

Adaptation of hand weaving technique for modern production of copies of Slutsk belts

Cite as: AIP Conference Proceedings 2430, 020002 (2022); <https://doi.org/10.1063/5.0077173>
Published Online: 24 January 2022

Galina Kazarnovskaya and Natallia Abramovich



View Online



Export Citation



Author Services

Maximize your publication potential with
English language editing and
translation services



LEARN MORE

Adaptation of Hand Weaving Technique for Modern Production of Copies of Slutsk Belts

Galina Kazarnovskaya^{a)} and Natallia Abramovich^{b)}

Vitebsk State University of Technology, Department of Design and Fashion, 72 Moscovsky av., Vitebsk, Republic of Belarus

^{a)}Corresponding author: designimoda@mail.ru

^{b)}Electronic mail: vio2004@yandex.ru

Abstract. The work is devoted to improving the technology of laying wefts in a double-sided four-face Slutsk belt when it is produced on modern weaving equipment in order to reduce the consumption of expensive raw materials: natural silk, gold and silver threads. The technology by which copies of Slutsk belts are currently being produced at RUE "Slutsk Belts" involves laying wefts in the head and middle of the belt along the entire width of the threading of the loom. The structure of the belt is formed from five to six wefts differing in color. This is accompanied by earning in the middle layer of wefts that do not participate in the formation of the pattern. It is proposed to lighten the structure of the belt in the border and middle due to the new principle of the order of laying wefts, which will bring the modern belt as close as possible to the historical one, where there was no middle layer.

INTRODUCTION

In the history of culture of different countries of the world there are exceptionally significant achievements that make it possible to objectively assess the level and scale of the national contribution to the world artistic heritage [1]. Slutsk belts have long lost their value as a household item and acquired the status of monuments of decorative and applied art. The famous Slutsk belts are one of the national relics of Belarusians, an excellent example of decorative and applied art, which has become not only a historical cultural symbol, but also a modern brand of Belarus. They have become a national symbol, a vivid and convincing evidence of the achievement of national culture, its rich age-old traditions [2-3]. Unfortunately, historically it turned out that in the museum collections of Belarus these rarities are represented by isolated monuments, in contrast to Russia, Lithuania, Poland, Ukraine. There is no more than a dozen authentic Slutsk belts left in Belarus. This is due to the export of collections and individual items outside the borders of Belarus and losses during the Great Patriotic War.

The revival of the technology of Slutsk belts, the production of their copies, the use of artistic stylizations plays a significant role in the modern economic space of Belarus, is important for representative purposes, in museum and stage practice, in expanding the range of goods of the domestic light industry, in the tourism sector, in the development of folk crafts [4-6].

The object of the research is the development of an assortment of analogs of copies of Slutsk belts, produced on modern weaving equipment. The aim of the work is to adapt the hand weaving technique for modern equipment to bring it closer to the historical one, as well as to optimize the structure – to lighten it in the middle of the belt. Detailed studies of the belt structure were carried out, which made it possible to determine the number of weaving effects that form color effects; for each of them, model weaves were constructed, which are algorithms for creating a software product. The proposed technology assumes the use of hand-weaving elements in the process of making the Slutsk belt – laying the wefts not over the entire width of the belt. As a result of optimization of the laying of the six main shuttles, a technical drawing was developed, implemented in the editor of a computer program provided by the EAT company. A scheme for filling a jacquard machine has been developed, a procedure for laying shuttles with replacing spools

with wefts of different colors in a shuttle box in certain sections of the belt, since there are eight wefts in the belt, and six shuttle boxes.

The problem proposed for development has not been solved in the republic, the CIS countries and abroad. The weaving technologies that were used in the production of Slutsk belts require meticulous scientific restoration. This is not about the reconstruction of authentic Slutsk belts, but about the reconstruction and production of copies of the Slutsk belts on modern weaving equipment [7].

The developed technology assumes that wefts are not laid in the belt over its entire width, which excludes the use of the "broche" effect and thereby increases labor productivity without reducing the aesthetic value of the belt [8-10].

The presented technology makes it possible to reproduce Slutsk belts on modern weaving equipment. The technological parameters of filling and manufacturing of the Slutsk belt on the weaving machine of the "Mageba" company, designed considering the peculiarities of the methods of hand weaving used in the Slutsk belt, have been developed. The results of scientific research are a significant contribution to the theory and practice of weaving fabrics of complex structures.

