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ADVANCED TECHNOLOGY OF SECONDARY RAW MATERIAL PROCESSING

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ABSTRACT
This article describes the features of different assortments of fabrics. The article describes the technology of processing of scraps from the textile industry, as well as the principles of operation of machines. Recommendations for improving the design of the machine in order to improve the length and mechanical performance of the fiber in the production of secondary fiber from raw materials. Product specifications from the improved machine are given.
KEYWORDS: *secondary fiber, waste fabric, feed roller, raw materials, dirt, thin fibers, brush drum, woolen cloth, linen, hemp.*

INTRODUCTION

The Decree of the President of the Republic of Uzbekistan on the Action Strategy for the five priority areas of development of the Republic of Uzbekistan for 2017-2021 and the State Program for implementation in the "Year of Active Entrepreneurship, Support of Innovative Ideas and Technologies" was adopted [1]. According to these documents, the widespread application of innovative developments in the sectors of the economy is shown.

Globally, population growth is leading to an increase in consumer textiles. It should be noted that the demand for non-woven raw materials is high in the population and some industries. At present, the production of non-woven raw materials is mainly due to low-grade fiber from cotton fiber separation enterprises. However, the pieces of waste fabric from the textile and garment industries are not fully recycled. However, if we take into account that 3-9% of fabrics used in the garment industry alone are recycled, the processing of this raw material is an urgent task today.

Fiber materials that are used, consumed, and not used for their intended purpose are referred to as secondary raw materials. Obsolete equipment is often used to recycle textile waste and obtain recovered fibers. Great cost-effectiveness can be achieved if modern machines are used to obtain quality yarns and fabrics from recycled fibers derived from used household textiles.

Clothes, household and technical fabrics made of natural fibers can be processed and recovered after their service. Fabric scraps are also produced in textile and clothing enterprises. Fibrous materials and products that are used and consumed and are not used for their intended purpose are called secondary raw materials. Up to 100,000 tons of secondary raw materials processed in the country can be collected for processing.

Clothing, household and technical fabrics made of natural fibers can increase the efficiency of secondary products by creating innovative technologies for the production of recycled fiber after its service.

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With the introduction of compact technologies in the processing of secondary raw materials, it is important to sharply reduce the cost of production, improve the working conditions of workers and mechanize labor-intensive work.

The processing of textile waste involves several stages: disinfection, dusting, sorting, washing, dry cleaning, cutting and fiber separation [2].

New wastes of new fabrics, knitwear and felt products appear in the sewing shops when they are cut. The amount of cuts in garment factories is 9% and they are divided into six groups:

- Wool, blended and semi-wool;
- Yarn fabric;
- Flax and hemp;
- Artificial and synthetic;
- Mixed fibers;

Each gypyh is divided into different types according to its development, density and color during the sorting process. They are divided into woolen fabrics, fine woolen fabrics, coarse woolen fabrics, and fur coats.

Therefore, the study of the classification of fabrics processed from natural fibers, the analysis and improvement of their processing techniques, technology is an urgent task.

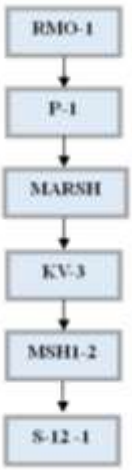
The technology for obtaining fiber from textile waste is shown in Figure 1. Today, the development of new technologies for obtaining fiber from by-products is one of the important areas of scientific research. Based on the study of the use of waste from the cotton and textile industries as a mixture of recycled fibers, it is possible to create a technology with great economic efficiency.

Recovered fibers are widely used to produce a wide range of household and technical fabrics. Recovered fiber is a valuable raw material for the textile industry. It is used "pure", ie without the addition of primary raw materials and in a mixed form.

MATERIALS AND METHODS

In the production of non-woven fabrics, various types of raw materials are used: linoleum floor, geotextile material, filters and shoe fabrics, technical mats, etc. materials are obtained.

