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DEVELOPMENT OF NEW STRUCTURES OF COMBINED WEAVES WITH A PATTERNED EFFECT BY ONE-SIDED AND TWO-SIDED LOOP TRANSFER

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Abstract

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 to the above problems in the technological part of the production of knitwear is of particular importance and is necessary. In the article, the features of creating a technological pattern on flat knitting machines were studied. On the basis of patterned, double-patterned weaves, various patterns were created for outerwear. The article explores the features of improving the technology of production of knitted fabrics using knitted elements, the development of practical methods for obtaining knitted knitwear based on scientific generalization, and the formation of patterns on flat knitting machines.

Keywords: knitted fabric produced on double-knit flat knitting machines, design methods based on elastic weave, with the introduction of a press pattern into the structure.

Introduction

An analysis of domestic and foreign scientific, technical and patent literature in the field of combined weave knitwear made it possible to identify three types of publications, the content of which corresponds to the applied tasks of this industry related to the problem being solved [1-7].

The first type includes patents, author's certificates and articles on knitting technology, containing only a description of individual structures and methods for producing knitwear with combined weaves. These publications lack the results of a study on the structures, properties and processes of knitting knitted products. But, they are of value for science and practice in order to further study the technological possibilities of the production of knitted materials and

products, and to find methods of combining, which is the starting point for the theory of combined weaves.

The second type includes research reports, which describe the structure and operational properties, and in some cases the features of the knitting processes of one or more types of combined weave knitwear obtained on a specific knitting or knitting machine and intended for a certain range of products.

And finally, the most interesting are theoretical publications of the third type - on the systematization of research results and the creation of a theory of combined knitted weaves. For example, I.I. Shalov proposes the division of combined types of weaves into simple ones, which contain only one element of the loop structure, i.e. loops, press, which include two elements, i.e. loops, as well as sketches and overheads containing loops and broaches, and mixed combined weaves, consisting of three elements of a loop structure, i.e. with the help of loops, broaches and sketches. The most common combination methods include the following: alternation of elementary rows of two, as well as several main weaves, incl.

Prof. L.A. Kudryavin proposes the division of culinary and warp-knitted weaves into simple combined, patterned combined, derivative, derivative-combined, as well as complex combined weaves [8-11].

As for the derivative-combined weaves, they, in contrast to the derivative combined, contain weaves of different classes. For example, in one row there can be such elements as an incomplete eraser, as well as loops that complement it and have a derivative surface.

Complex combined weaves include signs of two or more of the above types of combined weaves.

In one fabric, the use of different weaves of a single type is aimed at eliminating the negative and maintaining the positive characteristics of the knitwear of the weaves under consideration. Thus, for example, by significantly reducing the deformation in both directions, it is possible to achieve an increase in the dimensional stability of the knitwear, i.e. strength increases with the improvement of heat-shielding characteristics and appearance. It becomes possible to change the surface density in one direction or another.

In general, all types of knitted weaves used in the manufacture of a product constitute a certain ornament on the surface of the fabric.

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As for the ornament of knitted fabric, it, like other ornaments, is considered a system of regular (based on the laws of rhythm, symmetry, etc.) combinations of both geometric and pictorial structure-forming elements. It has a close relationship with the structure of the weave itself, as well as with the shaping and design features of materials and products, depending on the value of the latter.

The main regularity of the ornament is the periodic repetition of the motif, and this repetition of the ornamental motif produces an aesthetic effect. Ornamental compositions in which the motive is repeated at regular intervals are called rapport [12-14].

One of the methods of the compositional solution of the ornament is symmetry, it has a special place in the ornament. Symmetry allows you to reduce the infinite variety of ornaments to certain groups. In particular, on the basis of a compositional solution based on symmetry, the ornaments of knitted fabrics are divided into four groups:

1. Monorapport
2. Linear rapport
3. Mesh-rapport
4. Combined

Monorapport ornaments are finite figures with zero-dimension symmetry. Knitted fabrics of a mon rapport ornamental solution are most often piece products with a different contour (outline) - in the form of a square, circle and other more complex shapes. Such products include scarves, shawls, bedspreads, capes, lace and curtains, the product is symmetrical, its parts are transformed into one another, interchanged during symmetrical transformations.

