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Warp-Knitted Interlock Stitches – New Stitch Group. Concept of Formation and Structure

Abstract
The concept of a technology for new warp-knitted fabrics and a warp-knitting machine for manufacturing these fabrics are presented in this article. The structure of warp-knitted interlock stitches produced on the basis of the new technology has been described. The article indicates the way to produce a new group of stitches on a warp-knitting machine equipped with a tuck presser.

Key words: *warp-knitting, interlock, interlock stitches, end-use properties, cover factor, warp-knitting machine, warp-knitted fabric, tuck presser.*

Introduction

Depending on its purpose, knitted fabrics should have definite end-use properties. In order to obtain the required attributes, it is frequently necessary to apply fabrics with a high yarn cover factor; this is linked to high area mass and at the same time with high linear density of the yarn and high raw material demand. It leads to an increase in the cost of fabric production and can also occasionally lower the quality of minor knitted fabric features. But both a high cover factor and the minimisation of the knitted fabric clearance can be attained by thickening loops while using even thin yarns. This gives rise to a decrease in the demand for the raw material and an improvement in many of the fabric end-use properties, in particular minimising its clearance.

Thickening of the loops set in knitted fabric, and by this means the increase in density, is only possible to a certain degree. This is due to the needle gauge number of knitting machines and the kind of applied technologies dependent on the machines' constructional solutions. In the case of weft-knitted fabrics, produced on weft-knitting machines, it is possible to cover fabric with yarn on interlock-type machines, where two groups of needles form loops alternately. This way of loop forming inspired the elaboration of a new technology for warp-knitted fabrics, as well as a concept of design and a machine construction for application of this technology [1].

Double Needle Bar Warp-knitting Machine for a New Group of Stitches

The double needle bar warp-knitting machine (Figure 1) for the application of the new technology is equipped with two parallel needle bars (2) and (3), whose needles (1) are situated along one line and with its hooks pointed in the same direction. The needles (1) of the first bar (2) are placed between the needles of the second bar (3). Knock-over sinkers (9) fitted in a sinker bar (10) are situated between the needles and close to them. The sinkers are fitted with the same interspaces as the needles of one of the bars. Moreover, there is a fall plate (5) for knocking over the loops (4) from the needles. A guide bar (8) is located above the described needle-bars with guide needles (7), transporting yarns (6) which fed the needles (1). As in familiar warp-knitting machines, the number of guide bars can be various, depending on the kind of stitch produced.

Needles (1) of both bars (2) and (3) make to-and-from movements along their axes, which is needed to form the fabric's loops (4), whereas the needles of both bars (2) and (3) work alternately. The guide bar (8) make a swinging motion between the projected up-needles (1), shifting on the plane perpendicular to the needle bars and, in its extreme moments, taking the position in the front of and behind the hooks. Furthermore the guide bar, in the extreme positions of its swinging motion, shifts along the needle bars by a segment equal to one needle pitch (at the moment when it is in front of the hooks) and by a few needle pitches (depending on the produced stitch) when it is behind the hooks. In addition, it shifts by one needle pitch along the needle bars at the time when both needle bars (2) and (3) are in the lowest position. The knock-over sinkers (9) move to and fro against the needles. They also make a to-and-fro movement by one half of the needle pitch

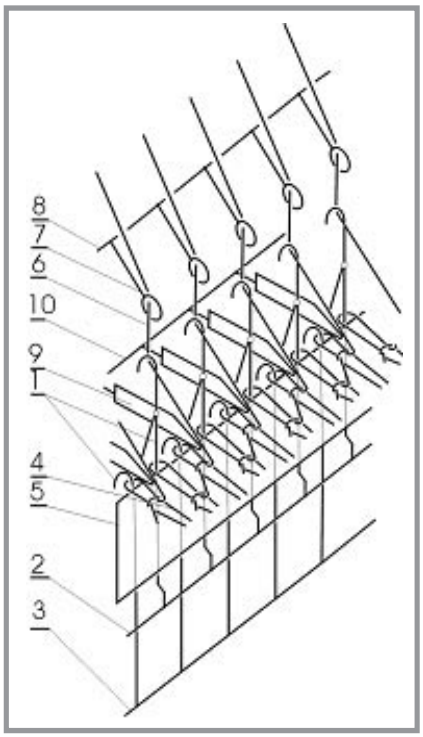

Figure 1. *New concept of double-bar warp-knitting machine.*

along the needle bars at the moment when both needle bars are in their lowest position. As a result of the machine elements' movements, the process of forming the consecutive loop courses occurs on every second needle.

Construction of Warp-knitted Interlock Stitch

As a result of applying the presented technology, a knitted fabric is obtained which is characterised by situating loops of one course in every second wale, as these loops are formed on every second needle. Loops of the next course are also situated in every second wale, formed on needles that had not formed loops in the previous course. Thus loops of consecutive courses, formed in every second wale, are shifted in relation to each other by half of their height. An example of the stitch construction described is shown in Figure 2.

