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ANALYSIS OF RESEARCH ON CHANGING THE SURFACE OF THE GRID IN A DEVICE FOR CLEANING COTTON FROM FINE IMPURITIES

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Abstract: This article analyzes scientific research carried out to improve the design of machines for cleaning cotton from small impurities at cotton ginning enterprises, which have a mesh surface, which is one of the main working parts of the machine for cleaning cotton from small impurities, analyzes were carried out and an optimal mesh surface was proposed.

Keywords: cotton cleaning, small quarrel, cotton, mesh surface, pegging drum, pegs, working chamber, efficiency, vibration, quarrel hopper.

Introduction. Today, scientific research is being conducted in the republic aimed at improving the quality of products and reducing their cost by increasing the efficiency of the cotton cleaning process. In this regard, in the process of cleaning cotton from small impurities, priority is given to research into creating designs that allow preserving its original quality indicators. In our country, a number of scientists are conducting research to improve the designs of working parts of technological machines for the primary processing of cotton, including cotton ginning machines, and to determine technological parameters and modes.

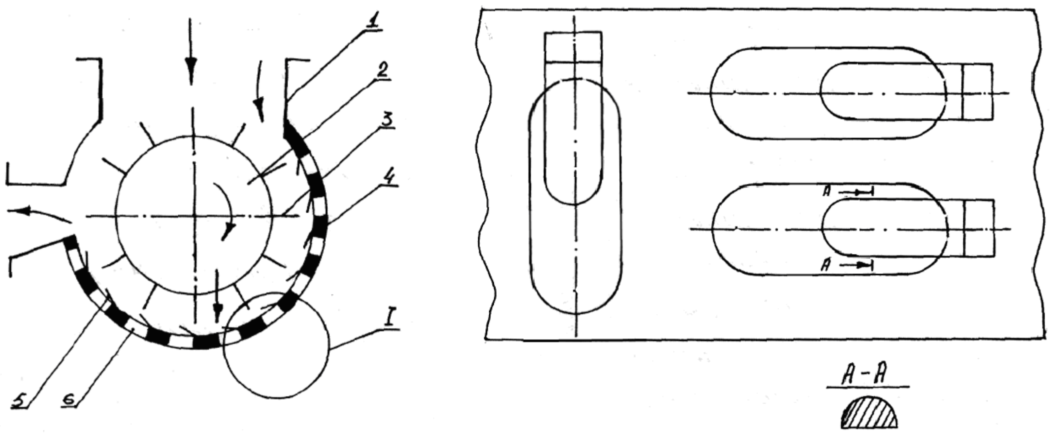


Figure 1. New mesh surface.
1-body, 2-tuning drum, 3-tuning pegs, 4-cleaning pegs, 5-band plate, 6-hole.

An analysis of existing scientific research shows that not enough work has been done to determine and increase the usable surface area of cotton gin meshes.

On a mesh surface, not enough attention is given to the cotton as it moves. A new design of the mesh surface of a cotton cleaner from small impurities has been proposed (Fig. 1).

The proposed device for cleaning cotton works as follows. Using a pegging drum (1), the cotton is pulled over the surface of the mesh (3). In this case, the strap placed in the holes of the mesh surface is exposed to plastic (4). Belt plates installed in the holes of the mesh surface vibrate and contribute to intensive cleaning of raw cotton from small impurities.

O. Radjabov proposed cleaning from small impurities using a multifaceted mesh surface of a cleaning machine (Fig. 2).

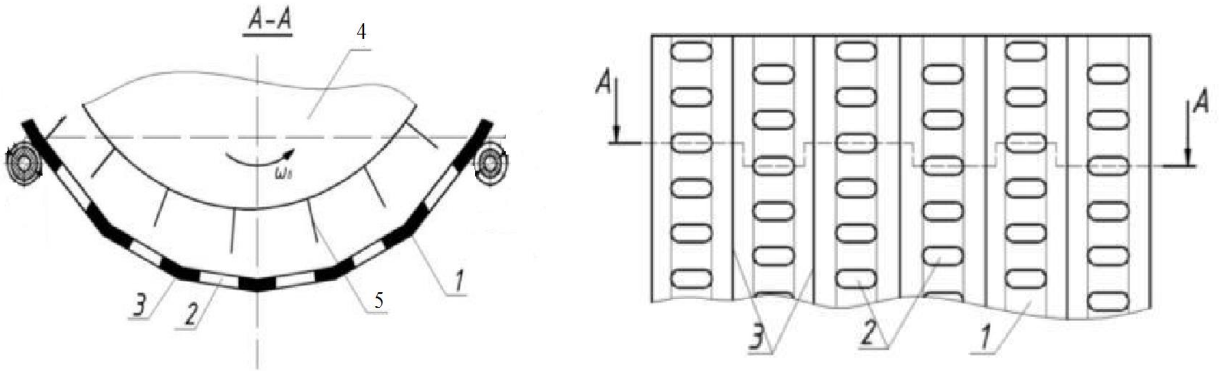


Figure 2. Multifaceted mesh surface for cleaning cotton raw materials.
1-mesh surface, 2-circular, 3-prismatic, 4-drum, 5-peg.

