

Development Of A Feeder Construction To Increase The Effectiveness Of Cotton Cleaning In A High-Scale Cleaner

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Abstract

The article presents an analysis of feeders for cotton feeding, their advantages and disadvantages, as a result of which it is stated that existing feeders have the ability to increase the cleaning efficiency of the equipment by dividing cotton into pieces with a low degree of loosening and increasing the degree of loosening.

Keywords: Feeder, spiked, bladed, cleaning effect, rollers, inclined bladed.

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1. Introduction

Feeding devices used in cotton cleaning machines also play a special role in the technological process of

cleaning cotton from waste. The function of the feeding devices is to ensure uniform delivery of cotton to the cleaning machine to ensure the specified productivity and cleaning efficiency.

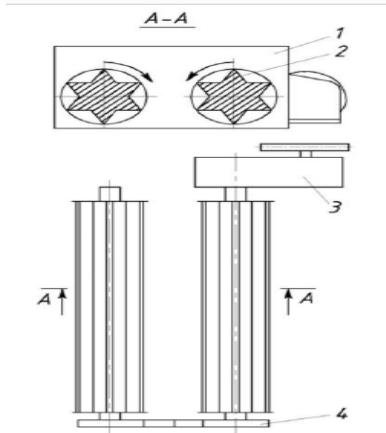


Figure 1. A feeding device used in cotton ginning machines.

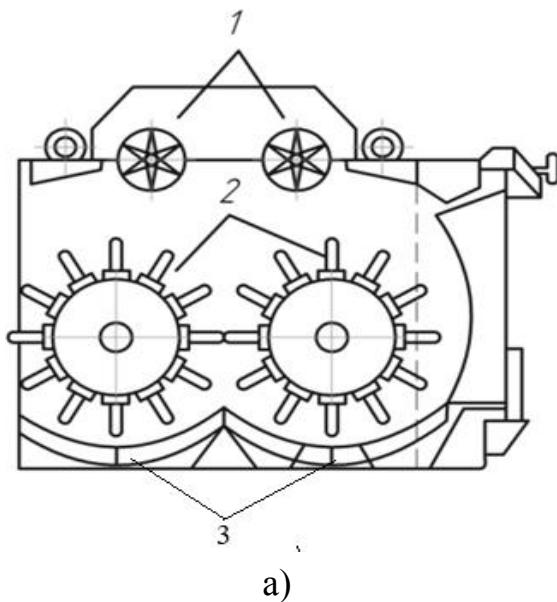
1-collecting shaft, 2-feeding rollers, 3-feed regulator, 4-drive gears.

Figure 1 shows a diagram of the feeding device used in practice in cotton ginning machines, which consists of a cotton harvesting shaft 1, feeding rollers 2, drive gears 4, and a mechanism for adjusting the feed 3 [1].

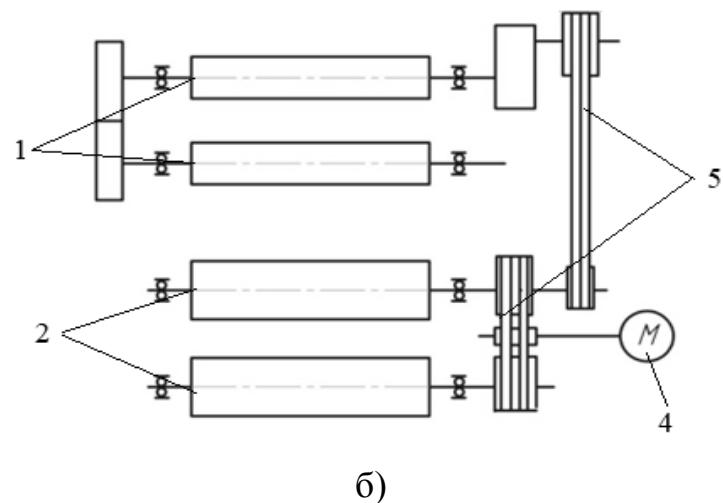
The feeding sections of cotton cleaning machines from small trash impurities consist of the following organs: feed rollers 1, a pair of spiked drums 2, and a mesh surface 3 (Fig. 2, a).