Flat piece products can only be transformed by the following symmetry operations: identification operation (stay in place); rotations around axes perpendicular to the plane of the figure; reflections in planes of symmetry perpendicular to the plane of the figure. These operations transform one into other equal parts of flat products, i.e. those parts into which the product can be divided. An example of a mono-rapport ornament in the form of an emblem on a pocket or sleeve of a knitted product is shown in Figure 1, a.

In linear-rapport ornaments, rapport (motif) has repeatability in the direction (along) one straight line, which is called the transfer axis; these ornaments refer to one-dimensional and infinite figures.

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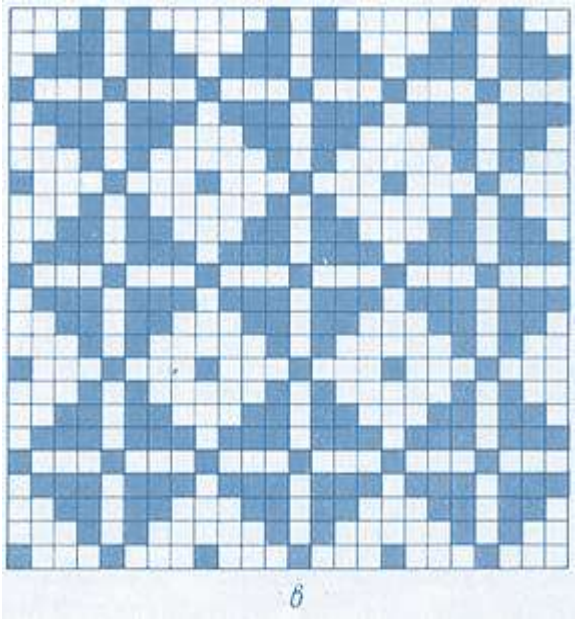
In knitted and textile materials and products, these types of ornaments are mainly referred to as "borders", which include ornaments on finishing products: ribbons, braids, and lace.

If we imagine an infinite series of equal flat figures (motifs) located one relative to the other as shown in Figure 1, and carry out the movement of the figures without changing their relative position in the direction (along) the straight line at a distance p under the conditions that each figure is aligned with the neighbouring one, then all the existing figures can take a relatively new position that does not differ from the original one. The smallest value of the distance p, passed by the figures, before the process of their combination takes place, is considered an "elementary transfer". Thus, figure 1, shows a linear-rapport ornament that has only such an element of symmetry as the translation axis (translation axis).

In total, seven types of linear rapport ornaments differ in the symmetrical transformations of their elements [9].

Linear rapport is very typical for knitted fabrics and products. They are especially characteristic of warp-knitted fabrics, the production method of which allows you to endlessly vary ornaments in composition and colour. Knitted fabrics and products with a linear-rapport ornament may have a different compositional structure depending on the nature of the filling of the fabric plane on both sides of the actual border.



Picture 1. Ornament of various compositional structures.

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Ornaments of the mesh-rapport type have two transfer axes - both horizontal and vertical, i.e. they can be attributed to the system of a two-dimensional infinite figure (Figure 1) the simplest mesh-rapport ornament is a grid of parallelograms (hence the name "net ornament"). In more complex ornaments, one can always find a grid, the nodes of which make up a certain system of points in the ornament.

There are five parallelogram systems of points, or nodes, which form the basis of the composition of the mesh ornament: square, regular triangular, rhombic, rectangular and oblique. For ornaments of knitted fabrics, only two systems of points are characteristic - square and rectangular. The rapport, or elementary cell, of the mesh ornament of the knitted fabric, is limited to the sides of a square or rectangle, it is filled with a certain number of loop rows, which are located horizontally, as well as loop columns, which are placed vertically. Thus, the loop structure of the knitted fabric determines the compositional structure of its ornament. The square and rectangular systems of points provide mesh-rapport ornaments of all kinds of symmetries and compositional solutions.

By subjecting the entire rapport or figure to transfers, we get congruent figures. Thanks to transfers, it is possible to cover the entire plane with rapport. Rapports always adjoin one another, not overlapping one another and leaving no gaps.

In mesh-rapport ornaments, the rapport itself is the final figure, limited by the transfer axes, which are two pairs of parallel lines. Each rapport (motif) of an ornament of a mesh type should have a location in the same ratio as neighbouring rapports (motifs) in any place of the ornament. This is provided by a rectangular system of points (nodes). It is always possible to determine the exact parameters of the ornament grid, i.e. distances between its equivalent points.

Based on the attribute of textured form, ornamental paintings are divided into three groups - smooth (planar), structural and combined.

