



DOI: **10.5958/2249-7137.2021.01887.5**

EXPLORING THE TECHNOLOGICAL POSSIBILITIES OF NEXT-GENERATION FLAT KNITTING MACHINES

Elyor Kholboyev*; **Dilafuz Khamidova****; **Maftunakhon Abdurakhimova****;
Nilufar Khankhadjaeva**

*Djizakh Polytechnical Institute,
Islam Karimov Djizakh, UZBEKISTAN

**Tashkent Institute of Textile and Light Industry,
Shokhjahn Tashkent, UZBEKISTAN

ABSTRACT

In this article technological possibilities of double bed flat knitting machines have been investigated to create cardigan knitting structures. Cardigan knitting structures have been created on the base of rib structures and tuck loop elements have been added into structure. Variants of cardigan knitting with cardigan effect were developed and produced to observe different changes in technological parameters. In this work structures and notations of two variants are offered as complex cardigan knitting structure.

KEYWORDS: *Flat Knitting Machine, Needle, Loop, Tuck Loop, Structure, Technological Parameters, Notation, Properties.*

INTRODUCTION

Double needle bed flat knitting machines are weft knitting machines, and the technological potential of such machines is very wide. Many structure types are available. In addition to the main and derivative fabrics, there are several different pattern knitting fabric variants are possible to produce. Several knitting factories in Uzbekistan are equipped with such machines, which are used to produce fabrics for different types of assortment. However, the technological potential of the new generation of flat knitting machines has not been fully used. This series of machines has a very wide range of technological capabilities due to the fact that they are equipped with computer programs. In order to further study the technological possibilities of the machine, to create new types of knitted fabrics, scientific works, patent materials, articles in

scientific journals related to the machines of this category and the types of fabrics obtained from them were studied and analyzed in depth [1-4].

Flat knitting machines are equipped with pattern making control mechanisms. In many types of machines, the pattern making program is often defined by attaching the loop knitting systems with different threads, feeding the needles in different positions of the them, and setting the lifting cams in three or four positions (clearing, pressed, semi-pressed, and miss). On some machines, changing the position of the clearing cams is done in the operating mode using special mechanisms. The machines are equipped with long and short batt needles.

The machine also has tuck position cams, which are used to form the cardigan stitches. Such cams raise the needles to the semi-clearing position, resulting in the formation of cardigan stitches along with the loop. The presence of such additional cams allows the knitting machine to produce pattern knitted fabrics in addition to simple smooth fabrics.

Methods

A tuck stitch [5] is composed of a held loop, one or more tuck loops and knitted loops (Fig.1). It is produced when a needle holding its loop (T) also receives the new loop, which becomes a tuck loop because it is not intermeshed through the old loop but is tucked in behind it on the reverse side of the stitch (Fig. 2). Its side limbs are therefore not restricted at their feet by the head of an old loop, so they can open outwards towards the two adjoining needle loops formed in the same course. The tuck loop thus assumes an inverted V or U-shaped configuration. The yarn passes from the sinker loops to the head that is intermeshed with the new loop of a course above it, so that the head of the tuck is on the reverse of the stitch. The side limbs of tuck loops thus tend to show through onto the face between adjacent wales as they pass in front of sinker loops. Tuck stitch structures show a faint diagonal line effect on their surface. In analysis, a tuck stitch is identified by the fact that its head is released as a hump shape immediately the needle loop above it is withdrawn. A knitted loop would be required to be separately withdrawn and a miss stitch would always be floating freely on the technical back.

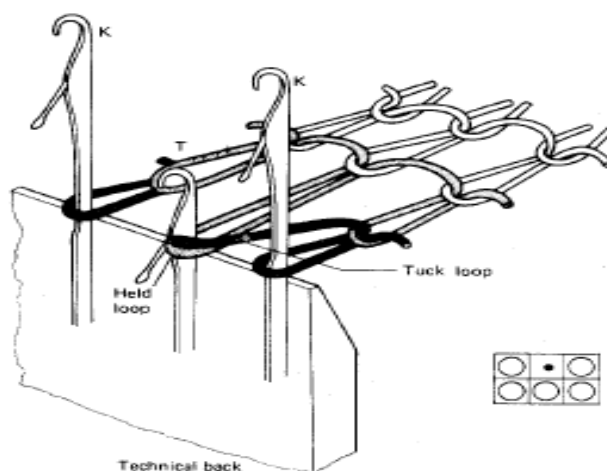


Fig. 1. Tuck stitch produced on a latch needle machine.