Figure 1. Scheme of secondary fiber extraction technology.



In these materials, secondary reconstituted fibers make up 80-90%. Non-woven fabrics have good acoustic and mechanical properties.

In the classification of used natural fiber fabrics, their origin, the type of fiber in the composition is taken into account. Cotton fiber can be obtained into secondary raw materials and is divided into production and household waste.

They are divided into different classes and types according to their origin and properties in each industry.

Wastes from cotton fiber spinning and weaving are divided into six groups, several types and standards [3]. In sewing, scraps are separated as waste and used as raw material. They differ from each other in appearance, type of fiber, processing technology and use.

The technology of processing secondary raw materials began to be implemented at the beginning of the last century. In practice, the processing of secondary raw materials uses specially designed or existing equipment in enterprises. Special equipment is often used in the processing of textile waste, ie in the production of recovered fibers. A series of special equipment has been created abroad for the processing of secondary raw materials for research analysis.

Secondary fiber production technology varies from country to country, with more than 6-10 machines involved in most technology chains. The importance of these technologies is that the machining power of the machines and the geometric dimensions of the fiber to be obtained are important. Therefore, the structure of the fiber obtained from each technology is different. In terms of secondary fiber production, the Russian-made Sshch-850 machine is characterized by a very compact size.

The working principle of secondary fiber extraction technology is as follows. Waste fabrics from the textile and clothing industry brought to the enterprise are first sorted by hand according to its

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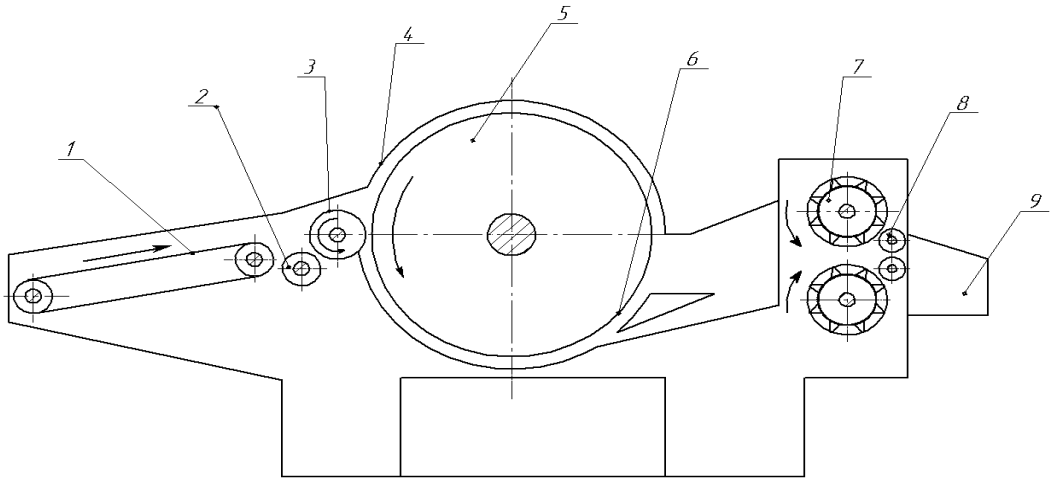
composition. The selected raw material is transferred to the cutting machine Sshch-850.

The principle of operation of the sshch-850 cutting machine is as follows, the raw material is partially disassembled by means of the saw drum 3 saw teeth under the compression roller 2 through the supply belt 1. The raw material separated into pieces is separated into fibers as a result of the mechanical action of the pile drum 5 piles. Pieces of fabric that are inseparable (hanging) from the pile drum piles are separated by the impact of the knocking knife 6.



1- supply conveyor, 2- compression rollers, 3- supply cylinders, 4- supply tables, 5-pile drum, 6- separating blade, 7-net drum, 8- outgoing roller, 9- outlet pipe.