In this case, the cotton ball is effectively cleaned of small impurities due to vibration when moving along a multifaceted mesh surface.

Methods. Today, scientific research is needed to improve the efficiency of the mesh surface by changing the useful surface of the cotton raw material during the cleaning process. Changing the useful mesh surface is accomplished in two different ways. In the first, the angle of the mesh surface relative to the center of the drum with pegs is changed. Secondly, the advantage of the mesh surface is the change in the shape of the holes affecting the surface.

The screen surface used in cotton gins today has a 90° angle to the center of the folded drum. This angle can be increased to 180°.

$$\alpha 1=90^{\circ}, \alpha 2=110^{\circ}, \alpha 3=130^{\circ}, \alpha 4=150^{\circ}$$

when the shape of the holes is round, oval, round-oval, rectangular.

To obtain a useful mesh surface, the surface area of the mesh must be determined. To do this, the length of the mesh surface was determined in relation to the center of the drum with pegs. In the UHK installation, the length of the mesh surface is 1343.92 mm. If we determine the length of the above angles α, then the length of the mesh surface is equal to 335.98 mm at the angle of the mesh surface relative to the center of the drum with the pile at a1=90°, and the length of the mesh surface is 410.98 mm at the angle a2=110°, and the angles a3= at 130° and a4=150° the length of the mesh surface in width was 485.17 mm and 559.97 mm. From this it is clear that by increasing the angle of the mesh surface relative to the center of the pricking drum, we observe that the length of the mesh surface increases in width, which necessarily leads to an increase in the useful surface.

Results. Using these data, we determine the surface on which the holes are located at a1=90°, a2=110°, a3=130°, a4=150° relative to the center of the drum splitter.

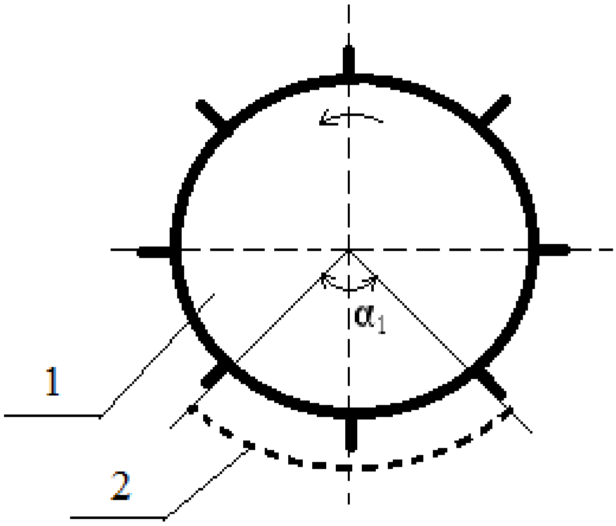


Figure 3. When the mesh surface a1=90˚ relative to the center of the stacked drum. 1-peg drum, 2-cell surface.

At a=90° relative to the center of the stacked drum, the surface area of the mesh is S1=1071776.2 mm2. Cleaning efficiency S1=40%. At a2=110° relative to the center of the drum pegs of the mesh surface (Fig. 4).

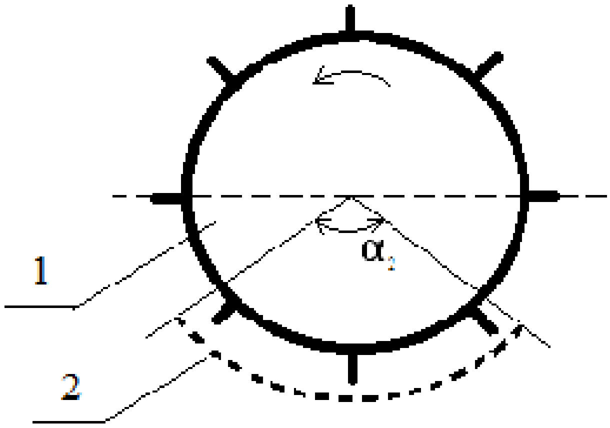


Figure 4. When the mesh surface a2=110˚ relative to the center of the tuning drum. 1-peg drum, 2-mesh surface.