The tuck loop configuration can be produced by two different knitting sequences:

1 By commencing knitting on a previously empty needle. As the needle was previously empty, there will be no loop in the wale to restrict the feet of the first loop to be knitted and, in fact, even the second loop tends to be wider than normal. The effect is clearly visible in the starting course of a welt. By introducing rib needles on a selective basis, an open-work pattern may be produced on a plain knit base.

2 By holding the old loop and then accumulating one or more new loops in the needle hook. Each new loop becomes a tuck loop as it and the held loop are knocked-over together at a later knitting cycle and a new loop is intermeshed with them. This is the standard method of producing a tuck stitch in weft knitting (Fig. 1).

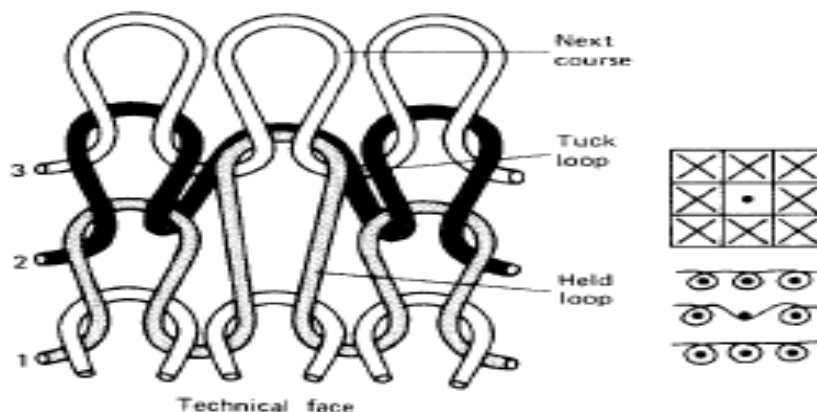


Fig. 2. Technical face of tuck stitch fabric.

Successive tucks on the same needle are placed on top of each other at the back of the head of the held loop and each, in turn, assumes a straighter and more horizontal appearance and theoretically requires less yarn. Under normal conditions, up to four successive tucks can be accumulated before tension causes yarn rupture or needle damage. The limit is affected by machine design, needle hook size, yarn count, elasticity and fabric take-down tension.

Experimental work

In this research work, the technological potential of the flat knitting machine was studied and new patterned press knitted fabric structures were created. First, pattern rapport of cardigan fabric were created. They are shown in Figures 3-4 below.

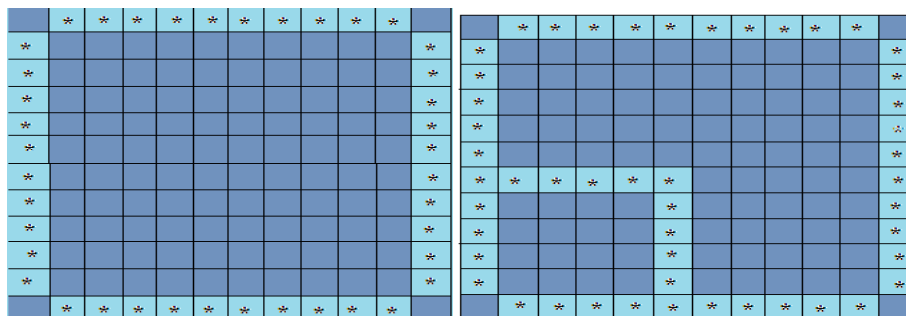


Fig. 3. Pattern rapport for cardigan structure variants 1,2 and 5,6.