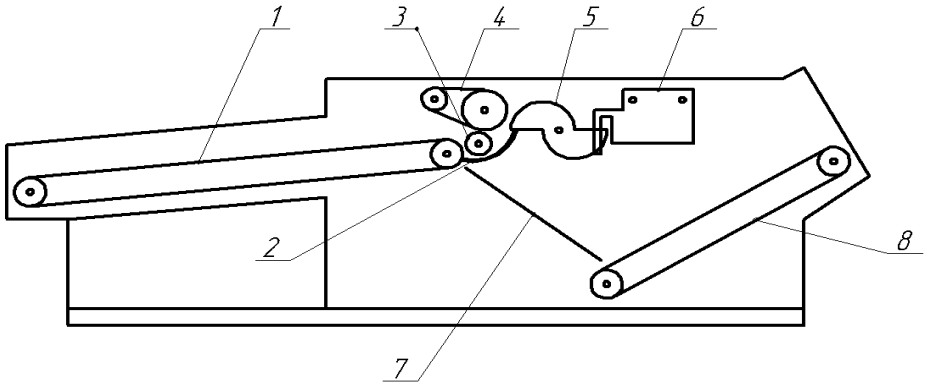
Figure 2. Sshch-850 cutting machine.

The fiber separated by the action of the pile drum sticks to the surface of the mesh drums 7 with a stream of air. The adhering fiber is removed using a roller 8 and discharged from the machine through the outlet pipe 9.

RMO-1 cutting machine, P-1 grinding machine, MARSh splitting machine, MSh1-2, MLU-800 and Polish AS-116, AS-12, AS-301 threshing machines, Ch-11-200Sh sweeping machines are among them.

In this technological process, the production of secondary fiber is carried out mainly in a series using 6 machines.

The selected raw material is first transferred to the RMO-1 cutting machine. The operation process of this RMO-1 cutting machine is as follows, the raw material is transferred to the raw material supply belt 1 by hand.The supply belt transfers the raw material to the compression roller 3 at the same time. The compression roller directs the raw material from the table 2 to the cutting blade 5. The blade side of the table is made in the form of a comb. The cutting knife cuts the raw material into small pieces and throws it on the sloping blinds 7. The transmission belt slides the raw material that slides over the 8 sloping blinds to the post-machine process.



1-supply belt, 2- table, 3- compression roller, 4- guide tape (straightener), 5- cutting knife, 6- fixed station, 7- blinds, 8-release tape.

Figure 3. Constructive scheme of RMO-1 cutting machine.

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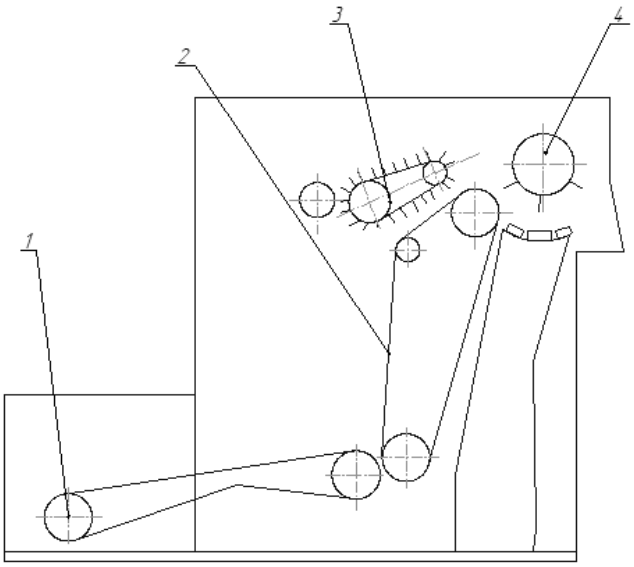
Another function of the guide belt 4 in the machine is not only to direct the raw material, but also to form the raw material roller into the working chamber zone. The formation of the raw material roller in the working chamber ensures that the fabric is cut to the same size. The function of the stationary comb in the machine is to unload the pieces of fabric that are stuck to the cutting blade.

