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# DESIGN FEATURES OF THE GRATE CLEANERS COTTON - RAW FROM A LARGE LITTER

**Nodira Mirzakulova[1], Odil Turaev[2]**

[1]*Teacher of the Department of Technological Machinery and Equipment, Bukhara Engineering Technological Institute, Bukhara, Uzbekistan*

[2]*Master's student of the Bukhara Engineering Technological Institute, Bukhara, Uzbekistan*

## ABSTRACT

***The article provides information on the design and operation of machines for cleaning raw cotton from coarse litter. The article also provides an analysis of the work done to improve the working bodies of the machine for cleaning cotton from large weeds.***

## INTRODUCTION

In the world, research work is carried out for the cotton ginning industry aimed at the development of innovative techniques and technologies that provide for the effective use of modern achievements of science and technology, and the modernization of existing ones. In this industry, including the development of effective, resource-saving designs of working bodies, grates of cotton cleaners from large litter is of great importance.

In our republic, special attention is paid to the creation of high-performance technological machines and equipment, their control systems for technological processes of primary processing of cotton. When performing this task, it is important, among other things, to create effective designs of grates for cleaning cotton from coarse litter and introduce them into production in order to obtain products of a given quality according to the initial quality indicators of raw cotton.

## LITERATURE REVIEW

Used in production, the construction of raw cotton cleaners from large trash impurities consists of two main parts, a working body in the form of a rotating serrated cylinder and a baffle device for deflecting large trash impurities (grates). The use of stationary grates of circular cross-section in the cleaner allows the separation of large trash impurities (see Fig. 2). At the same time, the main disadvantage of these grates with the arrangement of grates with gaps is influenced by the large escape of cotton volatiles to waste, which becomes a mandatory use of the regeneration section in the cotton processing line [1].

In work [2] it was found that when using trihedral grates at an angle of $157^0$ to the radius of the serrated cylinder with a gap between the grates equal to 40 mm, the cleaning effect of the machine is significantly increased.

In the ChKh-3 cleaners, grate bars with a trapezoidal section with face dimensions of 25, 16, 12 and 10 mm CHKH-3M were used. At the same time, it was revealed that triangular and trapezoidal grates contribute to significant damage to seeds. The grates have the same size of the working edge as in the triangular grates. The main advantages of grates with a flat working (triangular, trapezoidal) face is to ensure an increase in the force of impact interaction with cotton. This leads to an increase in the cleaning effect of raw cotton. The disadvantages of these grates are the increased formation of free fiber, as well as some damage to the fiber and cotton seeds.

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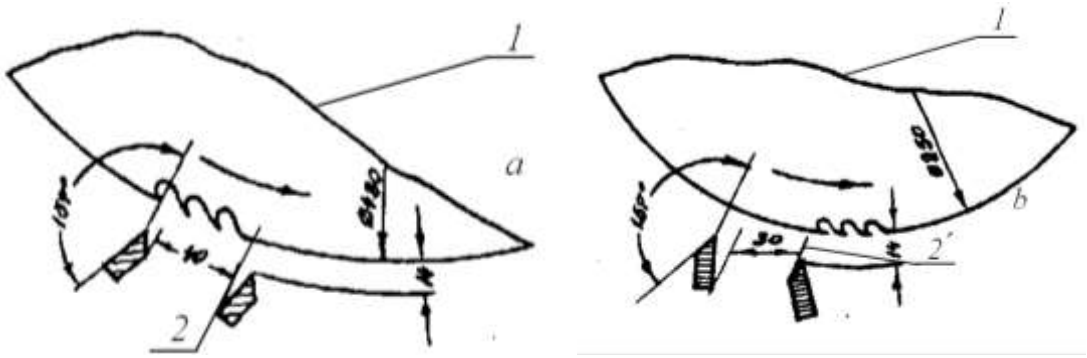


1-barbed cylinder, 2-trapezoidal grates.