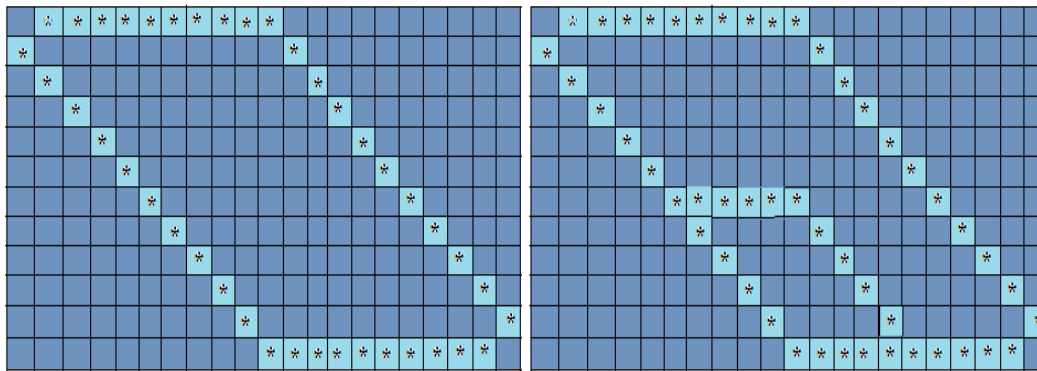


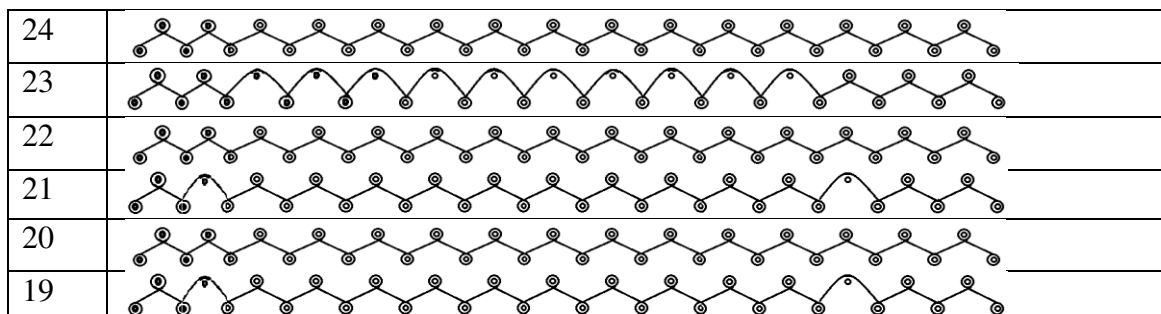
Fig. 4. Pattern rapport for cardigan structure variants 3,4 and 7,8.

In accordance with the created pattern rappers, graphic notations of the cardigan structures were created, which are designed for 1 and 2 index cardigan stitches (half loops). Below is the knitted composition and pattern ornament effect for each variant. Experiments were carried out on a double needle bed knitting machine LONG XING, installed in the knitting enterprise in the conditions of OOO "FLATNIT TEXTILE" in accordance with the rules of forming a cardigan structure for each variant.

Variant 1 of cardigan structure is shown in fig.5, the rapport of which is achieved by a pattern with a rectangular geometric ornament consisting of 24 courses and 12 wales. In the structure of the knitted fabric pattern, 1 index cardigan stitches are placed along the edges of the ornament. After each course in which the cardigan stitch is involved, a series of rib structure courses are placed to perform the process of removing the cardigan half loops. In this variant, the total rapport consists of 288 loops, accounting for 13.9% of the 40 cardigan sets placed.

Variant 2 cardigan structure's rapport is achieved by a pattern with a rectangular geometric ornament consisting of 24 courses and 12 wales. In the structure of the knitted fabric pattern, 1 index cardigan stitches are placed in a reduced shape along the edges of the ornament and in the lower left corner. After each course in which the cardigan stitch is involved, a series of rib structure courses are placed to perform the process of removing the cardigan half loops. In this variant, the total rapport consists of 288 loops, of which 17% are placed on 49 cardigan sets.