After the cotton transferred for cleaning falls on the feed rollers 1, it uniformly feeds the cotton to the spiked drums 2, and with the help of the spiked drums 2, it is cleaned of small impurities by dragging the cotton along the mesh surface 3.

Fig. 2, b shows the kinematic diagram of the drive of the first section of the UXK unit [2], in which motion through the electric motor 1 is transmitted by belt drives 2 to the feed rollers 3 and spiked drums 4.



a)



b)

Figure 2. Feeding section (a) and kinematic diagram (b).

1 - feed rollers; 2 - spike drums; 3 - mesh surface; 4 - electric motor; 5 - belt drives.

[3] the authors have developed a feeder design that increases the feed plane of inclined blade rollers by 1.5-

2 times (fig. 3), which has not been implemented in production due to the complexity of the feeder design.

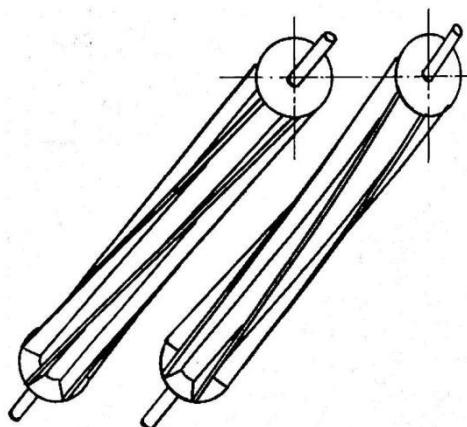


Figure 3. Inclined blade feed rollers.

In this design, it is possible to increase the degree of loosening of cotton, but due to its impact on fiber quality, it has not found its place in production.

To increase the degree of loosening of cotton, an

additional organ was introduced in another design of the feeder. In this case, the authors [3, 4] suggested that the degree of loosening can be increased by installing additional spiked drums under the feed rollers (Fig. 4).

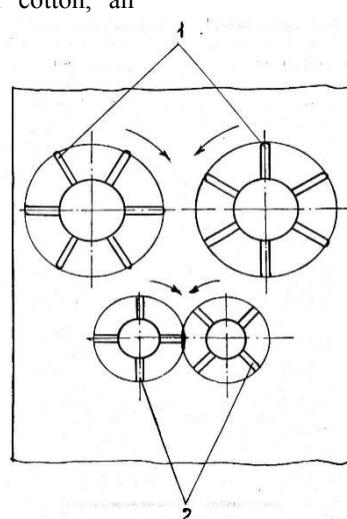


Figure 4. Method of feeding cotton in the drawing and loosening zone.

1 - feed rollers; 2-spike drums.

In foreign cotton ginning enterprises [5], feeders based on the operation of local feeders are used. Of these, in

roller gins of the "Rotobar" brand of the "Continental/Moss-Gordin" company, a feeder similar to the feeder of the roller gin of the DV brand is used (Fig. 5).

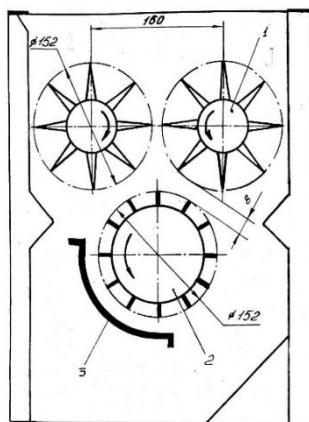


Figure 5. "Rotobar" roller gin feeder.

1 - feed rollers; 2-spike drums; Grid surface 3.

In the analyzed cotton feeder [6, 7], the feed blades are made wavy (Fig. 6). During the feeder's operation, the cotton flows from the opening 5 to the blades 4 of the feed rollers 3, where, with the rotation of the rollers 3, the cotton is transferred to the spiked drum 1. When

cotton is dragged along the surface of the grate 2 by means of the spiked drum 1, impurities are separated. Here, each blade surface is in the form of a sinusoidal curve, and the waviness of the blades is made at an angle of 450-600.