MATERIALS AND METHODS

The most common type of Slutsk belts is a double-sided four-face, the manufacturing technology of which is characterized by particular complexity. As an analogue, a belt was chosen, woven at a Slutsk manufactory in the second half of the 18th century and kept in the Museum of Ancient Belarusian Culture of the State Scientific Institution "Center for Research of Belarusian Culture, Language and Literature of the National Academy of Sciences of Belarus" (Fig. 1).



FIGURE 1. Double-sided four-face Slutsk belt-analogue.

The weaving technology of the presented historical belt, woven at the Slutsk manufactory, has not been reproduced at any of the other manufactories. The structure of double-sided, four-face belts includes two systems of warp threads: covering and pressing in a ratio of 1:1. The purpose of the covering warp is to create a pattern of the fabric, although the base itself does not participate in the formation of the pattern, it is located in the fabric in a straight line and, without intertwining with any of the wefts, releases those wefts that are present in the pattern to the outside of the belt. The purpose of the pressing warp is to form the structure of the fabric, for which it is intertwined with the main weft reps. There are two systems of ground wefts in the fabric: upper and lower in a ratio of 1:1, each system of weft threads in two colors, that is, in the belt there are four colors of ground wefts: black, burgundy, orange, beige [11].

The technological peculiarity of this historical analogue is that the laying of ground wefts in the middle and in the border is not carried out across the entire width of the belt, as well as the presence of a large number of wefts playing the role of a "broche".

And only in the head, gold and black wefts are laid along the entire width of the belt. In hand-woven weaving, this kind of weaving is especially difficult; in the machine method, it is practically impossible to implement it [12].

The technology by which copies of Slutsk belts are currently being produced at RUE "Slutsk belts" involves laying wefts in the head and middle of the belt along the entire width of the threading of the weaving machine, which, if there are five or six wefts in the fabric structure (Fig. 2), differing by color, it is accompanied by earning in the middle layer of all the remaining, except for two, participating in the formation of the pattern [13-14].

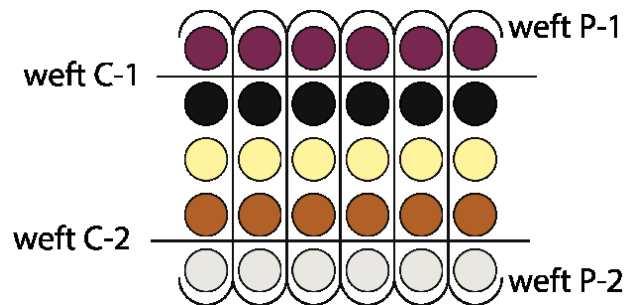


FIGURE 2. Longitudinal cuts in the head of the belt, where Pr1, Pr2 are the pressing threads of the warp; H1, H2 are the covering threads of the warp.

It is proposed to lighten the structure of the fabric in the border and middle and thereby bring the modern belt as close as possible to the historical one, where there was no middle layer, by means of a new principle in the order of laying the wefts (Fig. 3).

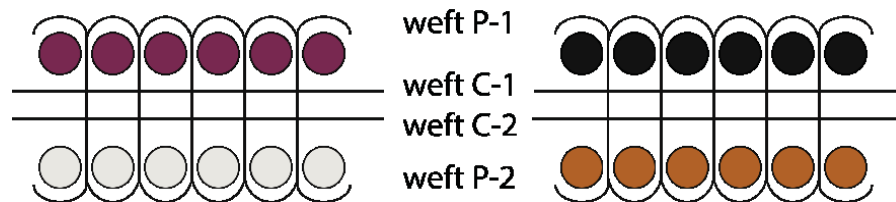


FIGURE 3. Longitudinal cuts for optimized weft placement in the belt.

Research and analysis of the structure of the historical sample of the belt allowed to conclude that it makes sense to lay wefts only on the background areas formed by them: change the wefts in the center of the belt and on the border between the middle and the border. All six shuttles are in operation on the machine: four of which form the color in the middle, two in the border. The ornament in the border is created not by "broche" wefts, as in the historical belt, but by a covering warp of two colors.