Variant 3 is a cardigan structure's rapport which has a pattern effect with a geometric ornament in the form of a parallelogram consisting of 24 courses and 21 wales. In the structure of the knitted fabric pattern, 1 index cardigan stitches are placed along the edges of the ornament. After each course in which the cardigan stitch is involved, a series of rib structure



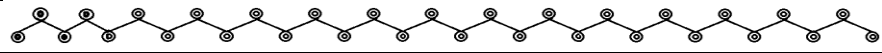

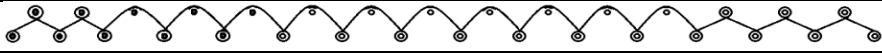

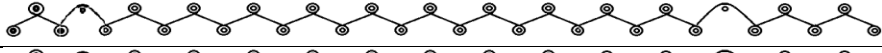



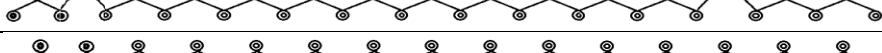


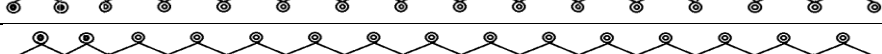
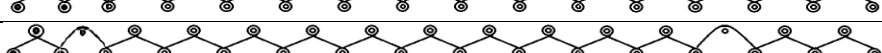

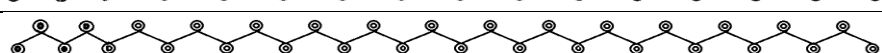

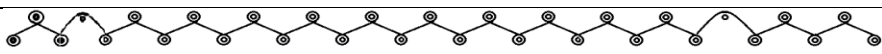
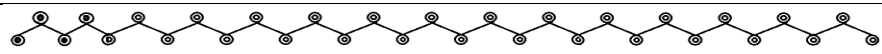
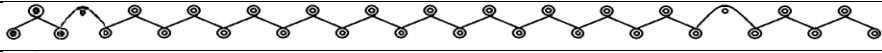
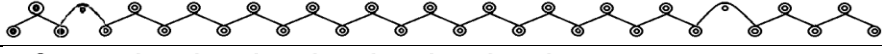
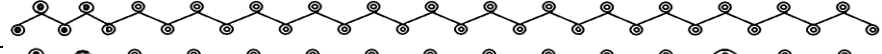
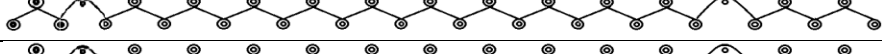
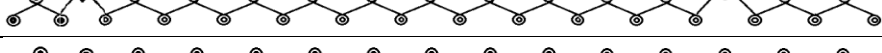
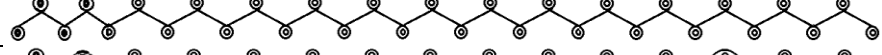
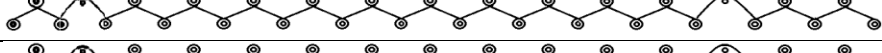

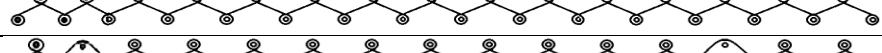

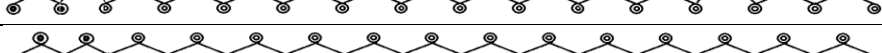

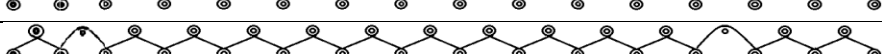

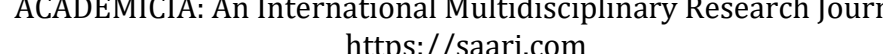
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	Variant 1

Fig.5. Graphical notation of variant 1

courses are placed to perform the process of removing the cardigan half loops. In this variant, the total rapport consists of 504 loops, which is 7.9% of the 40 cardigan sets placed.

Variant 4 is a cardigan structure's rapport which has a pattern effect with a geometric ornament in the form of a parallelogram consisting of 24 courses and 21 wales. In the structure of the knitted fabric pattern, 1 index cardigan stitches are placed in a reduced shape along the edges of the ornament and in the lower left corner. After each course in which the cardigan stitch is involved, a series of rib structure courses are placed to perform the process of removing the cardigan half loops. In this variant, the total rapport consists of 504 loops, of which 9.7% are placed on 49 cardigan sets.

