

Loosening Wool Machines

Ismoyilov Furkat, Khakimov Sherkul, Khodjayeva Margarita

Abstract: This article provides information about the technology of primary processing of wool and the feeding part of the baking machine. It analyzes the operating principle and types of baking machines at the enterprise of primary processing of wool. The disadvantages of baking machines affecting the product are considered. The principle of work and the design of new baking machines for the manufacture of quality products are proposed. The article provides information about the technology of primary processing of wool. Studied the mechanisms of machines for the production of wool and identified their design flaws. The designs and sizes of the pegs of the peg drum are analyzed. The designs of the loosening machines used in the loosening process were studied. The types and principles of baking machines working at the enterprises of primary processing of wool are analyzed. The technical characteristics of the machines are given. The negative aspects of the details of the mechanical impact on the product are noted. Defects of baking machines and their effect on the product are explained. The design and operational principle of a new spraying machine for the preparation of high-quality products is proposed. The proposed characteristics of the machine have high performance, structural design, impact on the product, low energy consumption, energy efficiency and effective loosening. In this machine, the optimal version of parts that have a positive effect on the natural characteristics of the product is selected.

Key words: wool raw materials, fiber, loosening process, pollution, cleaning, storage, sorting, fluff, spinning, roller, food, grate.

I. INTRODUCTION

Currently, there is a development in the field of textiles and processing of wool raw materials. The technology of processing wool was developed before our era, this continues to the present. Two main factors in the processing of raw wool: technology and high-quality wool raw materials. From past centuries to the present, the improvement of wool processing technology and the improvement of wool quality continue. For the production of industrial wool raw materials, scientists have developed a breed of sheep with soft wool. At the same time, wool processing enterprises are modernized and improved. The varieties of wool in the world vary depending on the climate of the region and the breed of sheep's wool. The main indicators of wool appear in its fineness [1]. The primary processing process includes the acceptance of wool by quantity and quality, sorting and washing. All natural sheep's wool is divided into thin, semi-fine, semi-rough and coarse. For acceptance of wool by quality, a control classification is made with the selection of wool samples for laboratory tests. Not all wool is subjected to control classification, but only 10-20%, the results obtained apply to the entire incoming batch of raw materials. Industrial sorting of wool is carried out manually on conveyor lines, by dividing the runs into

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separate parts, which are certain varieties with different physical, mechanical and technological properties of the fiber (fineness, length, strength, condition, color). In the process of sorting, production assortments of wool are formed for subsequent primary processing and processing in spinning. The technology of primary processing of wool is shown in the following figure (fig. 1).

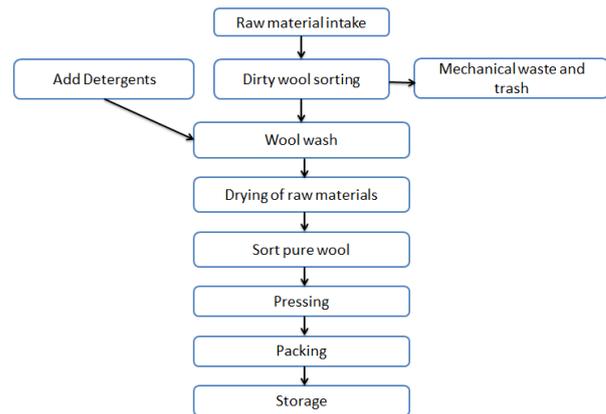


Fig. 1 Technological scheme of wool processing.

In the production of primary processing of wool raw materials, the general indicators of raw materials are taken into account. Separate processes for fine and coarse wool are selected. Each machine in the technological system processes the product and prepares raw materials for the further processing process. There are so many different types of wool loosening machines. The loosening machines used in the world differ in their structural structure and work efficiency. During the initial processing of wool, baking machines are of great importance. The baking machine is designed for loosening and cleaning 25-35% of wool contamination. If the wool raw materials are well loosened, then washing the wool will be effective. As a result of mechanical action, the wool is loosened and cleaned. Here it is necessary to pay attention to the grade of wool. Otherwise, with mechanical action on the raw material, its natural properties are damaged. As a result, poor quality wool cannot be used in the spinning industry.

