WEFT KNITTED FABRIC WITH NEW EFFECTS

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Abstract
The paper presents various structures with relief patterns achieved through mix of techniques, knitting – transfer or knitting – miss in order to achieve knitted fabrics with new surface / structural effects.
In the first case there are described seven structure variants based on single jersey, rib and purl with transferred elements (loop and stitch), with transferred and crossed stitches.
In the free arrangement of the knitted fabric the bilateral transferred loops and the sinker loop close a shape which suggests a knitting of the yarn as a stitch, positioned on a cross direction. In a stretched state the elements determine a structure of network type with quadrilateral openings.
The yarn migration from the normal stitch to the transferred stitch, always located in the same rows, leads to increase of the sinker loop length that connects them, and this suggest an effect of longitudinal stripes consisting of 3 rows.
Mixing the float stitches with tuck loops that are alternating arranged in a rib evolution 1x1 can lead to achieving an effect of arrangement of honeycomb shape mainly determined by increase of the took loop step as against the float stitches.
The structure description has as base the analytical representation and also the representation of the stitch rows section in order to underline the sequence of the work stages.
The obtained effects in the knitted fabric are distinguished with help of photos achieved by image caption on a microscope.

1. Introduction

The development of the knitted fabric in what concerns effects aims at creation of new effects that will be used in the garment.
New effects in knitted fabrics can be generated not only through the change in pattern type and dimensions, but also by using other basic evolutions than jersey (rib and purl) [1, 2].
The knitted fabrics with stitch transfer patterns represent an important group of structures to be used when designing garments. Their large range of characteristics (from open structures to closed ones, net like open structures with different shapes and dimensions, etc) recommend them for different types of clothing, especially for women. They also can be used in technical applications, with specific type of raw material.

2. Theoretical considerations

The transfer technique [1], specific to flat knitting machines, can be used to produce a large range of fabrics, with different types of patterns with yarn geometry modifications. In this direction, the stitch transfer patterns can be developed to generate new surface effects.
The transfer technique is used to produce transfer patterns, basic evolutions (purl), tubular ribs and cable/aran patterns. It considers the transfer of the following structural elements:

- Stitch elements (needle loop, sinker loop and arms)
- Loops – split loops or beginning loops, produced in the first cycle a needle works

The structural variants of the patterns obtained based on the transfer of needle loops (stitch transfer) are determined by [3]:

- The transferred stitches or loops are placed in different wales
- The transfer is carried out on a needle that has a stitch or a loop
- The transfer direction varies along the pattern height

Considering the transferred elements, there are the following structural possibilities: a stitch transferred to a stitch, a stitch transferred to a loop and a loop transferred to a stitch. The paper presents pattern variants with transferred stitches (stitch to stitch) with transfers in both directions and in only one direction.
The basic evolution used for the fabric is another important aspect, influencing the yarn geometry, the surface covering and the fabric behaviour. In practice, almost all knitted fabrics with transferred stitch patterns are produced using the jersey evolution. In this direction there is a possibility to develop new patterns using rib and purl evolutions

3. Experimental Part

The selection of the structural variants is based on the theoretical considerations presented above, taking into consideration patterns with small dimensions and uniform distribution of the modified elements. The fabrics were produced using jersey, rib and purl evolutions, thus combining the effect generated by the pattern with the specific geometry of each type of evolution.
The samples were produced on a flat knitting machine, gauges 5E and 12 E, using acrylic yarns.
The effects obtained in the fabrics are grouped based on their surface cover capacity – open, semi open and closed fabrics.

3.1. Knitted fabrics with open structure

In this group there are included several structural variants with openings of different shape and dimensions and positioning within the fabric. The effects are 2D.
Variant V1 – *Jersey fabric with transferred stitches in opposite directions, on two needles loops* (see Figure 1) is characterised by the fact that the loops are in front of the transferred stitches. The structure is similar to the one known as eyelet/pelerine/ananas.