This cutting machine has its drawbacks and it is divided into two types. The first is constructive and energetic.

The fabric, which is cut into small pieces, is transferred to a P-1 sewing machine. The working principle of this machine is as follows. The raw material is passed to the leveling conveyor 3, which is hung on the teeth of the gear belt 2 over the drum belt 1. The process of grinding is carried out as a result of hitting the transferred pieces of fabric on the grate using the teeth of the pile drum 4. Under the pile drum is designed a grate grate. Fine fibers and dust particles are expelled from the machine by a stream of air through the grate.



1- supply drum, 2- gear belt, 3- adjusting belt conveyor, 4- thrust pile drum.

Figure 4. P-1 threshing machine.

The importance of calibrating pieces of fabric hung on the teeth of a toothed belt is that it is important to transfer them evenly to the pile drum. Delivery of excess product to a pile drum will result in poor performance of the grinding process.

The raw material is then sorted according to size using MARSh large chunks.

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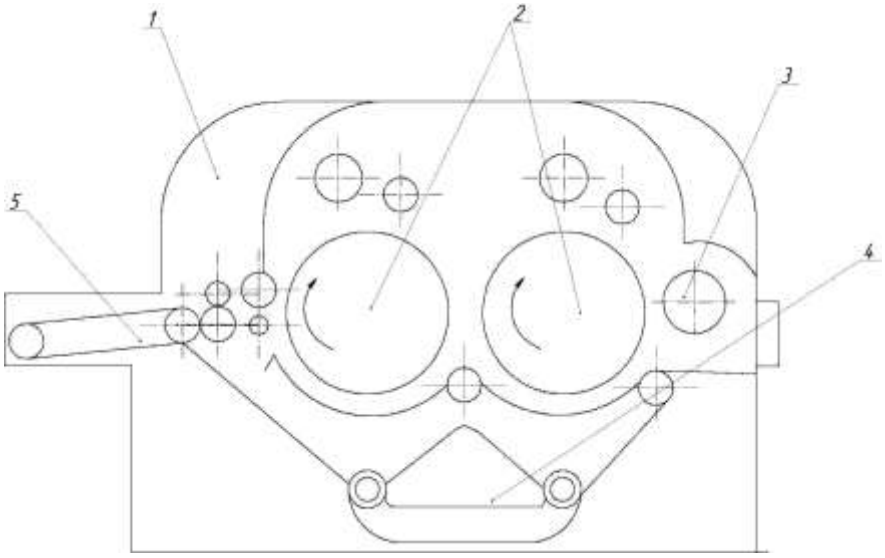
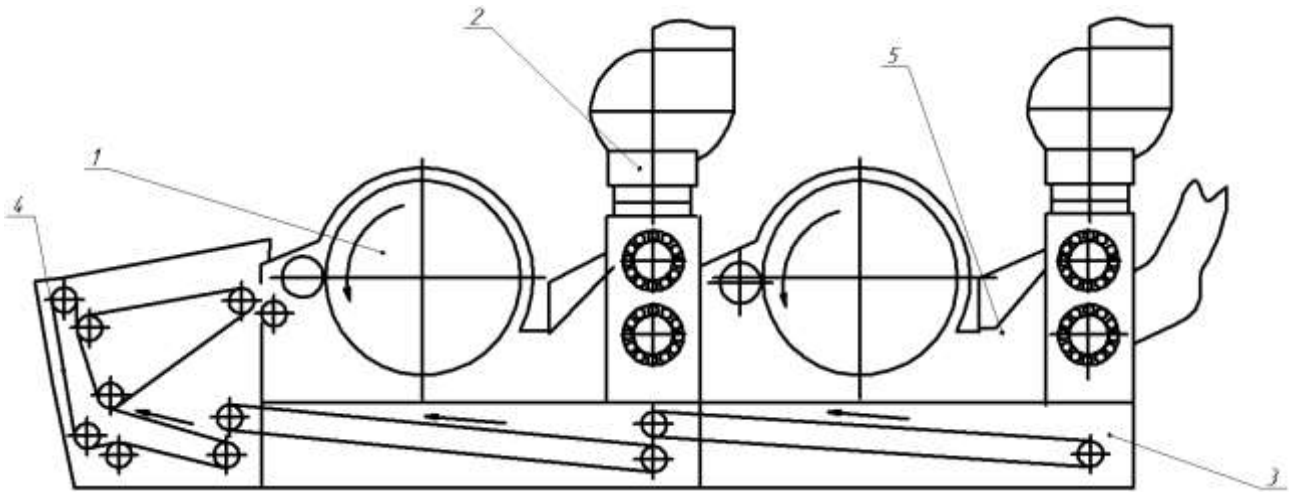