Figure 4 shows a diagram of the location of color effects in the middle of the belt, from which it can be seen that the black weft, in addition to forming color in the middle of the middle on one side of the belt, participates in the formation of the color of the border on the other side of it.

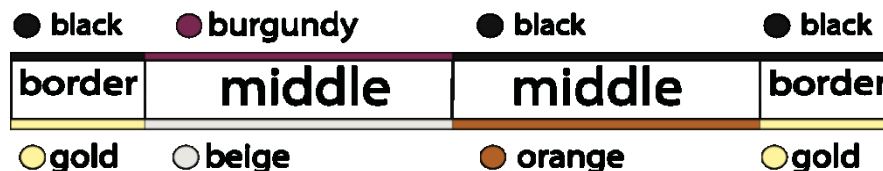


FIGURE 4. Layout of color effects in the middle of the belt.

Based on this situation, it was proposed to lay black weft over the entire width of the machine filling. The golden weft is laid according to the same layout, since it forms a zigzag along the width of the belt and the color of the border under the black weft (Fig. 5).

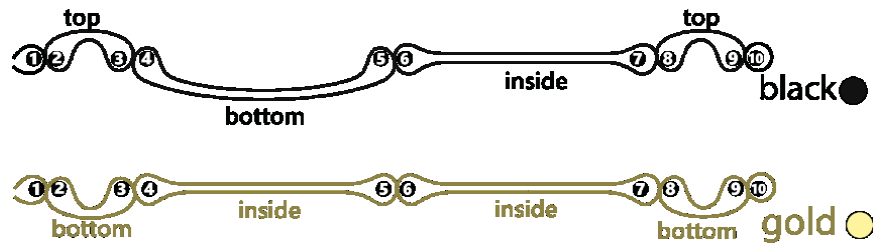


FIGURE 5. Layouts of black and gold wefts in the belt.

Burgundy, orange and beige wefts are laid only half the width of the belt (Fig. 6).

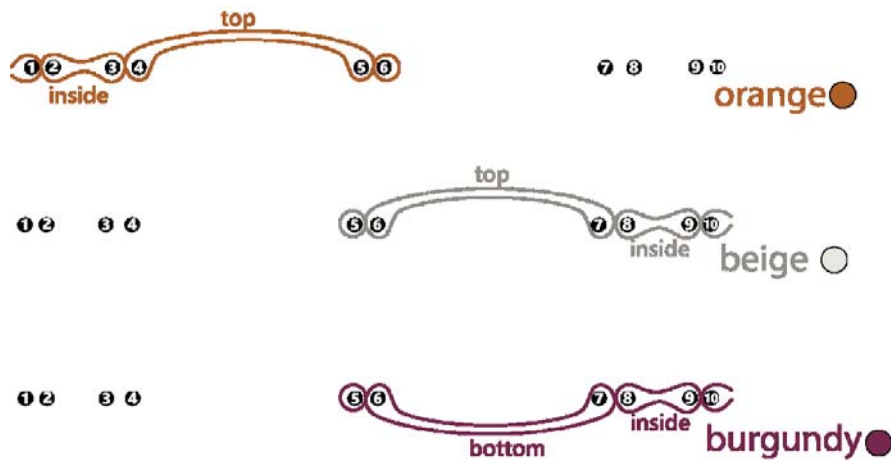


FIGURE 6. Layouts of orange, beige and burgundy wefts in the belt.

The layouts are presented for working the belt face down, which contributes to better conditions for the threads of warp. Due to such laying of wefts, the structure of the belt in the middle and border is three-wefts (Fig. 7), and not five and six-wefts, as in the head.

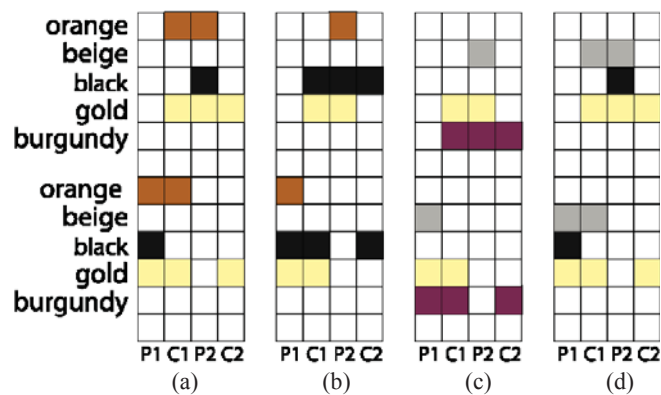


FIGURE 7. Model weaves for the middle of the belt: a) left border: black – gold; b) middle: orange – black; c) middle: beige – burgundy; d) right border: black – gold.