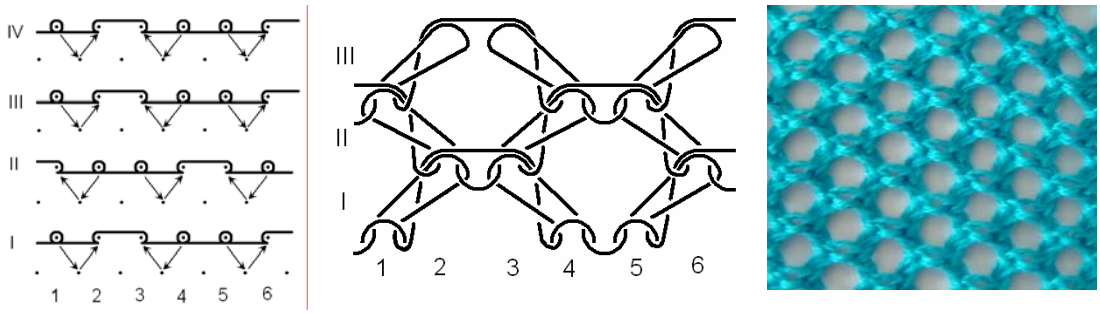


Figure 1. Fabric knitting sequence, structural representation and aspect for variant V1

The stitch transfer takes place in two stages, first on the opposite bed and then on the needles that formed the loops. The openings have a diamond shape and are placed diagonally.

Variant V2- *Jersey fabric with loops transferred on needles with stitches* (see Figure 2) is characterised by a pattern made of 3 rows and 3 wales, different from the

classic variant with 2 rows and 2 wales. The pattern width includes a normal stitch, with vertical position.

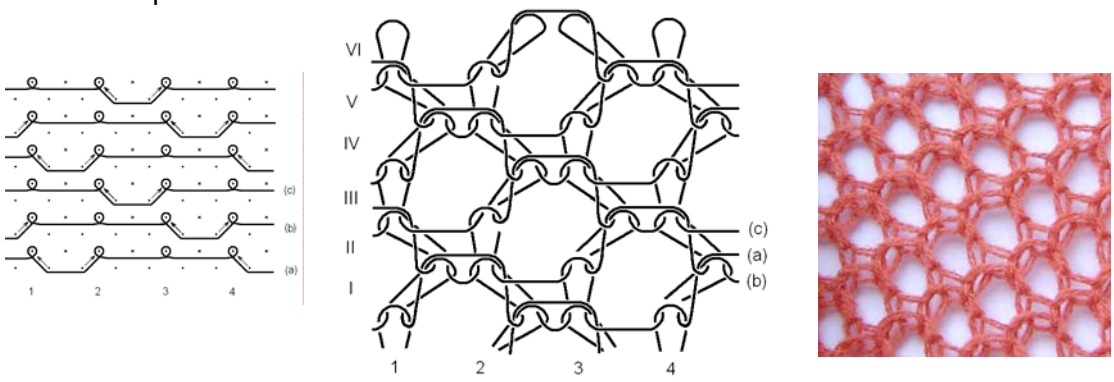


Figure 2.Fabric knitting sequence, structural representation and aspect for variant V2

Variant V3 *Rib fabric with transferred stitches in the same directions for each bed* is a 1x1 rib fabric, with successive transfer of the front and rear stitches in the same direction. In each pattern course (Figure 3) there are front and then rear stitches transferred on neighbouring needle from the opposite bed, determining a diagonal placement of the loops formed after transfer. The effect generated in the fabric is the same on both sides, the stitches presenting an inclined geometry. This is semi open structure, with an equal number of normal and transferred stitches. The rib aspect is diminished due to the fact that the front stitches cover the rear ones. The fabric extensibility is high on both directions, as well as along the diagonal direction.