1- chamber, 2- main drums, 3- drums, 4- bunkers, 5- belt conveyors.

Figure 5. MARSH is a device that separates into large pieces.

MARSh is a device that breaks up large pieces and absorbs the fine fibers in the raw material through a condenser. Large pieces of fabric are transferred to the MSh1-2 threshing machine. The MSh1-2 threshing machine separates the fabric into small pieces using a pile drum.



1- main drum, 2- pipe system, 3- belt conveyor, 4 -belt conveyor system, 5- chamber.

Figure 6. MSh1-2 threshing machine.

The following secondary fiber production technology is used in foreign countries. However, the disadvantage of this technology is that the use of six machines in the fiber extraction system increases the energy demand.

Improving secondary fiber extraction technology is an urgent task today. This requires the compaction of the fiber extraction system and the design of improved machines [4].

In order to save electricity and ensure the efficient implementation of the fiber extraction process, an improved machine for secondary fiber extraction is offered. The constructive view of the machine is shown in Figure 7 and it works as follows.

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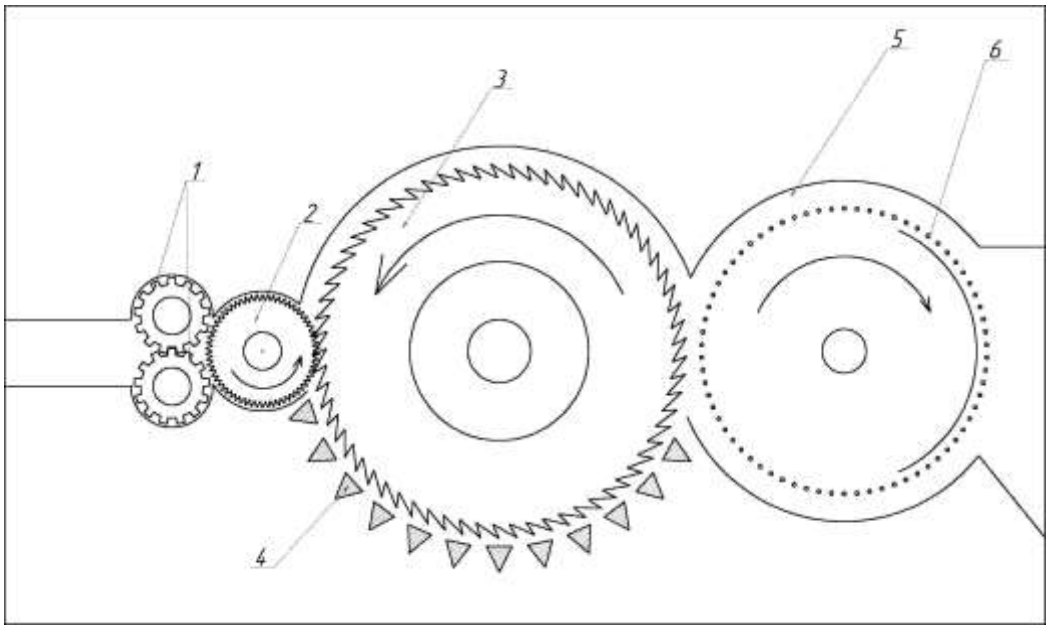
RESULTS AND DISCUSSION

