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COTTON CLEANER WITH MULTIFACETED GRATES

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Abstract: Based on the experiments carried out with a change in the number of sides of the grate in the area of pulling raw cotton, it has a sinusoidal shape relative to the faces of the grate, with different angles of location, which leads to the release of impurities of different masses and different depths in the cotton. Multi-faceted grates can hold the most loosely attached cotton flakes, which leads to repeated and uniform unloading on the teeth of the saw drum. Multi-faceted grates can hold the most loosely attached cotton flakes, which leads to repeated and uniform unloading on the teeth of the saw drum.

Keywords: grate, saw-toothed drum, raw cotton, cleaner, pulse blow.

Introduction. The development of technology and technology sets the most important tasks that are related to international standard requirements, which in turn require researchers and designers to solve many scientific and technical problems. 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, 2].

The creation of highly efficient cotton processing machines that ensure the preservation of the natural qualities of cotton requires the improvement of technology and equipment for the primary processing of cotton.

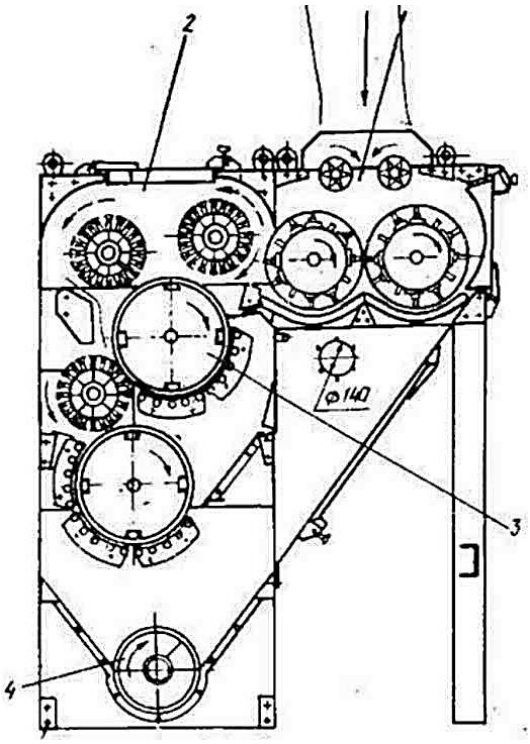
In the last decade, in the cotton ginning industry there has been a tendency to reduce the number of technological cleaning equipment and increase the capacity of raw cotton purifiers, including modules for cleaning cotton from large and small impurities. This is an objective indicator of the insufficient efficiency of existing equipment, an increase in the number of which in the cleaning line worsens the physical and mechanical properties of the raw material, which leads to damage to the fiber and seeds [3, 4].

Cotton fiber and products made from it occupy a special place in the economic independence of the Republic of Uzbekistan. To develop equipment and technology for the primary processing of cotton, it is necessary to resolve issues related to reducing production costs for processing raw materials, improving product quality and competitiveness in the world market. The implementation of such tasks is possible using the achievements of modern science and technology.

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. 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. [1].

The main direction of improving and creating new cleaning machines, their working parts and mechanisms is to expand technological capabilities while maintaining high productivity and cleaning effect. When developing new cleaning machines and their elements, it is advisable to preserve the natural and physical-mechanical properties of raw cotton, as well as technological factors. Properties of materials such as elongation (deformability), coefficient of friction, density, melting (combustion) temperature, thickness, etc., impose certain requirements on the design of working bodies in advance. [5, 6].



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

Figure 3. Scheme of the cotton cleaner УХК

To develop equipment and technology for the primary processing of cotton, it is necessary to resolve issues related to reducing production costs for processing raw materials, improving product quality and competitiveness in the world market. The implementation of such tasks is possible using the achievements of modern science and technology.

An analysis of the designs of domestic and foreign cleaners for raw cotton from large debris showed that they are based on a set of cleaning modules, each of which includes a saw-tooth drum with a grate, a lapping brush and a removable brush drum. As a rule, cleaning forms a large debris cleaner and is oriented in a vertical plane [7, 8].

The design of the grate of fibrous material ensures an increase in the cleaning effect and the production of high-quality products. To isolate cotton leaves, bolls, particles of stems, twigs and other large and small impurities from cotton, machine and manual collection, saw-toothed grate cleaners are used in domestic and foreign practice. [8, 9,10].

In the existing design, the grates are made mainly of round section [11,12,13]. The main disadvantage of this design is the low cleaning effect.

Methods. To increase the cleansing effect of fibrous material, in particular raw cotton, from large impurities, it is necessary to create interaction between cotton and grate bars with different impulse forces, both in direction and in magnitude, due to the implementation of multifaceted grate bars. Moreover, along the location, the grate bars have a different number of edges. Changes in the number of grate faces in the cotton pulling zone have a sinusoidal (triangular) shape relative to the cotton along the grate faces, with different angles, which leads to the release of various impurities from raw cotton.

The essence of the grate design is illustrated in fig. 1 and fig. 2, where in fig. 1-scheme of grate bars, fig. 2-law of changing the number of grate faces along the fibrous material cleaning zone.