In the refueling on the machine, ten bass threads, two on each side of the belt (1, 2, 9, 10) act as edging, two on the joint of the border and the middle, and two in the center of the belt, which fix the laid wefts, intertwining with them with linen weave. Edge threads make their way one by one into separate teeth of the comb, pressing and covering warps – one thread per tooth: one pressing, one covering. Bass threads make their way into the individual teeth of the comb along with the pressing and covering warps, i.e. in the locations of the bass threads – three threads per comb tooth.

Bass threads 3, 4, 7, 8 are intertwined with the wefts of the outer sides of the belt with a plain weave and thereby contribute to the formation of a clear border between the middle and the borders (Fig. 8).



FIGURE 8. Connecting the border and middle with bass threads.

Bass threads 5, 6 serve to fix the wefts, which are applied at half the width of the belt, in its middle (Fig. 9).



FIGURE 9. Connecting different colored wefts in the middle of the belt with bass threads.

In certain sections of the belt, part of the shuttle boxes of the machine was turned off, some made a double stroke, pulling unworked wefts behind them. The sequence of placing bobbins with a certain color of the wefts in the shuttle boxes is designed in such a way that the wefts do not intersect with each other when making the reverse move.

On the section in the belt with a strip, ornamented with a zigzag, weft threads are laid over the entire width. For this, three shuttle boxes were sequentially turned off.

The project to develop a technology for the manufacture of a historical analogue of the Slutsk belt on modern weaving equipment was carried out using information technology. It became possible to implement the belt manufacturing features thanks to the software product "Design Scope Victor" by EAT (Germany), which controls the operation of the weaving machine (jacquard machine, shuttle boxes, machine stops when replacing bobbins in shuttle boxes, commodity regulator).

In the program code stops are marked with places where it is necessary to replace the spool with one another (with a different color) in order to obtain all the color effects in the belt border and at the same time to lighten the structure and density in this area. It is possible to reduce the number of weft systems by changing them one by one. Thus, at the edge of the belt, due to the change in the color of the weft threads in the shuttle boxes, there are five weft systems instead of six. One shuttle box in this area was in the off state.

RESULTS AND DISCUSSION

The idea to revive the traditions and technologies of Slutsk belt products, to include them in the practice of national decorative art and in the branch of souvenir production, to carry out thorough scientific research, was the basis of the State Program adopted by the Belarusian government. It involves the study of the history, artistic features of the Slutsk belts, the study of the production technology of authentic masterpieces at the Slutsk manufactory, and their revival in modern conditions.

As a result of the work performed, studies of the structure were carried out, software products were developed, including technical drawings, sets of weaves, unfolded cartridges, coding of jacquard looms, control of shuttle boxes and a commodity regulator. The developed technology involves laying wefts in the belt not along its entire width, thereby increasing labor productivity, reducing the cost of expensive raw materials: natural silk, gold and silver threads without reducing the aesthetic value of the belt.

Today copies of the original historical masterpiece are being created. In their manufacture, natural silk, threads containing gold and silver, izamet thread and polyester, metallic are used.

A copy of the Slutsk belt, made according to the proposed technology, was approved at a meeting of the scientific and expert council on referring product drawings to analogues, copies, artistic stylizations of the Slutsk belts under the Ministry of Culture of the Republic of Belarus. The technology of the Slutsk belts was introduced at the RUE "Slutsk belts".

The reconstructed Slutsk belts, made according to the presented technology, are on permanent display in the foyer of the hall of the Presidium of the National Academy of Sciences of Belarus, and are also stored not only in museums in Belarus, but also abroad.

CONCLUSION

The Slutsk belt is becoming a symbol of the country along with other national attractions. The developed products are aimed at creating a Belarusian national cultural brand, a symbol that can be replicated in various variations, in parallel with the revival of analogues of authentic Slutsk belts, developing an assortment of souvenirs [15]. The significance of the work results is obvious. Today, copies of the original historical masterpiece are being created. There are no analogues to these products in the world. The Slutsk belts are one of the determining factors for national self-identification in the modern European and world cultural space [16-17]. As a result of endless mixing and innovations, fast-moving processes, flexible, changeable in dialogue and interrelations of cultures, the problem of globalization not only of the industrial and market, but also of the cultural sphere arises. Historical and cultural heritage comes to the fore as a source of development of various national cultures [18-19].