In turn, the group of smooth canvases is divided into subgroups, which include shiny, combined (or tinted), and the group of structural canvases can be divided into the following subgroups - embossed, openwork, pile and combined.

The process of forming a knitted fabric ornament is accompanied by several artistic, technological and functional and economic norms and requirements.

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Fulfilment and observance of these requirements are mandatory at the design stages of ornamental paintings regarding materials and products for various purposes.

In connection with the foregoing, in the ornament of knitted fabric, it is possible to embody a kind of synthesis of art, science, as well as technology.

According to the principle of using pattern-forming devices when developing different patterns on canvases, ornamental canvases can be classified into four main groups:

1. Fabrics that are created using a simple knitting method (by means of flat knitting, circular knitting and warp knitting machines), where there is no need to use additional pattern-forming devices.
2. Cloths that are obtained in the case of a group selection of needles using patterned presses (using warp knitting machines).
3. Fabrics obtained in the case of individual selection of needles, i.e. when using jacquard mechanisms.
4. Cloths that are obtained in cases of using a combined knitting method (using various types of machines).

According to the structure of the weaves used in the formation of patterns, knitted fabrics can be divided into the following groups in accordance with the existing classes of weaves: main; keeper; incomplete; paid; sirloin; openwork; weft; plush; jacquard; press; lined; combined.

An ornament on a knitted fabric is formed on the basis of the interlacing of threads that form the fabric, and therefore the contour outlines of the ornament motifs are processed in relation to the weave. Depending on the weave of the fabric, they can be straight, stepped or curved. The specificity of rapports (motifs) of the ornament is expressed by the decorative mechanisms of the weave structure, which include loops, broaches, sketches and weft threads of different shapes. The visible structure of the weave is significantly affected by the thickness and type of yarn, and the decorative properties of the threads. This should also be taken into account when forming an ornament.

It should be noted that the structure of the knitted fabric is characterized by a certain aesthetic content. Ornament and interweaving are a means of aesthetic impact and decorative expressiveness. Therefore, the structure of the weave of the web must be visible.

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An ornament, as an element of the structure of the weave of knitted fabric, has several properties with common patterns. Both the ornament and the structure of the weaving take on the property of symmetry, the weave of the canvas, like its ornament, has a number of symmetry elements. To find out the relationship between the symmetry of the ornament and the symmetry of the weave, it is necessary first of all to establish symmetrical patterns in the structure of the weave, and then compare them with similar patterns in the ornament, revealing common features and differences. As a result, the relationship between the forms of ornament motifs and the structure of the canvas will be found.

Knitwear has three dimensions: width, length, and thickness, i.e. is a three-dimensional figure. However, the artist of the leaf ornament can neglect one dimension - thickness - to imagine knitwear as a two-dimensional flat endless system, characteristic of the mesh-rapport ornament. In this case, a common pattern arises between the mesh-rapport ornament and the weave of knitwear: the presence of transfer axes in two mutually perpendicular directions. It is also possible to reveal the presence of a rectangular system of repeating mesh nodes, in which both weaving elements and ornamental elements fit. In knitted knitwear, the repeat knots of the grid of the ornament and the weave completely coincide, while in warp knitwear, these grid knots most often do not match.

Considering the structure of culinary weaves, it is easy to notice the presence of symmetry elements in them. For example, planes of symmetry can be drawn in weaves such as satin, eraser, fang, etc. regularities of symmetry in the structure of warp-knitted weaves have a different character. In such weaves, the top and bottom are clearly distinguished, therefore they cannot have such an element as a horizontal plane of symmetry. The vertical plane of symmetry cannot be drawn in them, with the exception of sirloin and plated weaves, which can be carried out conditionally. These two types of weaves are formed by two systems of threads with their opposite (symmetrical) masonry.

The structure of knitwear is characterized by various rhythmic movements of its elements - loops, sketches, and individual threads. The main weaves, which have the simplest structure, are characterized by simple rhythmic movements, the patterned and combined weaves are more complex.

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Conclusion

1. The features of technological pattern formation on flat knitting machines have been studied. Various pattern ornaments for outer knitwear based on double-patterned weaves have been created.
2. The structure, graphic recording and description of the process in rows for 2 variants of new combined knitwear based on elastic weave using the technological process of transferring loops and introducing an additional patterned element into the weave structure - elongated loop broaches to create a patterned effect on the surface of the fabric.

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