**Figure 1. a) Working area of the cleaner CHH-3M2 with trapezoidal grates, b) Working area of the purifier OXP-3 with trapezoidal grates.**

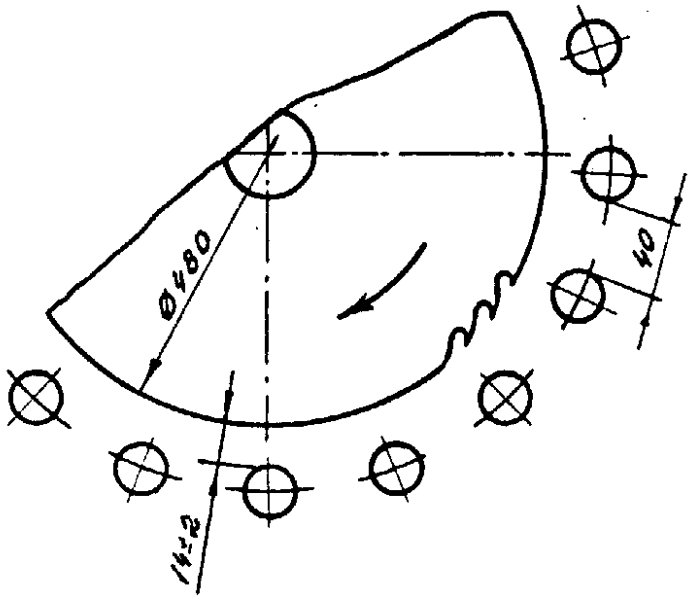


**Figure 2. Working area of the UKHK cleaner with round grates.**

Trapezoidal grates were also used in the cleaning section under the serrated cylinder of the OXP-3 cleaner (Fig. 1). When using trapezoidal grates in ChKh-3M cleaners, their working edge is 12 mm in size. Studies have shown that this design was ineffective. Round grates, the parameters of which are substantiated in [3], are more effective, but it should be noted that round grates used in cleaners are inferior to grates with a flat working edge in impact force, allow intensive release of trash impurities and lead to a decrease in the amount of free fibers. It is known that in OX-2 purifiers. ChKh-3M2 "Mekhnat", unit UKhK, in the purifier-regenerator PX, grates of a round profile are used. In fig. 2 shows the section for cleaning the cleaners ChKh-3M2, "Mekhnat" and the UKhK unit. In our opinion, grates of circular cross-section do not allow an increase in the cleaning effect without additional constructive solutions. One of these ways is to increase the degree of mobility of round grates.

Recently, cotton cleaning units UHK have found widespread introduction in production [4]. The UKHK unit sequentially includes sections for cleaning raw cotton from fine and coarse litter. In fig. 3 shows a schematic diagram of a cotton cleaning unit UKhK, which includes three sections for coarse cleaning of cotton. In all these three sections, there are two serrated drums 4 and grates 5 under them. The grates have a circular cross-section with an outer diameter of 20 mm. It should be noted that with an increase in the cleaning efficiency of each of the sections, it is possible to reduce the number of sections, thereby also the frequency of cleaning cotton [5]. The lower the frequency of cleaning, the less damage to the fiber and cotton seeds.

In [6] A. Djuraev et al. Proposed elastic grates (Fig. 4), which consist of a cylindrical rod with a diameter of 18 mm and a rubber tube mounted on it. During the operation of the purifier, rubber-coated grates absorb the impacts of the cotton fly on the grate, which reduces mechanical damage to the seeds and the escape of the fly into waste.