II. EXPERIMENTAL PART

Partially loosened wool is delivered to the feeding device of the loosening wool machines. The structure of the rollers can be corrugated and smooth. The feeder of the bobbin machine consists of a feed grill and feed rollers. The supply grilles are made of wooden or metal strips attached to belts or interconnected by rings and forming an endless web worn on rollers. The feed rollers take a layer of wool from the supply grill and clamp it, holding it, under the influence of drum sticks, thus contributing to loosening. There are several types of power supplies. The most common device consists of two pairs of feed rollers (Fig. 2, a): the first pair has corrugated

rollers, the second has the upper roller corrugated and the lower smooth. The diameter of the rollers is 100-150 mm. Both pairs receive a load to enhance fiber clamping. The speed of the second pair is 12-15% higher than the speed of the first pair, which ensures stretching of shreds of wool. The corrugated surface of the rollers contributes to better clamping and retention of the fibers, and a smooth surface reduces the possibility of winding wool.

The device, consisting of one pair of feed rollers (Fig. 2, b), in the work does not differ from the previous one, but there is no pulling of shreds of wool. With insufficient clamping of the fibers, the drum slices can snatch whole unhoused shreds of wool from the clamp. One of the common devices is also a device consisting of feed rollers with curved teeth (Fig. 2, c) - the teeth are bent to the side opposite to the direction of rotation of the roller. Such a feeding pair reliably holds a layer of wool until it is completely loosened; while the drum pegs loosen the front part of the shreds, the back part is in the clamp of the rollers or loosens when the feed rollers are pulled out of the clamp by the teeth. The upper roller has a spring load. The diameter of the rollers is 150-250 mm. In the process, the upper roller is cleaned of wool by drum sticks; on the lower roller, shreds of wool are planted upon impact of drum sticks, so a special cleaning roller is installed to clean it, although this does not exclude the possibility of winding long wool on the lower roller.

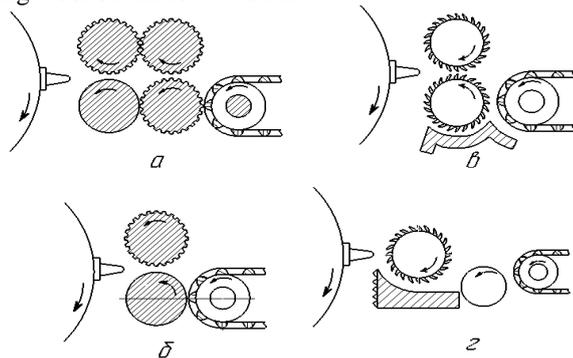


Fig. 2. Types of feed devices scutching machines

The desire to eliminate the winding of the wool led to the creation of a feeding device with one (upper) feeding roller, where the lower roller is replaced by a fixed table (Fig. 2, d). Part of the table has a concave shape and covers the teeth of the roller, thereby creating a good fiber clamp. The front part of the table is inclined and has holes through which some of the heavy mineral impurities fall out. Directly adjacent to the table is the grate. This system eliminates the possibility of winding wool. In all feeding devices, the bearings of the upper rollers lie in the guides and can move in the vertical direction. When passing through a thick layer of wool, they rise and then fall into place. All upper rollers are pressed to the lower spring or lever-load devices. The load value is selected depending on the type of wool being processed: ragged and felted wool requires a stronger grip. The working surfaces of the feed rollers must be smooth and free of nicks and burrs that can cause the wool to cohere. Rollers should be regularly cleaned of adhering dirt. On the drums loosening the wool, various forms of spikes are used. The influence of spikes on wool is different; they are used depending on the types of machines and types of products.

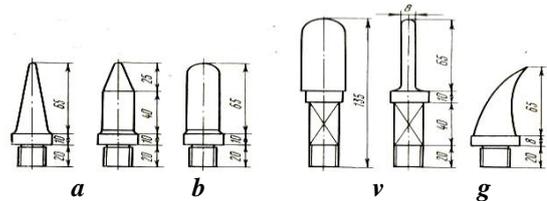


Fig. 3. Forms of drums spinning machines. Headset of working bodies of bobbin machines.