A significant place in this process is occupied by the continuity of generations, which is carried out through the educational process, including the study of both the historical cultural heritage and modern developments that contribute to the revival of national traditions and self-affirmation.

Slutsk belts are recognized by the world cultural heritage as a unique type of hand weaving and a symbol of national identity. Now that the technologies for creating belts have been revived, the Slutsk belt can become not only a cultural and historical, but also a modern symbol of Belarus.

REFERENCES

1. A. V. Pavlovskaya, "National identity in international education: Revisiting problems of intercultural communication in the global world" in *Training, Language and Culture* **5(1)**, pp. 20-36 (2021).
2. A. S. Belorusets, "Symbol as a means of orientation in personal tasks: a personological perspective" in *Cultural-Historical Psychology* **16(1)**, pp. 78-87 (2020).
3. M. N. Zhilenko, "Interdisciplinarity and system approach as methodological bases in Culture Studies" in *Bulletin of Slavic Cultures* **58**, pp. 101-109 (2020).
4. O. A. Suleimanova, "Towards synergetic combination of traditional and innovative digital teaching and research practices" in *Training, Language and Culture* **4(4)**, pp. 39-50 (2020).
5. E. V. Voevoda, "Intercultural communication in multicultural education space" in *Training, Language and Culture* **4(2)**, pp.11-20 (2020).
6. D. A. Leontiev, "Cultural-historical psychology of activity in the context of the "functional paradigm"" in *Cultural-historical psychology* **16(2)**, pp.19-24 (2020).

7. G. Kazarnovskaya, "Slutsk belts technology on modern weaver's equipment" in *Art culture of Armenian communities in the lands of Polish-Lithuanian Commonwealth* **22** (2013).
8. I. V. Palaguta, "Studies of Ornament: Main Trends and Prospects" in *Bulletin of St. Petersburg University. Art history* **10(4)**, pp. 571-585 (2020).
9. C. Janka, *Symbolism Belarusian folk culture* **430** (Minsk, 2001).
10. B. Lazuka, *Slutsk belts: revival of traditions* **127** (Minsk, 2013).
11. G. Kazarnovskaya and N. Abramovich, "Technology of production copies of historical belts made in manufactory of Slutsk" in *Bulletin of Vitebsk State Technological University* **26**, pp. 44 (2014).
12. G. V. Kazarnovskaya, N. A. Abramovich, *Reconstruction of Slutsk belts using modern equipment* **163** (Vitebsk: – EI "VSTU", 2017).
13. G. V. Kazarnovskaya, N. A. Abramovich, "Revival of technologies and traditions of manufacturing sluck belts and development of production of national souvenir products" in *Education and science in the XXI century Articles of the International Scientific and Practical Conference* pp. 48-51 (EI "VSTU". – Vitebsk, 2017).
14. G. Kazarnovskaya and N. Abramovich, "Features of the structure of Slutsk belts and Lyon belts" in *Bulletin of Vitebsk State Technological University* **36**, pp. 30 (2019).
15. G. Kazarnovskaya and N. Abramovich, "Design of piece products based on the Slutsk belts" in *Bulletin of Vitebsk State Technological* **1(32)**, pp. 61-70 (2017).
16. M. Hřebačková, "Teaching intercultural communicative competence through virtual exchange" in *Training, Language and Culture* **3(4)**, 8-17 (2019).
17. G. N. Lola, "Design Of Communicative Event: The "Communicative Navigation' Method" in *European Proceedings of Social and Behavioural Sciences EpSBS LXXX* (London: European Publisher, 2020)
18. R. D. Lewis, "The cultural imperative: Global trends in the 21st century" in *Training, Language and Culture*, **3(3)**, pp. 8-20 (2019).
19. G. N. Lola and T.I. Aleksandrova, "The Time Code in Contemporary Art: A Discursive Analysis of Temporal Art Projects" in *Bulletin of St. Petersburg University. Art history* **11(1)**, pp. 150-166 (2021).