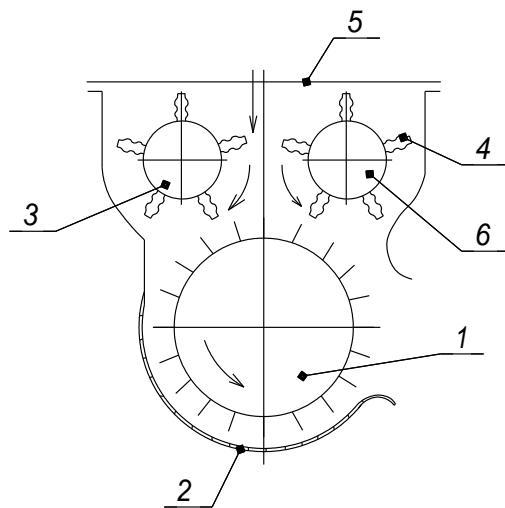


Figure 6. Wavy blade cotton feeder.

1-spike drum; 2 - mesh surface; 3,6-feed rollers; 4 - blades; 5 - cotton loading device

The undulating paddle drums of this feeder increase the ability to retain fibrous material, but because of the complexity of this design it was not adopted in production.

In studies carried out at TTESI [8], toothed rollers with an undulating configuration were developed (Figure 7), which achieved an increase in the frictional contact area with the cotton. Increasing the wave-surface height and

amplitude of the undulating paddles in the direction of cotton movement led to increased resistance of the paddles. The cleaning efficiency of the large-debris removal equipment rose from 56.2% to 62.8%, the structural composition (index) of the raw cotton increased from 0.504 to 0.532, and the amount of cotton entrained with contaminants decreased from 3.51% to 2.64%.



Figure 7. Undulating paddle feeder.

Rasulov R.Kh. et al. proposed a new feeder design for easing compaction and improving the disintegration of cotton during transfer from the bunker [9] (Figure 8).

Cotton is conveyed from the bunker (1) to the feeding rollers (2), and through the rollers it is delivered to the

spiked feeders (3, 4). When cotton passes between the spiked drums, tearing and fragmentation cause more of the cotton to be separated into lumps and conveyed to the cleaning unit, which increases cleaning efficiency; however, the potential increase in mechanical damage to the cottonseed content was not addressed.

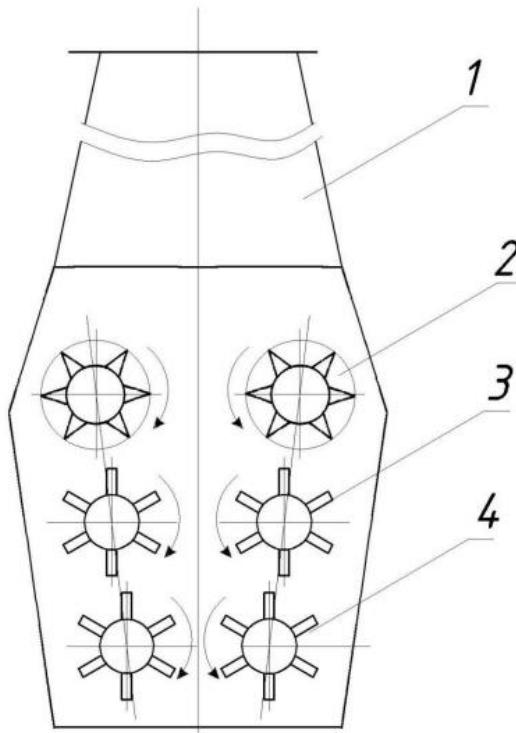


Figure 8. Multi-spike feeder proposed by R. Rasulov.

1 – chute, 2 – blade drum, 3, 4 – spike-type drums.

The general drawback identified in the analyzed feeders is that they cause additional compaction of the cotton and

negatively affect the feeding of cotton into the cleaning unit in a loosened state.

An analysis of the conducted scientific research shows that due to insufficient fragmentation of the cotton mass as it passes between the feeder rollers, it is advisable to develop the constructive and technological parameters of the cotton feeder.

Therefore, to further improve the efficiency of the cotton cleaning unit for removing small impurities, experimental analyses will be carried out on fragmenting the cotton by installing the feeder rollers at an inclined angle and adjusting their rotational speed.

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