The raw material is squeezed between two supply rollers 1 and delivered to the fine saw drum. The fine saw drum separates the raw material into pieces. The next saw from the crushed pieces of fabric is hung using 3 teeth. Condenser 5 is designed to remove the fiber separated by the saw teeth from the saw teeth. The condenser collects the fiber and removes it from the machine.

Under the saw cylinder are placed three-sided columns. The function of the chimneys is based on turning the raw material (very small pieces of fabric) that the saw teeth hold onto the edge of the chisel into fiber.



1 -supply rollers, 2 -straight gear saw cylinder, 3- bevel gear saw cylinder, 4- crankshaft, 5- condenser, 6- diaphragm.

Figure 7. Advanced secondary fiber extraction machine

In the production of secondary fiber, the raw material contains 10-30% of fibers with a staple length of 21-30 mm.

The length of the fiber in the spinning mills of spinning mills is 21-22 mm.

According to the analysis, 94.5% of the waste generated by textile enterprises is used. The waste is recycled and 54.5% of spun fiber, 14.7% of household fiber, 17.9% of fiber is used for non-woven materials, 7.4% for other purposes, the rest is disposed of as non-recyclable waste.

Depending on the origin of fibrous waste is divided into production and household waste, cotton, wool, silk, hemp, chemical fiber waste, cotton ginning, textile, knitwear, garment industry waste, depending on the type of fiber. They are divided into different classes and types in each industry depending on their origin and properties.

In the production of yarn from cotton fiber, the spinning mill separates the return and waste. Their amount varies depending on the spinning system, the linear density of the yarn and the types of machines that make up the technological system.

Returns include the spinning, re-spinning and spinning machines' spinning methods, spinning and spinning machine spinning rings, and the spindles and rings (fluff coils) that come out of the spinning machine. The amount of returns is usually 1.5 to 3.5%[5].

When cotton fiber is cleaned, it releases weeds, various contaminants, fluff, ie waste. Waste separated during spinning processes is divided into two types:

- recyclable waste. They are called visible wastes;
- reusable or invisible waste. These include dust, lost moisture, and very short fluff.

Visible waste is divided into two types: waste that can be spun and waste that cannot be spun.

Waste suitable for spinning includes knots, tarantulas, and supurindi fibers from enterprise workshops.

Non-spinning wastes include short fibers less than 14–15 mm in length, lint wrapped in rollers, and lint from filters.

Textile production wastes are divided into technologically unavoidable and unavoidable according to their origin, and they arise as a result of disruptions of the technological process in production.

The first group depends on the vibration, cleaning processes, machine design and readiness, the periodicity of the technological process and the breakage of the thread. Violations are caused by violations of the technological

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regime and the rules of operation of machines.

Textile industry waste is divided into wool, cotton, hemp, linen, chemical and natural silk waste depending on the type of fiber. Textile industry wastes are mainly generated from fiber processing. They consist of spinning, non-spinning and invisible waste according to their properties. Wool waste is generated in wool washing, yarn production, weaving, decoration of woolen fabrics and knitwear, felt, fur, fur. Wool waste is constantly present in the wool and yarn production mix.

Cotton fiber waste is divided into cotton ginning, cotton spinning, sewing, hosiery, cotton wool processing waste. Fiber waste from ginneries is divided into three types. The fiber is separated as dead, regenerated (recovered) fiber and lint waste. Dead fiber contains only 3-10% fiber. Lint I class I nav 4.5; 6.0; 8.5% impurities, while type II may have 8.0 11.0: 15.0% impurities, respectively.