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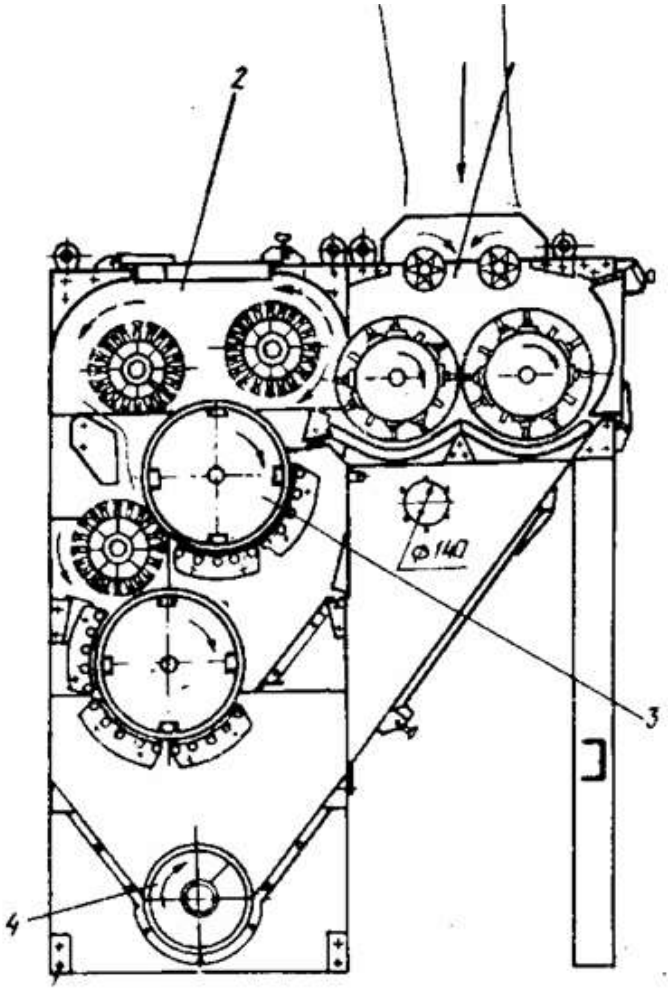
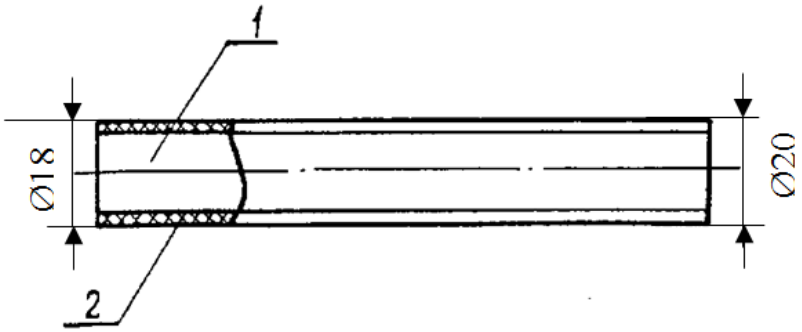



1-feeder, 2 - brush cylinder, 3-saw cylinder, 4 - auger for removing impurities.

**Figure 3. Scheme of the cotton cleaning unit UKHK**




1-round bar; 2-rubber tube.

**Figure 4. Round grate with rubber attachment**

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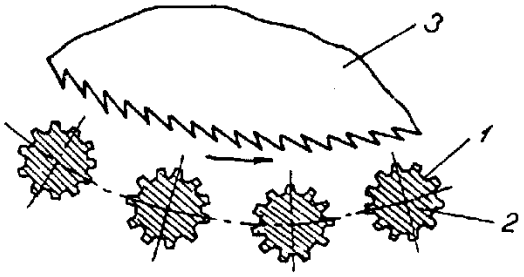
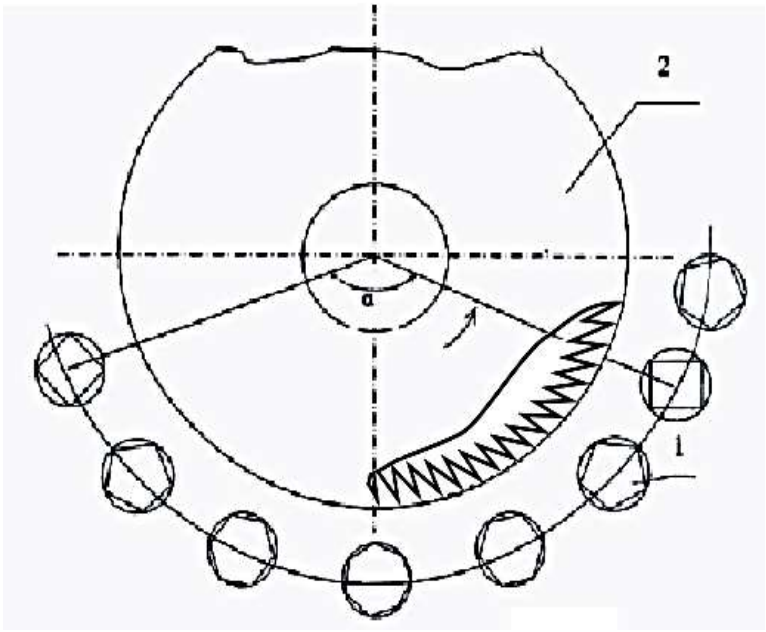



