

Table 3 – Desirability limits of partial optimization criteria

Type of card clothing	Desirability
OK-40	$D_1 = (d_{1,1} \times d_{2,1} \times d_{3,1} \times d_{4,1})^{1/4} = 0,35766$
OK-37	$D_2 = (d_{1,2} \times d_{2,2} \times d_{3,2} \times d_{4,2})^{1/4} = 0,568873$
OK-36	$D_3 = (d_{1,3} \times d_{2,3} \times d_{3,3} \times d_{4,3})^{1/4} = 0,527424$

An analysis of the results shows that the most desirable card clothing is OK-37 ($D = 0.56$). Its teeth have a negative angle of inclination of 99° and a pitch of 4.7 mm, and this clothing also has the fewest teeth on the surface of the drum (compared to OK-40 and OK-36).

UDC 67.05

THREAD CHAIN CUTTING MECHANISM

Krasner S., Vitebsk State Technological University, Vitebsk, Republic of Belarus

Korneenko D., LLC «Mainsoft», Vitebsk, Republic of Belarus

Keywords: *thread chain cutting, clipper method, automation of cutting process.*

Ключевые слова: *обрезка цепочки ниток, способ гильотины, автоматизация обрезки.*

Annotation. The article reviews the state of technical equipment used in the area of chain thread cutting; it highlights common technological and design features of thread cutting devices and mechanisms; the analysis of advantages and disadvantages of devices having different technical layout is carried out. In accordance with carried out analysis, the mechanism with improved layout is proposed, which implies the use of single actuator (e.g. solenoid stem) for the operation movement of three basic elements of the mechanism: safety fence and pressing element as well as the blade itself.

Аннотация. В статье выполнен обзор состояния технических средств в области обрезки цепочки ниток; выделены характерные технологические и конструктивные признаки устройств и механизмов обрезки цепочек ниток; дан анализ достоинств и недостатков различных технических исполнений устройств. В соответствии с выполненным анализом предложен механизм улучшенной комплектации, позволяющий от одного источника движения (в частности, штока электромагнита) обеспечить работу трех главных элементов механизма: ограждающего и прижимного элемента, а также самого ножа обрезки.

Thread chain cutting is a process necessary for automation of sewing machines; its goal is a provision of reliable separation between thread chain formed as a result of interweaving process in formed seam or shuttle stitch line overlapping the edge of sewn-up materials and thread fragments stuck to operative parts.

There are following features for these devices (or mechanisms) distinguishing them among common class of devices and mechanisms designed for thread cutting in sewing machine:

- a) simultaneous cutting off of all threads forming the group involved in seam formation by single cutting edge or by several ones; it is also called joint cutting-off;
- b) operation of the mechanism with no necessity in full or partial stop of main sewing mechanisms of the machine;
- c) clipper cutting mode;
- d) obligatory fabric retrieval from under the presser and its retrieval from cutting area.
- e) preferred location of the device on external rear surface of the sewing head and its flexible sleeve;
- f) preferred location of the main cutting tool at 25-30 degrees to chain forming line, as arising from paragraph (d)

While first four described features are technological ones, the last two are design-related; however, they are mostly owed to first features and typical morphology of flexible sleeve of sewing machine. Paragraph (d) imposes sufficient limitations on technological possibilities of mechanisms or devices of this kind. At the same time, paragraph (b) makes the mechanism convenient for use in appliances where some features are not necessary, e.g. auto stop tracking, accurate needle and thread take-up positioning etc.

Features, stated above are specific for a number of known devices and mechanisms [1-4; 5, p. 123-125; 6, p. 5-6; the range of Juki T030, T040, T050 pneumatic devices and their modifications]. In modern sewing machinery these features have found wide application in chain stitching machines, mostly in overlockers. Their use in semi-automatic or automatic sewing machines has not been widely supported, as it requires implementation of cycling type of these mechanisms. Implementation of cycling layout results in loss of one of advantages of these devices: optionality of stopping of sewing tools and their mechanisms. Out-of-cycle layout requires implementation of chain-arresting elements providing guaranteed cutting-off.

As the device is embodied externally and, as so, it is located in the area of hand manipulations performed by the operator of sewing machine or semi-automatic device, its operation is a subject of strict requirements aimed at trauma risk reduction. The use of safety fence, however, might result in reduction of working space adjacent to tail part of machine sleeve, which, in turn, might reduce application efficiency of devices of this type.

If the device has its own actuator, or its kinematics is maintained through its binding to actuators of sewing machine's main mechanisms, it falls under the definition of the mechanism. When designing the mechanism with autonomous actuator, the preference is given to pneumatic or electromagnetic actuators, as they are the simplest and at the same time fast and reliable when performing high-powered works.

Features of different thread chain cutting devices described above had been carefully analyzed which resulted in patenting of invention of chain thread cutting mechanism [4].

The mechanism (Fig. 1) comprises a solenoid 1, attached to the sewing machine's platform. This solenoid is kinematically connected with the stem 3 through leverage mechanism 2. The stem is installed in the opening in the bracket 4 so as to provide its reciprocal movement. The bracket itself is fixed to the tab arm bushing 5 through terminal connection 6. The plunger 7 is pressed into the stem; its other tail is placed in guides 8 and therefore secured from axial turn when moving in bracket opening. In the bottom part of the stem the blade 10 is attached through bolts 9; the guiding sleeve 11 is installed in the same place; it holds movable clamps 12 and 13 inserted into each other. Each clamp is spring-loaded with its own spring 14 and 15. Butts of each spring rest upon stem collar from one side and upon the clamp of corresponding butt from the other one. The sleeve 11 and clamps 12 and 13 are secured from falling out by blade ledges 16 (see Fig. 2). Ports 17 are cut for protrusion of screws 9 during blade installation. Clamps 12 and 13 have specially shaped areas 18 and 19 with flat surfaces 20 and 21. The throat plate 22 has an opening 23 for blade protrusion.