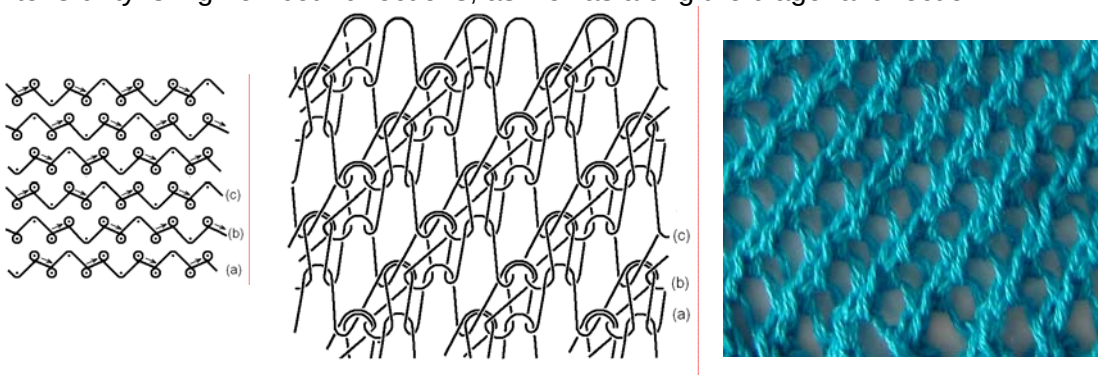


Fig. 3. Fabric knitting sequence, structural representation and aspect variante V3

Variant V4 – *Fancy purl fabric with transferred stitches in opposite directions* – is an example where the transfer always takes place on a needle from the opposite bed. Even though the number of rear stitches is higher within the pattern (w=2 wales, h=4 rows), the transferred front stitches cover the rear ones. The openings have an irregular contour, caused by the positioning of the structural elements under different angles, as illustrated in Figure 4.

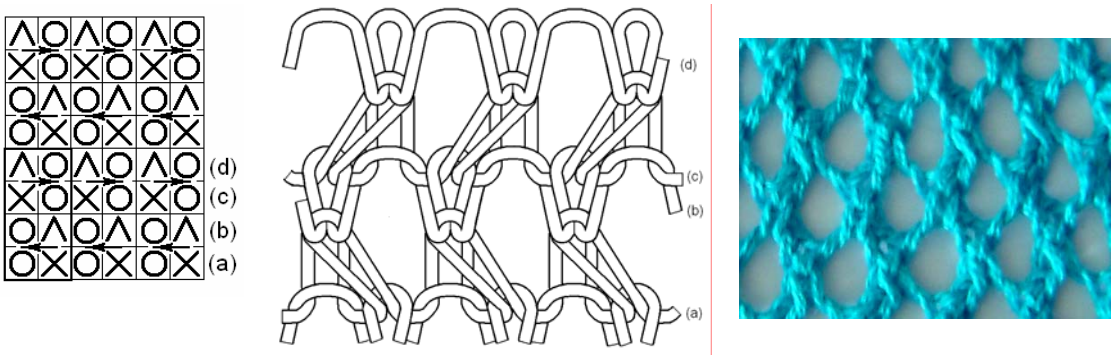


Fig. 4. Fabric knitting sequence, structural representation and aspect variante V4

3.2. Knitted fabrics with semi open structure

Variant V5 – *Jersey fabric with loops transferred on two needles* - (Figure 5) contains three rows: the first is normal jersey while in the other two the loops are formed and transferred on needles from the opposite bed. After transfer, the two loops are extended on the neighbouring needles. The relief effect generated on the fabric back is extremely interesting and is caused by the horizontal positioning of the extended transferred loops together with the sinker loops.
The yarn length in the transferred loops gives the fabric an increased elasticity on both directions. When the fabric is strained, the square shaped openings become visible.