Textile enterprises generate 7% to 30% of cotton fiber waste. Recycled spinning mills with low linear density generate the largest amount of waste, accounting for 80-90 percent of the total spinning waste.

Low-grade cotton fiber processing plants often produce non-spinning and non-returnable wastes, which account for 35-55% of the total volume. In specialized cotton spinning wastes, low-grade non-returnable wastes are separated.

In the waste classification, it is noted that all fiber wastes of the cotton industry are divided into six groups.
35% of the I-spinning group consists of wastes numbered 22-32 (michka, rings), 30% is numbered 14-16 (re-scraping).
60% of the spinning group II is waste No. 2 and 3 (knots and down for cleaning) and 30% is waste No. 10-12 (hat tarandi). 30% of the group is waste No. 4 (cleaning knots and fluff) and 25% is waste No. 7 and 8 (cleaning knots and fluff).[6].

Classification of waste from the textile industry
Table 1.

Waste guruhi	Waste type	Waste numbers	Area of application
I can spin	The rewinding thread is 333.3 flat and lower linear densities of the spindle rings	14, 14a, 15, 15a, 16, 16a 18, 18a, 19, 19a, 20, 20a, 21, 21a, 22, 22a, 23, 23 a, 24, 24a, 25, 25a	When spinning in the snow system according to the type sorting (initial cleaning from defects and contaminants)
II Suitable for spinning	Knots and fluff in the cleaning	2, 2a, 3, 3a	In the production of non-woven fabrics and cotton wool
	The sum of colored fibers	6	
	Hat tarandisi	10, 10a, 11, 11a, 12, 12a,	
	Toza supurindi	33, 33a	
III past navli	Filter wool	1, 1a	Furniture is used in the production of downy cotton and plastics, in agriculture, construction, etc.
	The second stage is cleaning nodes andfluff	5	
	Dirty	34, 34a	
	Dirty	35, 35a	
	Shaved hair and down	51	
	Weaving	52	
IV artuvbop	Twisted yarns	36, 36a, 37, 38	In the production of nonwovens and other materials (after shredding)
	The ends of the twisted thread	41, 41a, 50	
V attorlik	The ends of the twisted thread	39,39a, 40,40a, 42, 42a, 43,43a, 44,44a, 45,45a, 46,46a, 47, 47a, 48.48a, 49.49a	Nets, sacks and in the manufacture of tapes

YesThe first clothes are triangular in shape. were divided into rectangular and trapezoidal surface shear groups and statistical data were obtained for each group. As you know. They are used for different purposes because the properties of the fibers reconstituted from the fibers containing natural fibers differ from the special properties of the fibers obtained from the fragments containing artificial fibers. The test results are given in Table 2.1.

The results show that the surface area of triangular shapes is 28 cm2, trapezoidal shapes are 54 cm2, and rectangular shapes are 39.3 cm2. . The reconstituted fiber mixture was selected in this study as a square by mass.

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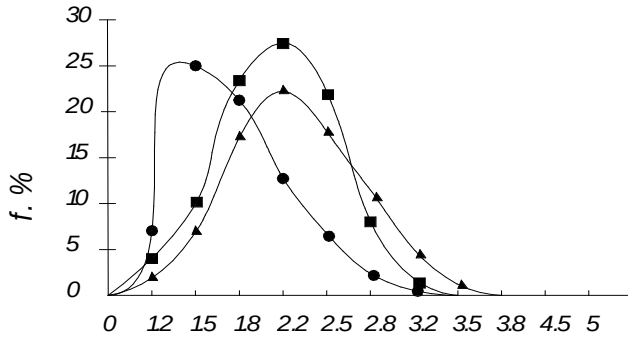
The lengths of the regenerated fibers were determined after the first and second pinching machines and using the samples taken after the pinching machine.

Distribution of slash shapes.
Table 2.