The shape of the pegs, their size and the frequency of placement on the drum, affect the results of loosening and scuffing, as well as the safety of the fibers during this treatment. The shape of the pegs is chosen taking into account the absolute breaking load of the wool fibers of different fineness and the degree of stalling (density) of shreds. In the form of splitting there are straight (cylindrical, conical, faceted) and curved.

Straight conic and cylindrical pegs (Fig. 3, a and b) penetrate well into the mass of wool and easily leave it. The blow is applied to the streamlined surface of the pegs, and they do not tear the fiber. Spikes of this shape are recommended to use for thinner and semi-thin wool, less ragged and having a smaller breaking load.

Straight cut pegs (Fig. 3, v) have a rectangular cross-sectional shape and rounded edges of the faces, which reduces the shrinking ability of the peg. The working side of the spike is narrow, so it easily penetrates into the dense mass of wool, cutting it like a knife. Faceted splitting has a stronger effect on the fiber than conical and cylindrical, therefore, when pulling the felted tufts of wool, there is a breakage and destruction of the fibers. Faceted kolkovaya headset can be recommended for the treatment of semi-coarse and coarse ragged and felted wool, having a greater breaking load than thin wool.

Curved pegs (Fig. 3, g) are used in the development of heavily felted wool. They have a round or oval cross-section and a pointed top. With the help of curved pegs, the landfills and felted runes, which were separated during sorting, are broken and pulled apart. This operation is accompanied by a massive fiber break, so the wool obtained from landfills has a significantly smaller average fiber length.

The surface of the spike, regardless of its shape, must be smooth, without burrs, so that the wool does not linger and easily leaves the pegs. On the drum, pegs are arranged in rows along its line, at a certain distance from each other, and in the planks they are fixed with a thread or pressed in a hot condition.

III. METHODS EXPERIMENTS

The process of loosening is as follows. After sorting the wool, the AGSh-1 auto-feeder will be loaded into the hopper. The feeder sends the wool to the 2BT-150-Sh baking machine.

The 2BT-150-Sh double-drum binder machine differs from the previously produced 2BT machines in its larger working width and productivity.

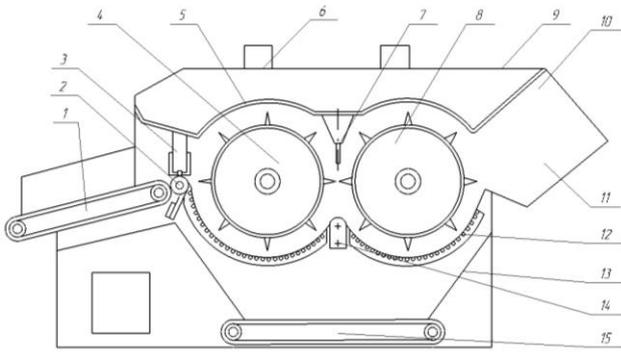


Fig. 4. Wool opening machine 2BT-150-Sh

In addition, it has a number of improvements that improve the beating process. The process of beating on the machine 2BT-150-Sh is as follows. The feeder places the unwashed wool evenly on the feeding grid 1 (Fig. 4), moving at a speed of 0.067-0.133 m/s. The feed rollers 2 (upper - grooved, lower - smooth) capture the wool and feed it into the bobbing chamber. The clamp in the feed pair is created by two springs 3 and reaches 1.75 kN. The upper roller rotates faster than the lower, due to which, straightening and shifting shreds of wool is ensured. The first ring drum 4 has eight ring bars and rotates at a speed of 12.5 m / s, the second drum 8 - at a speed of 14.3 m / s. The first drum hits the shreds of wool sandwiched in the feed rollers, loosens them into small shreds and dumps them onto the grate 12 located below it, and then drags it along the grate. In this case, the wool is additionally shaken and loosened, part of the impurities is separated from the wool and falls out through the openings of the grate to the hopper 13, and then, using the conveyor 15, it is removed from under the machine. Further, shreds of wool carried away by the pegs of the first drum are brought to the pegs of the second drum, picked up by this drum, hit the prism 14 and again pulled along the grate to the outlet 11. Loosened and partially cleaned wool is ejected by the centrifugal force into the outlet to the discharge conveyor. Visor 10 dampens the speed of the departing wool and changes the trajectory of its flight. When switching from the first drum to the second, separate pieces of wool can be delayed by stationary pegs 7, which interact with the pegs of the second drum and further loosen the wool. Above the drums there is a perforated partition 5, and on top the machine is covered by a casing 9. In the casing there are two nozzles 6 through which dusty air is sucked out of the machine [2].