At a=110˚ relative to the center of the stacked drum, the surface area of the mesh is S2=1311026.2 mm2. We calculated that the cleaning efficiency changes from S1=40% to S2=48.9% due to the change from α=90˚ to α=110˚. Thus, this change provides an 89% increase in cleaning efficiency when considered from a theoretical point of view.

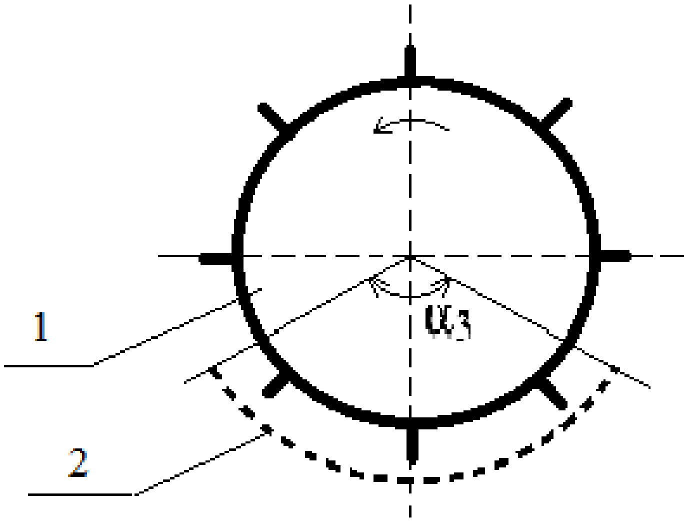


Figure 5. When the mesh surface a3=130˚ relative to the center of the stacked drum. 1-peg drum, 2-mesh surface.

The efficiency of cleaning the surface of the mesh under the pile drum was 40% and 48.9% at angles a1=90˚ and a2=110˚ relative to the center of the pile drum. Therefore, cleaning efficiency increases by increasing the surface area of the mesh. Therefore, when we changed it to a3=130˚ relative to the center of the stacked drum, the surface area of the mesh was S3=1547692.3 mm2, and the cleaning efficiency was S3=57.8%.

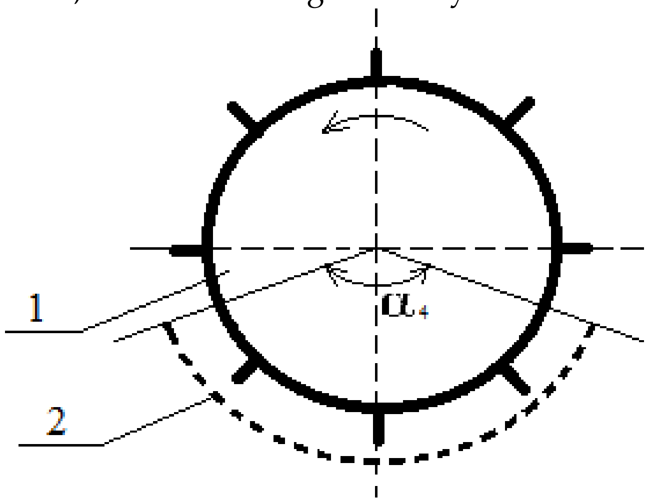


Figure 6. When the mesh surface a4=150˚ relative to the center of the stacked drum. 1-peg drum, 2-mesh surface.

It has been determined that the cleaning efficiency of the mesh surface S4=1786304.3 mm2 will be S4=66.7% when preparing the mesh surface at an angle a4=150˚ relative to the pile drum.

S1=1071776.2 mm2; S2=1311026.2 mm2; S3=1547692.3 mm2; S4=1786304.3 mm2

S1=1071776.2 mm2 at the central angle of the stacked drum a1=90° cleaning efficiency S1=40%, at a4=150° S4=1786304.3 mm2, S4=66.7%

