on flat knitting machines. Further, in the next section, the results of the tests and analysis of the technological characteristics and physical and mechanical properties of the finished samples in the CENTEXUZ certification center at TITLP are presented.

Conclusions

- The knitting system, the position of the wedges and the technological capabilities of two-hole flat knitting machines have been studied and analyzed, in particular, using the example of PROTTI machines with program control.
- The conditions for the formation and design of colored patterned structures of weaves, both large and small rapport on fabrics, the features of technological pattern formation on PROTTI flat knitting machines, and various pattern ornaments were developed in relation to the outer knitwear.
- New structures of double patterned weaves with a small pattern were developed, formed and created, as well as obtained, on the basis of which graphic records were compiled, descriptions of the knitting process in rows are presented.

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