The stitch presented in Figure 2 is constructed from one yarn system, which means that one guide bar was used for its production. These stitches can also be made from many yarn systems, using many guide bars for their production.

A group of knitted fabric stitches produced according to the above-mentioned technology may be referred to as warp-knitted interlock stitches, as they are similar to the weft-knitted interlock stitches. The loops of one stitch are situated between loops of the other. The technology presented has not so far been used, as warp-knitting machines according to the concept shown in Figure 1 have not yet been built.

Anticipating the merits of some end-use properties of fabrics with the new stitches, the relationships between the structure of these stitches and some of their end-use properties are to be examined. The features of warp-knitted interlock fabrics have been compared to warp knitted fabrics with stitches applied so far.

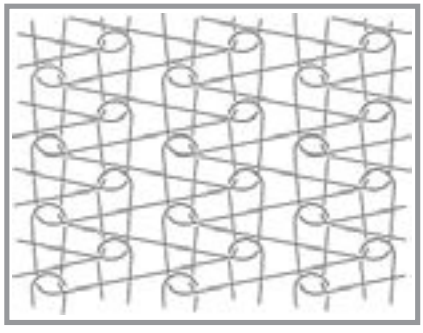

Figure 2. *Warp-knitted interlock stitch.*

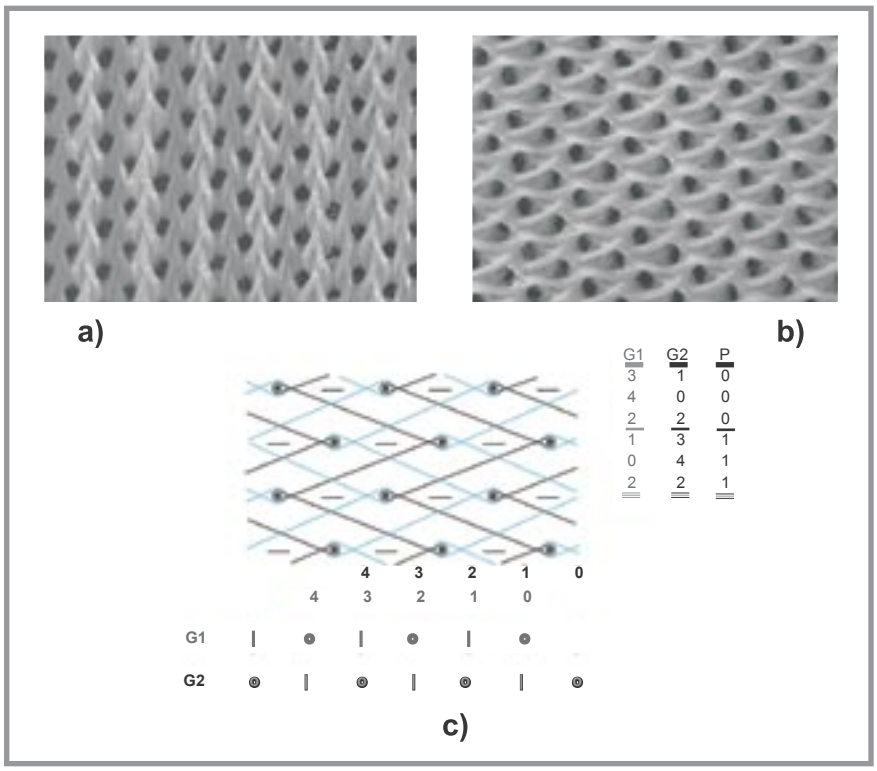

Figure 3. *An example of the warp-knitted interlock stitch, produced on a warp-knitting machine equipped with a tuck presser.*

An analysis of the production method of knitted fabrics according to the proposed technology led to the observation that warp-knitted interlock stitches can be obtained on warp-knitting machines with latch needles, equipped with a tuck presser.

Obviously, by using a warp-knitting machine with a tuck presser it is impossible to obtain a fabric density similar to that obtained according to the concept presented in Figure 1.

Example of Warp-knitted Interlock Stitch Produced on Warp-knitting Machine with Tuck Presser

To gain the effect of the warp-knitted interlock stitch, a tuck presser of repeat 1×1 needs to be used and shifted by one needle pitch, alternately in both directions. An example of the warp-knitted interlock stitch, produced on a warp-knitting machine equipped with a tuck presser, is shown in Figure 3. Pictures of stitch right side (a), left side (b) and its schematic diagram are presented.

Summary

- The new technology proposed enables the production of a new warp stitch group, called warp-knitted interlock stitches.
- Warp-knitted interlock stitches are characterised by the fact that loops of one course are situated in every second wale as they are formed on every second needle. Loops of consecutive course are also situated in every second wale, formed on needles that had not formed loops in the previous course. Thus, loops of consecutive courses formed in every second wale are shifted in relation to each other by half of their height.
- The new kind of stitch is characterised by a higher fabric cover factor.
- The new kind of stitch can be produced on a warp-knitting machine equipped with a tuck presser.

References

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