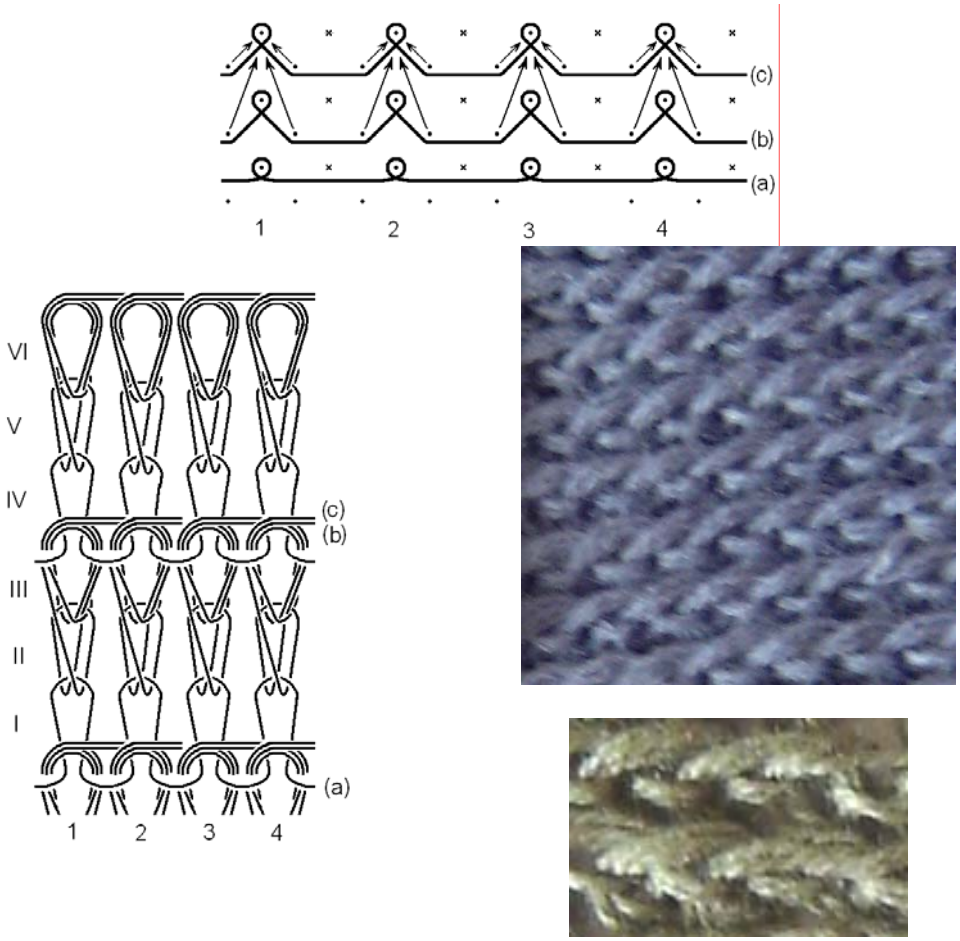
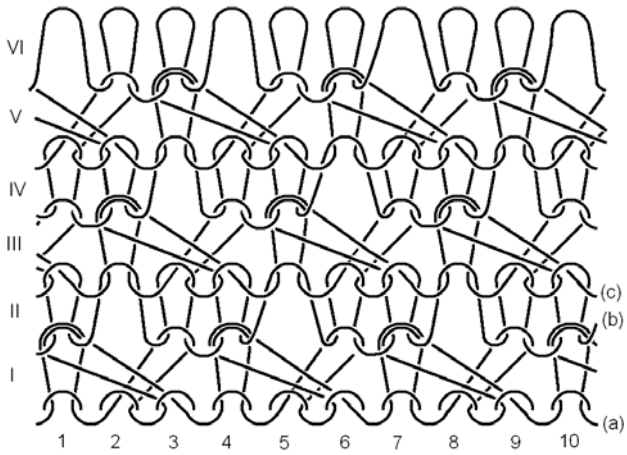


Figure 5. Fabric knitting sequence, structural representation and aspect for variant V5

Variant V6 – *Jersey fabric transferred and crossed (cable patterns) stitches* – (Figure 6) resulted from using the transfer technique to obtain two types of patterns. The pattern dimensions are 3 wales and 6 rows. The effect is caused by the stitches transferred not on the neighbouring, but on the second needle and the ones transferred on the neighbouring needle, that are forming a cable pattern. The fabric is extensible on the wale direction. When strained, the diagonally placed openings are visible.



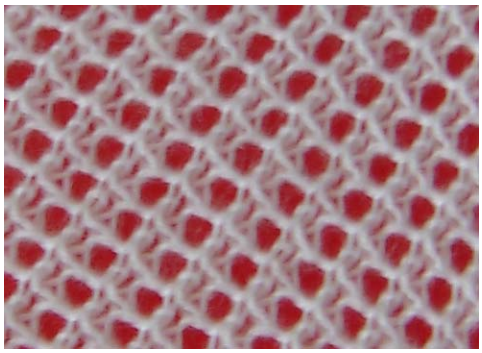


Figure 6. Fabric knitting representation and aspect for variant V6

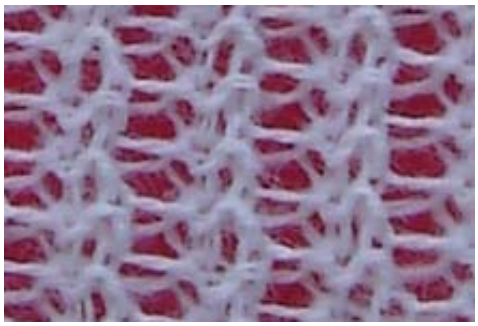
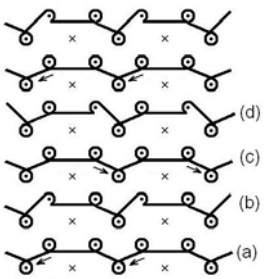