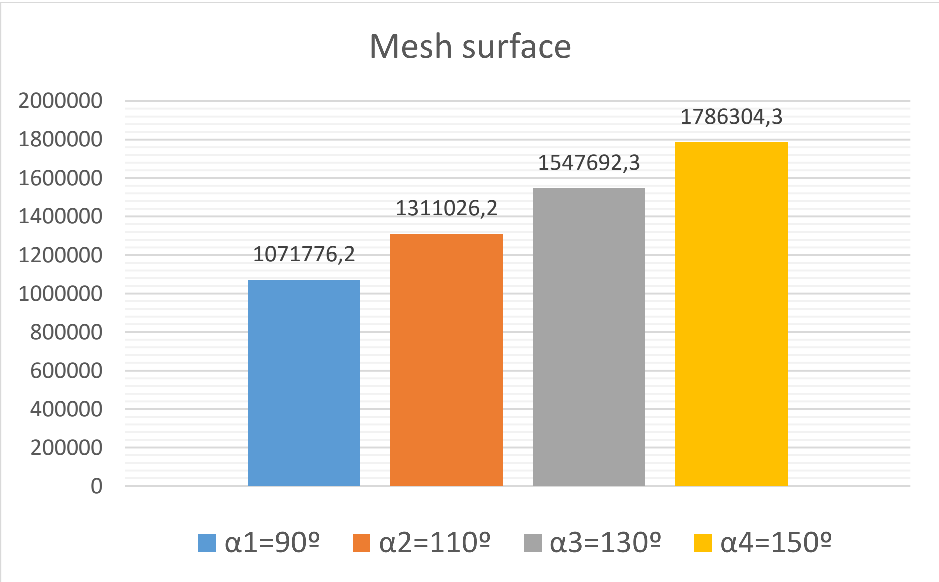
Based on the results, the following table was generated.

Table 1.

№	Mesh surface position angle	Mesh surface length, mm	Width of mesh surface, mm	Mesh area, mm2	Cleaning efficiency, %
1	α1=90º	1343,92	335,98	1071776,2	40
2	α2=110º	1343,92	410,98	1311026,2	48,9
3	α3=130º	1343,92	485,17	1547692,3	57,8
4	α4=150º	1343,92	559,97	1786304,3	66,7

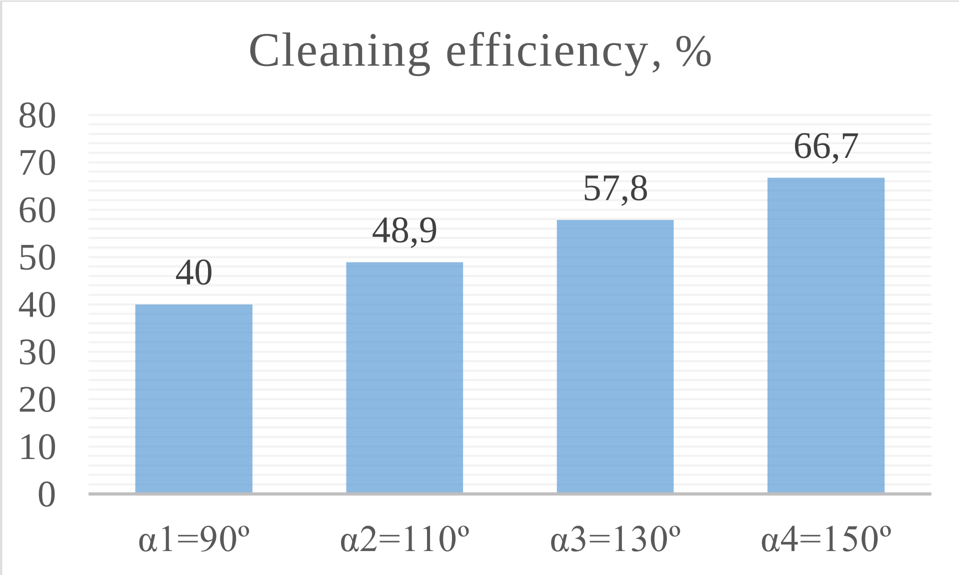
Table 1 shows the effect of varying the mesh surface angle on the mesh surface area and cleaning efficiency. The length of the mesh surface did not change, but the width of the mesh surface increased due to a change in the position angle of the mesh surface. Based on this table, graphs 1 and 2 were obtained.

Schedule 1.



Graph 1 shows the surface of the mesh surface at different angles to the center of the stacked drum at a1=90°, a2=110°, a3=130°, a4=150°.

Schedule 2.



Graph 2 shows a graph of increasing efficiency of cleaning the mesh surface at various angles a1=90°, a2=110°, a3=130°, a4=150° relative to the center of the pile drum.

Thus, the surface located in relation to the center of the drum is equal to a1=90º S1=1071776.2 mm2, a4=150º S4=1786304.3 mm2, and it increases significantly. This in turn increases the number of pores that can be located on the surface of the mesh, increasing cleaning efficiency from 40% to 66.7%.

Conclusion. Analyzing the results of the theoretical studies, we can come to the following conclusion.

By increasing the useful surface of the mesh without spending too much energy, the efficiency of cleaning the machine from small impurities can be increased by an average of 28%. In addition, the 1XK cotton gin can reduce the number of lint drums while maintaining overall cleaning efficiency.

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