№	The shape of the cut	Indicators					
		The arithmetic mean		Mean square difference		Quadratic notexlik coefficient	
		mass g,	surface sm2	mass g	surface sm2	mass g,	surface sm2
1	Triangle	2.02	39.30	0.64	27.84	31.8	70.8
2	Rectangle	1.64	27.97	0.49	19.90	27.9	71.3
3	Trapezoid	1.64	54.0	1.01	30.6	0.61	56.7

According to the results of the experiments, graphs of distribution along the lengths of the fibers were drawn (Figures 1; 2). It should be noted that the fiber lengths in the third pinch machine are shorter than in the second pass of the pinch machine. If the modal length of the fibers in the first machine was 18 mm, in the second machine it was 16.5 mm, in the last machine it was 14.4 mm. The maximum length of the recovered single fibers was 31 mm on the first spinning machine, 25 mm on the second machine, and 22 mm on the last spin. This means that the length of the goals, which are recovered from it when biting the stalks and clots, decreases along the stalks.

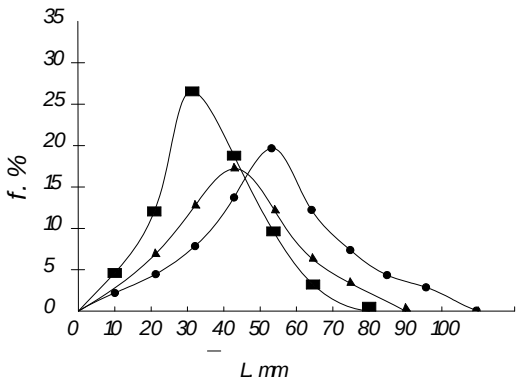
An increase in the amount of short fibers (up to 8 mm.) Was observed with the impermeability of the sawtooth tooth. If in the first machine the short fiber was 25%, in the second machine 38%, then in the last machine it was 48%.



(a)

■ - rectangle ▲ – triangle ● - trapezoid

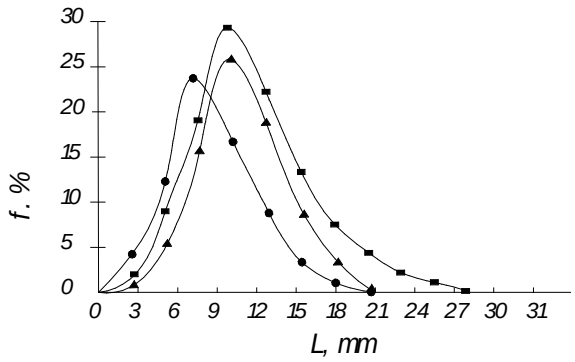
1-graph. Distribution of fragments of different shapes (a) and surface (b)



(b)

● - In the pinching machin.

2-graph. Length of individual fibers recovered from different transitions (L) distribution on



■ - in the pinch machine ▲ - In the pinching machine .

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Recovered fibers also contain untwisted residual yarns. Their amount is 35% in single-stage recovery and 15% in two-stage recovery.

CONCLUSION

When the fabric is spun only, up to 60% of the spun mass may be spun. Recovered fibers inevitably contain unbroken pieces of yarn - residual yarns. It should be noted that densely woven fabric garments are spun on a multi-drum machine, while fabrics spun from thick yarn are spun on a low-drum machine. The cotton wool is slightly crushed and the fibers recovered from it are longer. Pinching and canning machines are used for yarn fabrics and viscose clots. In order to study the properties of the recovered fibers, the physical and geometrical properties of the first and second stages of spinning were studied by taking samples from the crushed mass and comb coming out of the spinning machine. The residual yarns were found to consist of single and baked yarn residues. It has also been confirmed that in many cases the yarn residues consist of thin yarn cuts. They are wide in length. According to the results of the study, the modal length of the fibers was reduced from 35 mm to 18 mm. This means that the fibers are mechanically damaged during the recovery process.

Given the efficiency and energy savings of this proposed machine, it should be noted that the use of this machine in industry can achieve great economic efficiency.

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