1-grate; 2-riffles (straight); 3-barreled cylinder

**Figure 5. Grate of the fiber material cleaner with corrugated grates**

In this case, the rubber sheath leads to a decrease in the shock impulse. In addition, the rubber coating, due to the increased friction between the cotton and the grates, inhibits the pulling of the cotton. Therefore, grates with an elastic coating are inactive and therefore have not found application in production. Also in the design of the grate (Fig. 5) having grates with grooves on the cylindrical surface [7] leads to damage to the fiber and seeds, the amount of free fiber increases.

In [8], a grate for a large litter cleaner is proposed, where under the serrated cylinder, triangular grates with a circumferential diameter of 20 mm are installed, having forced rotations. The advantage of a grate with three-sided rotating grates (see Fig. 7) is that they allow better separation of trash impurities due to their edges, allowing some increase in the cleaning effect. When the depressions of the neighboring triangular grates coincide, the gap between the grates actually increases, which leads to the fallout of raw cotton volatiles through them. In addition, in the three faces of the grate, a significant amount of volatiles can fall out to waste, as well as an increase in damage to the fiber and cotton seeds.




1-grate, 2-working cylinder.

**Figure 6. Lattice grate with multifaceted grates.**

In a grate, where grates of multifaceted shape are installed between adjacent round grates [9], which also have forced rotations (Fig. 8). During the operation of the cleaner, the grate with forced rotation, to some extent, shakes the cotton, and therefore there is some additional effect of cleaning the cotton. But, in this design, volatiles drop out to waste and to some extent increases the mechanical damage to the fiber and seeds [10-12].

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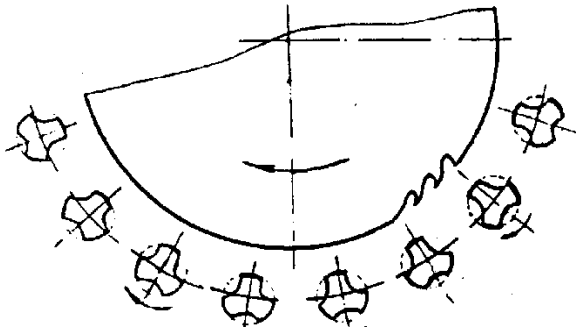
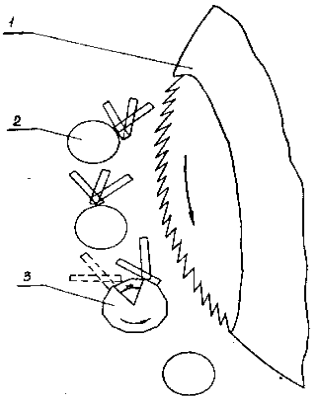


**Fig. 7. Raw cotton grate with rotating triangular grates**




**1-saw cylinder; 2-round fixed grates; 3-rotating multifaceted grate.**
**Fig. 8. Raw cotton grate with rotating multifaceted grates**

In this case, the radius of installation of the grate relative to the axis of rotation of the cylinder and the pitch between them will be different, which correspond to the values of the corresponding diameters of the grate. Insufficient is the large waste of volatiles.

## CONCLUSIONS

Based on the design of plastic grates on elastic supports. For the analysis of the designs of grates of cotton cleaners - raw from coarse litter, newer effective lightweight schemes have been developed.

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