Wool opening machine AV-8V. The AV-8V machine is part of the BS-2A wool-washing unit (NDP). Its feature is an increased working width (1600 mm) and two pairs of feed rollers.

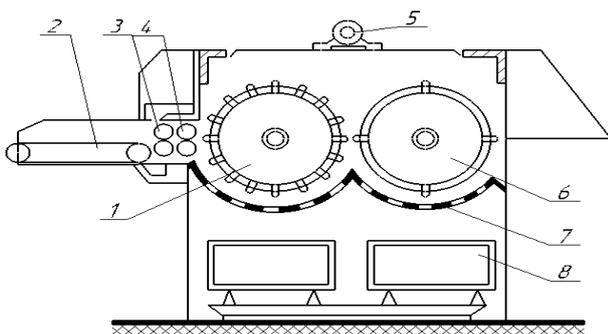


Fig. 5. Wool opening machine AV-8V (NDP).

The machine consists of cast-iron frames, on which are installed: a feed grill 2 (Fig. 5), feed rollers 3 and 4 and ring drums 1 and 6. Under the drums are grate 7, under which there are drawers 8 to collect lunges and facilitate them cleaning from under the car.

The first drum has 16 rows of pegs, the second - 4 rows. Splitting straight, cylindrical, with a conical top. The diameter of the drums (over the pegs) is 740 mm. Retractable grate, made of perforated sheet. The machine is driven by an individual electric motor 5 located on the top of the machine casing. The operation of the AV-8V machine does not fundamentally differ from the operation of the 2BT-150-Sh machine.

Wool opening machine company Charpentier (Belgium). The Charpentier double drum bobbin machine has the same process flow diagram as the machines described above. Its peculiarity is a feeding organ, consisting of a ring roller and a feeding table (see Fig. 2, d). The ring roller is made of gear discs, which are flush against the common shaft. The pegs are tilted in the direction opposite to the direction of rotation of the roller.

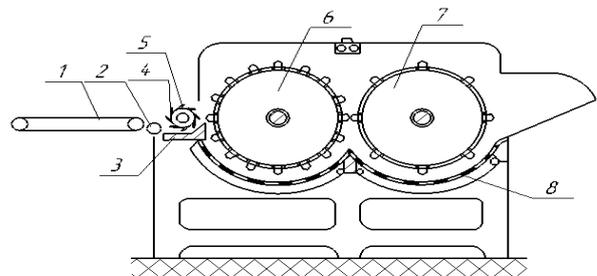


Fig. 6. Wool opening machine company "Charpentier"

The wool from the supply grill 1 (Fig. 6) enters through the smooth support roller 2 to the ring roller 4 with a spring load 5, which presses the wool layer against the table 3 with the back of the pegs. The bent pegs firmly hold the tufts of wool during the impact of the first pegs drum 6. The first drum has 16 bars with pegs, and the second drum 7 has eight bars. Under the drums are grate 8 from perforated steel with holes with a diameter of 10 mm.

Wool opening machine TP-90-Sh1 (fig. 7) is designed for scrubbing coarse and semi-coarse wool. The main working bodies of the machine are the feed grill 1, feed rollers 10, main drum 8, work rollers 5, grate 9, valve 4, outlet grill 2 and fan 7. Wool manually, evenly lay on the supply grill 1. The grill leads the wool to the feed rollers 10, and the latter to the main drum 8. The grill and rollers work periodically, and therefore, the wool is fed into the machine in batches.