The mechanism has the following advantage: a single actuator, namely solenoid stem, provides the work of three components of the mechanism: pressing for fencing, pressing for arresting and chain cutting itself. Finally, the mechanism is made up quite compact and reliable, as it comprises all the key parts necessary to run chain cutting process. Previous layouts did not offer such possibilities (e.g. overlapping of clamping strap system) and therefore lagged behind a new one to a certain extent.

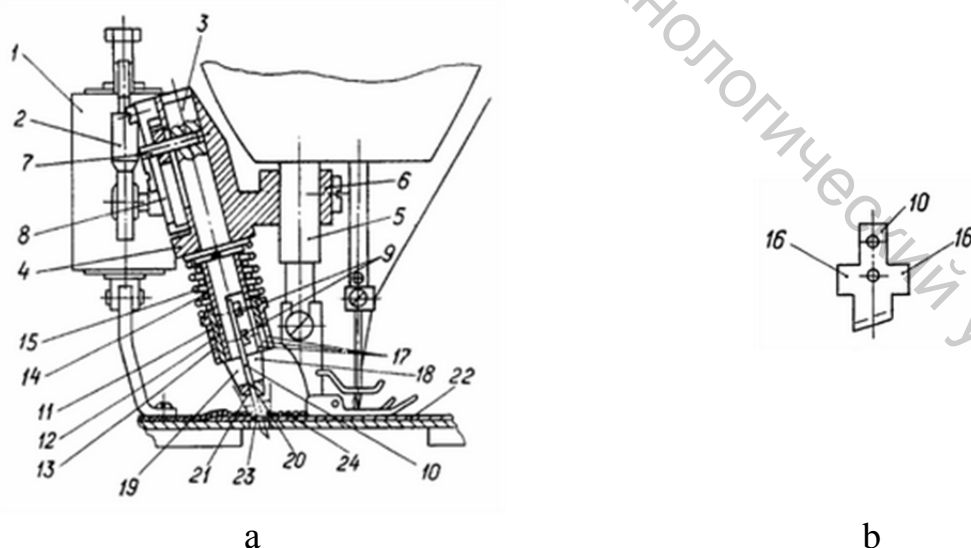


Figure 1 – Thread chain cutting mechanism [4]

References

1. Устройство для обрезки нитей на швейной машине : а. с. 787509 СССР, МКИ D 05 В 65/02 / А. Б. Леошко, М. А. Птицын, И. В. Лопандин, С. Ф. Мякота, А. А. Яцук ; заявитель и патентообладатель Оршанский Трудового Красного

- Знамени завод легкого машиностроения. – № 2731442/28-12 ; заявл. 27.02.1979 ; опубл. 15.12.1980, Бюллетень № 46. – 4 с.
2. Устройство обрезки цепочки ниток на швейной машине : а. с. 956656 СССР, МКИ D 05 В 65/00 / А. А. Ганулич, Б. С. Шкрабов, Г. С. Пронин, И. Ю. Эскин ; заявитель и патентообладатель ЦНИИШП. – № 2972419/28-12 ; заявл. 08.08.1980 ; опубл. 07.09.1982, Бюллетень № 33. – 3 с.
 3. Устройство для обрезки цепочки ниток на швейной машине : а. с. 1751242 А1 СССР, МКИ D 05 В 65/00 / Ю. А. Заборских. - № 4692268/12 ; заявл. 16.05.1989 ; опубл. 30.07.1992, Бюллетень № 28. – 4 с.
 4. Механизм обрезки цепочки ниток на швейной машине : пат. 7016 РБ : МПК7 D 05 В 65/00 / Ю.М. Краснер, С.М. Семерик, С.Ю. Краснер ; заявитель и патентообладатель ОАО «Завод швейных машин». – № а 20010019 ; заявл. 09.01.01 ; опубл. 27.12.04. – 3 с.
 5. Зак, И. С. Приспособления и агрегатные узлы к швейным машинам / И. С. Зак. – Москва : Легкая индустрия, 1970. – 182 с.
 6. Полухин, В. П. Способы и средства автоматической обрезки ниток на швейных машинах / В. П. Полухин, В. Н. Соколов, В. А. Уйманов. – Москва : ЦНИИТЭИлегпищемаш, 1970. – 76 с.

UDC 677.021.125.7

**PRODUCTION OF A HIGH-VOLUME COMBINED
YARN WITH THE USE OF HIGH FREQUENCY
CURRENTS**

**ПРОИЗВОДСТВО ВЫСОКООБЪЕМНОЙ
КОМБИНИРОВАННОЙ ПРЯЖИ С
ИСПОЛЬЗОВАНИЕМ ТОКОВ СВЕРХВЫСОКОЙ
ЧАСТОТЫ**

*Kulandin A., postgraduate student, Kogan A., professor
Vitebsk State Technological University, Vitebsk, Republic of Belarus*

*Куландин А.С., аспирант, Коган А.Г., профессор
Витебский государственный технологический университет,
г. Витебск, Республика Беларусь*

Key words: yarn, degree of voluminosity, microwave, volume, shrinkage.

Ключевые слова: пряжа, степень объёмности, СВЧ, объём, усадка.

Abstract. The aim of the research is to develop a new technology for producing high-volume yarns using microwave currents. In the research experiments on increase of volume of the combined yarn are conducted, results of researches show increase in volume of a yarn in 1.5-3 times.

Аннотация. Целью проводимых исследований является разработка новой технологии получения высокообъёмной пряжи с использование токов СВЧ. В