Variant 5 of cardigan structure is shown in fig.6, the rapport of which is achieved by the effect of a pattern with a rectangular geometric ornament consisting of 36 courses and 12 wales. In the structure of the knitted fabric pattern, 2 index cardigan stitches are placed along the edges of the ornament. After each course in which the cardigan stitch is involved, a series of rib structure courses are placed to perform the process of removing the cardigan half loops. In this

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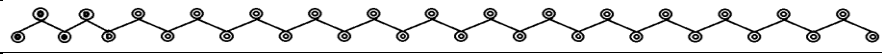
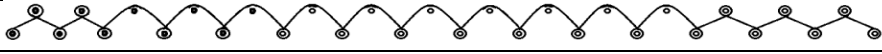
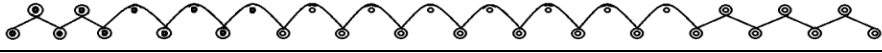
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	Variant 5

Fig.6. Graphical notation of variant 5

variant, the total rapport consists of 432 loops, accounting for 18.5% of the 80 cardigan sets placed.

Variant 6 is a cardigan knitted fabric's rapport which is achieved by the effect of a pattern with a rectangular geometric ornament consisting of 36 courses and 12 wales. In the structure of the knitted fabric pattern, 2 index cardigan stitches are placed in a reduced shape along the edges of the ornament and in the lower left corner. After each row in which the cardigan stitch is involved, a series of rib structure courses are placed to perform the process of removing the cardigan half loops. In this variant, the total rapport consists of 432 loops, accounting for 22.7% of the 98 cardigan sets placed.

Variant 7 is a cardigan structure's rapport which has a pattern effect with a geometric ornament in the form of a parallelogram consisting of 36 courses and 21 wales. In the structure of the knitted fabric pattern, 2 index cardigan stitches are placed along the edges of the ornament. After each row in which the cardigan stitch is involved, a series of rib structure courses are placed to perform the process of removing the cardigan half loops. In this variant, the total rapport consists of 756 loops, of which 10.5% are placed on 80 cardigan sets.

Variant 8 is a cardigan structure's rapport which has a pattern effect with a geometric ornament in the form of a parallelogram consisting of 36 courses and 21 wales. In the structure of the knitted fabric pattern, 2 index cardigan stitches are placed in a reduced shape along the edges of the ornament and in the lower left corner. After each row in which the cardigan stitch is involved, a series of rib structure courses are placed to perform the process of removing the cardigan half loops. In this option the total rapport consisted of 504 loops, of which 9.7% contained 98 cardigan sets.

CONCLUSION

1. The types and technological capabilities of flat knitting machines, spire parts and their control were analyzed, and the experimental work was carried out on a two-needle LONG XING modern flat knitting machine.
2. Cardigan fabric structures with pattern elements added on the basis of elastic rib fabric were created and samples were taken in the conditions of FLATNIT TEXTILE enterprise.
3. Variants that differ from each other in the number of cardigan stitches and the number of half loops were developed on a flat knitting machine and prepared for the study of technological parameters and physical and mechanical properties.

REFERENCES

1. Ramazonov ,D.Xamidova, N. Xanxadjaeva. Sposob povisheniya konkurentosposobnosti trikotajnix izdeliy.Mejdunarodniy kongress «Sivilizatsiya velikoy stepi» 19-21 may. Taras 2017g. S. 221-223.
2. Xamidova D., Ramazonov I., Xanxadjaeva N.R.Sposob povыsheniya konkurentosposobnosti tkikotajnego proizvodstva.«MOLODEJЬ i XXI vek-2017»Mejdunarodnaya nauchno-prakticheskaya konferentsiya. 21-22fevralь.Kursk -2017g. S.391-393.
3. Hua Wang, Hafeezullah Memon. Cotton Science and processing technology (e-book). Springer Nature Singapore Pte Ltd. 2020y – 567p.
4. Xanxadjaeva N.R. Naqsh hosil qilish nazariy asoslari. Darslik. Toshkent TTYeSI bosmaxonasi. 2021y – 450b.
5. Spencer D.J. Knitting technology (Third edition). - England: Woodhead Publishing Limited, 2001. - 380 p.