Results. In the proposed design, the cleaning process of fibrous material is carried out as follows. During operation, raw cotton (fibrous material) is transferred to the saw-toothed drum 2, the teeth of which capture the raw cotton and drag it along the grate. In the area of action of the saw-toothed drum 2, the cotton hits the multi-faceted grate bars 1.

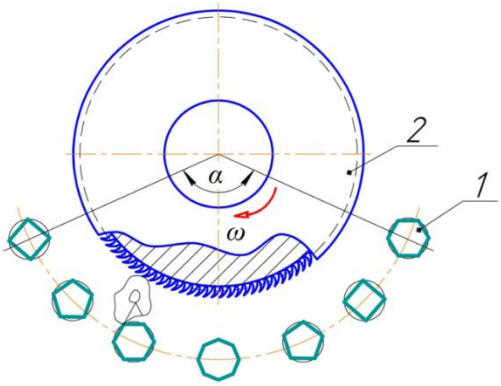


Fig. 1. Diagram multifaceted grates

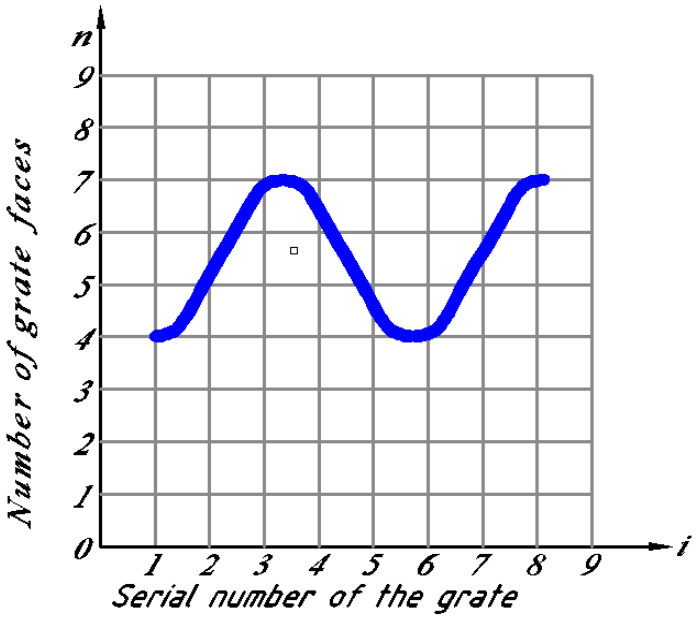


Fig. 2. Law of change in the number of faces of the grate along the sedum zone of fibrous material

In this case, the force and direction of the blows along the rotation of drum 2 will be different, due to the number of different faces of the grate 1. In this case, the force and direction of the blows along the rotation of drum 2 will be different, due to the number of different faces of the grate 1.

The impulse force of the impact of cotton on the edge of the grate 1, with a decrease in the number of faces of the grate 1, on the contrary, the impact force increases. This interaction of cotton with multifaceted (various quantities) grates 1 from raw cotton releases impurities of varying mass and varying depth found in the cotton. In order to control the process of cleaning raw cotton, the installation of grate bars 1 along the rotation of drum 2 is carried out according to a sinusoidal (triangular) law and the cotton lobes oscillate (see fig. 1).

In this case, the monotony of the process is eliminated; the magnitude of the direction of the impulsive impact of cotton on various faces of the grate 2 will change cyclically, allowing a significant release of impurities from raw cotton. If the average number of faces of the grate is psr, then for the i grate the number of faces will be, for the option shown in the figure, the graph in fig. 2 corresponds, where n1=4; n2=5; n3=6; n4=5; n5=4; n6=5; n7=6, etc. The period of change in the number of faces is selected depending on the size of the grate 1, between the grate gap, the size of drum 2 and the gap between grate 1 and drum 2.

Based on experimental data, it is recommended to take the gap between the saw drum and the grate from 10 mm to 13 mm, and the gap between the grate from 30 mm to 40 mm, as a result of which it leads to an increase in the cleaning effect on large litter by 10-15%.

The edges of the grate bars affect the retention strength of flies on the surface of the saw drum, destroying the density of cotton and unloading it repeatedly and evenly on the surface of the saw drum headset, which makes it possible to effectively remove debris from cotton, resulting in an increase in the cleaning effect.

Discussion. The force of the impact load has the maximum effect on the amount of released impurities, provided that the natural quality of the fiber is preserved; the distance of the grate from the rotating drum should ensure the free passage of volatiles.

When a piece of cotton hits and interacts with the grates, it is important that the behavior of the grains leads to a chaotic arrangement.

Conclusions: Multi-faceted grates can hold the most loosely attached cotton flakes, which leads to repeated and uniform unloading on the teeth of the saw drum. Multi-faceted grates can hold the most loosely attached cotton flakes, which leads to repeated and uniform unloading on the teeth of the saw drum. And also, in the article, the proposed design is carried out with a change in the number of faces of the grate in the cotton pulling zone; it has a sinusoidal shape relative to the cotton along the faces of the grate, with different angles of location, which leads to the release of various impurities from raw cotton.

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