Figure 7.Knitted fabric with longitudinal stripes effect

A totally different is obtained using the same pattern, but with another positioning/distribution of the modified elements. Figure 7 presents a fabric where the pattern repeat is 2 rows; therefore the modified elements are always placed in the same wales.
The effect is of longitudinal stripes, 3 wales wide and separated by the extended sinker loops.

Variant 7 - *1x2 rib fabric with transferred stitches* – (Figure 8) is a fabric where the effect is generated by the normal front wales and the openings created on the rear bed.



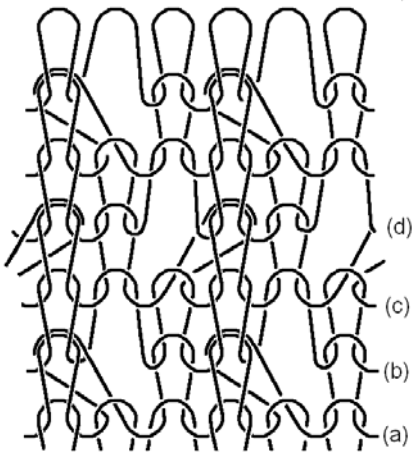


Figure 8. Fabric knitting sequence, structural representation and aspect for variant V7

3.3. Knitted fabrics with closed structure

Variant V8 – *Rib fabric with miss and tuck stitches* – (see Figure 9) – has a relief effect , identical on both sides of the fabric, caused by the different pitch specific for miss and tuck stitches.

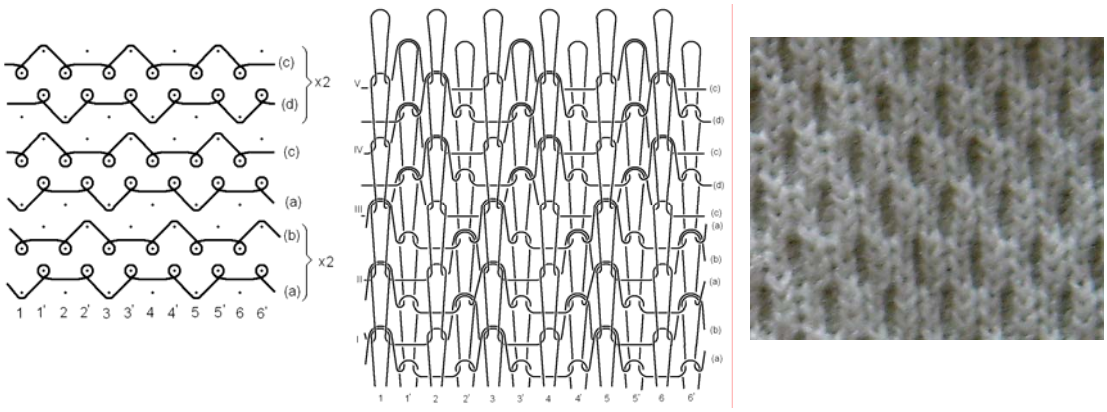


Figure 9. Fabric knitting sequence, structural representation and aspect for variant V8

4. Conclusions

In conclusion we can say that the relief patterns can lead to achievement of new effects in the knitted fabric by selecting the type of the evolution modification and their arrangement in the report frame. The evolution corresponding to the new aspect characteristics obviously modify the knitted fabric behaviour and this must be correlated with the purpose of the garment.

The transfer technique continues to be an important way to develop new knitted fabrics with different surface or relief effects.
The combination possibilities with other knitting techniques, as well as the use of different evolutions, especially rib and purl, represent one of the main design directions for the knitted fabrics. Fabrics with new and unlimited effects can be obtained, adding value to garments, where aesthetic criteria are of most importance.

Acknowledgments

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