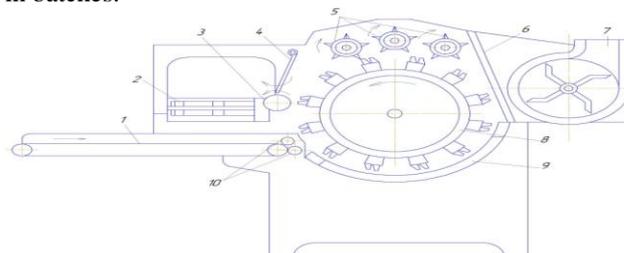


Fig. 7. Wool opening machine TP-90-Sh1

Loosening Wool Machines

Technical characteristics of scutching machines 2BT-150-Sh, AV-8V, “Charpentier” and TP-90-Sh1

	2BT-150-Sh	AV-8V	“Charpentier”	TP-90-Sh1
Productivity, kg/h	1600	1000	1500	300
Working width, mm	1500	1600	1420	902
Feed conveyor speed, m/s -	0,07; 0,1; 0,13	0,07	0,05—0,1,	-
Ring drums rotation frequency, s ⁻¹ :				
first	4,1	7,2	5,5	5,3
second	4,75	7,9	6,2	-
Diameter of drums (on pegs), mm	950	740	725	1052
Electric motor power, кВт	7,5	7,5	7	4,5
Overall dimensions of the car, mm:				
length	4230	3120	3370	3210
width	2210	2500	2320	2550
height	2260	2000	1700	2100
Weight, kg	4750	2500	2300	2750

This baking machine is morally obsolete, therefore, it has disadvantages, including: with the mechanical action of spikes on the wool fiber.

The design of various ring drums and work efficiency is as follows.

Scaffold machines of different designs have drums with 4, 8, 12, 16 and 24 rows of pegs. The completeness of cultivation is characterized by the number of impacts of spikes that receive 1 kg of unwashed wool when passing through a bobbin machine:

$$P_k = (\kappa_1 m_1 n_{\sigma_1} + \kappa_2 m_2 n_{\sigma_2}) / v_{II.p} b q$$

where P_k - the fullness of loosening (the number of strokes); κ_1, κ_2 - the number of rows of pegs on the drum; m_1, m_2 - the number of pegs in the same row; $n_{\sigma_1}, n_{\sigma_2}$ - drum rotation frequency, s^{-1} ; $v_{II.p}$ - the speed of the supply grid, m/c ; b - width of the supply grid, m ; q - is the mass of the wool flooring per $1 m^2$ of the supply grid, kg [3].

Various machines for loosening and cleaning wool are widely used in the world. The principle of loosening and cleaning wool is as follows (fig. 8).

The disadvantage of this machine is that the bulk, well-loosened, of raw wool, leaves the machine. Designed on the machine and the mesh surface 5, to cleanse dirt from wool. If instead of a grid surface, a grate is designed, then contamination is released faster. [4].

IV. RESULTS AND ITS DISCUSSION

An advanced baking machine for separating the maximum number of shreds of wool and for cleaning contaminants maximally separates the raw materials of wool into shreds, which ensures cleaning efficiency.

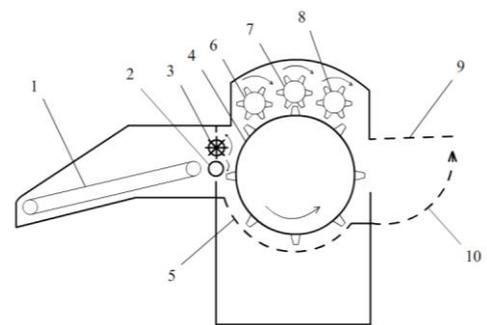


Fig. 8 Fearnought wool opener

1 feeding tape, 2-3 rollers, 3-pointed roller, 4-pointed drum, 5-mesh surface, 6-7-8 small drums, 9-blades 10-angle louver.

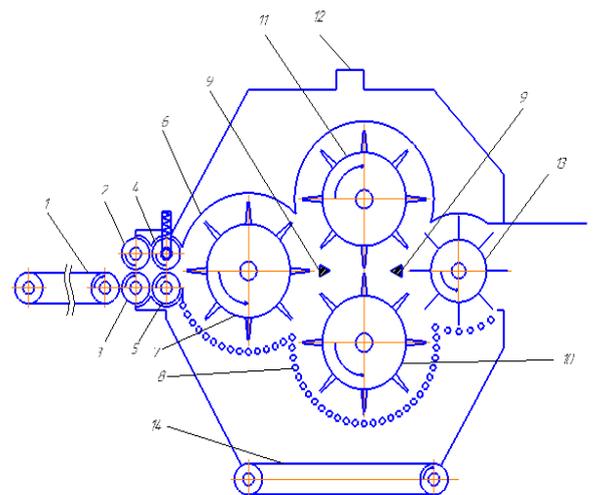


Fig. 9 New Loosening Machine

1 feeding tape; 2, 5-grooved rollers; 3-smooth roller; 4- Tightening grooved roller; 6-mesh surface; 7,10,11 - ring drums; 8 grate; 9-perforated partition; 12-pipe that removes dusty air; 13

membranes drum; 14-tape, removing dirt.

The proposed machine operates as follows. The raw materials are transferred to the feed tape 1. The feed rollers 2,3,4,5 ensure a uniform supply of wool to the cleaning drums. Under the influence of the ring drum 7 and the grate 8, the wool is loosened and cleaned of impurities. Raw materials with the help of ring drums 10,11 are further loosened. Then through the drum out of the car. Using the pipe 12, the dust is sucked out. Weed impurities through the grate 8 fall on the tape 14. The tape removes weed impurities from the machine. There are other parts of this machine that differ from the previous loosening machines, two perforated partitions -9 are designed in the machine. There are three angles in the perforated partition; when you hit their edges, shreds of wool are cleaned very efficiently. The research process was carried out with four replicates. The results are shown in the 1-diagram.

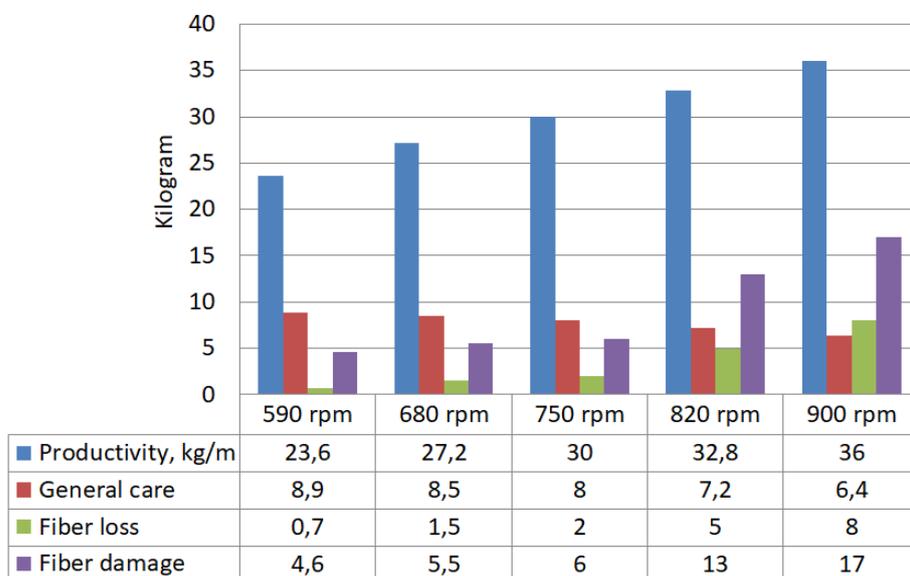
Ring drums 7,10,11 perform the main processes of loosening. The frequency of rotation of the drum pegs in (7 <10 <11) is different.

The goal of this machine is to increase efficiency and productivity. The mechanical forces and the destructive natural properties of the raw materials were studied.

When conducting the experiment according to the state standard, raw materials were selected: half-wool of the 2nd grade, 1st grade.

In order to increase the productivity of the machine, studies were conducted on 5 types of speeds of ring drums. When analyzing the results, the influence of the efficiency of the machine to increase productivity is determined. The optimal speed parameters of the annular drum are determined.

Rotational speed of ring drums, rpm



V. CONCLUSIONS

The purpose of this design of the wool processing machine is to improve the quality of the wool. Currently in production for primary processing of wool there is obsolete equipment with large dimensions.

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