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# RESEARCH ON THE INTRODUCTION OF A DOUBLE-FACED IMPROVED COTTON SEPARATOR

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**ABSTARCT**
This article analyzes the newly proposed, improved types of separator equipment for use in cotton processing plants and their working principles. Getting cotton out of the air without the negative impact on quality indicators, without reducing the fibers and seeds, while maintaining the natural properties of cotton in the air. The goal is to increase the efficiency of production by improving the quality of products of economic significance, increasing the effectiveness of separation of cotton from the airflow and eliminating existing deficiencies in the cotton plant.

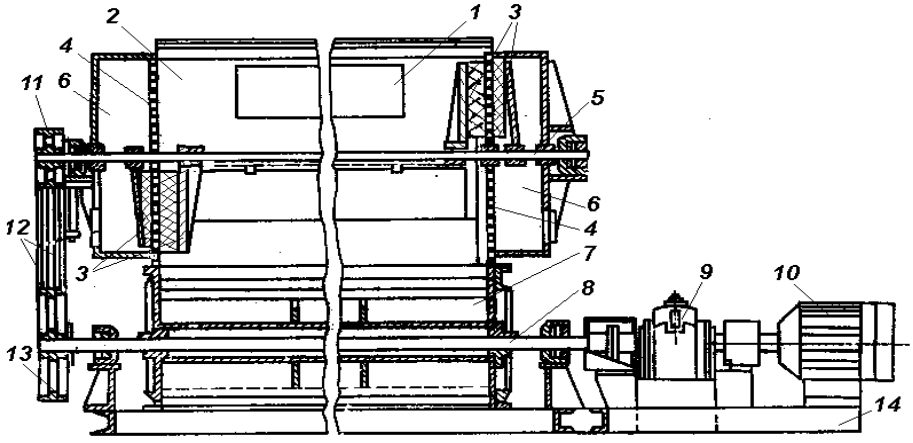
**KEYWORDS:** pneumotransport, cotton, separator, inertial separator, extra air duct pneumoeparator, net surface, vacuum-clapper, separation chamber, spiral plate.

## INTRODUCTION

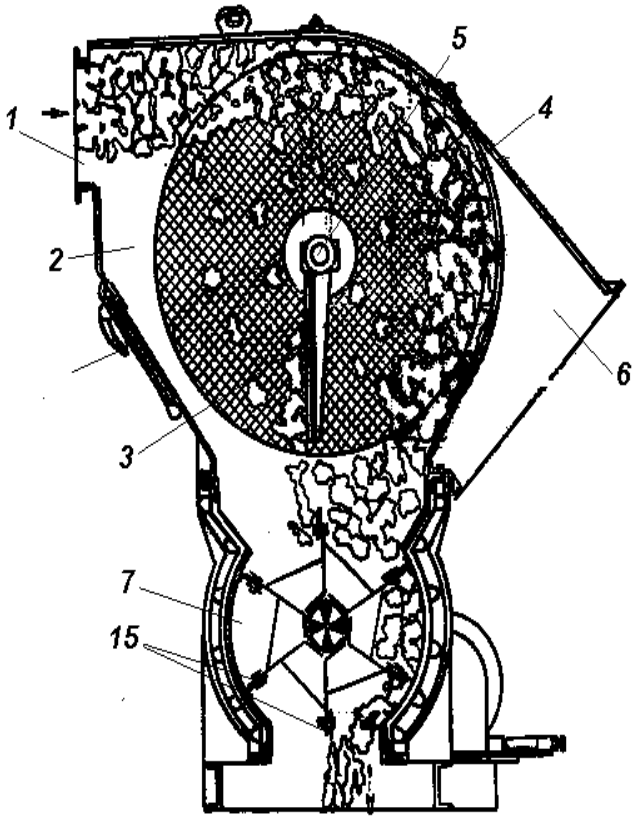
The efficiency of ginneries and the quality of their products depends on the quality of technological processes and equipment involved in the enterprise. This requires in-depth knowledge of specialists, because it requires a thorough knowledge of the operation and management of each technological machine, the whole technological process, all of which is aimed at ensuring the quality of the product obtained. At present, CC-15A separator is used in ginneries to separate cotton from air.

The separator is used continuously in production because it is convenient, easy, and reliable to use. The general view of the separator is shown in all dimensions (Fig. 1) and the cross section is shown in Fig. 2. The SS-15A scraper separator is divided into two sections by a mesh barrier: the seed cotton section (1) and the air section (2). In the seed cotton section, there is a scraper (4) on both sides of the guide (3) and the mesh surface (5), which pushes the cotton and throws it into the vacuum valve (6).

Vacuum-valve Seed cotton is not allowed to enter the air from the outside when leaving the separator volume up.




(Figure 1). Log cross-section surface of CC-15A separator.




(Figure 2). Cross-sectional view of the CC-15A separator

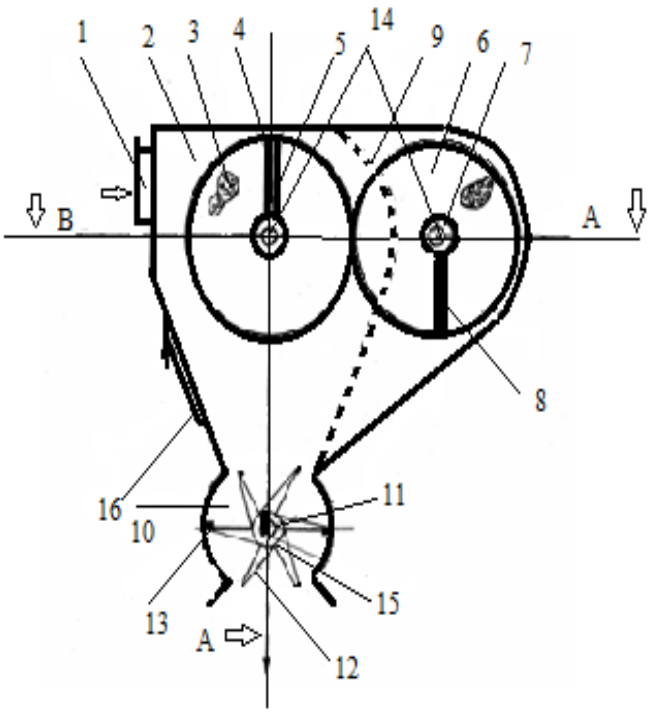
1 inlet pipe; 2- working camera; 3 - scraper; 4- mesh surface; 5 – shaft: 6-outlet pipe; 7 - vacuum valve; 8 - vacuum-valve shaft; 9 -editor; 10 - electric motor; 11, 13 - shkif; 12 - belt extension; 14 - basis; 15 - Vacuum-valve blades.

The air section of the chamber is blocked by a mesh surface on one side and cones on the other side and is connected to a pipe leading to the fan. As a result of the air flow entering the separator and a part of the seed cotton hitting the mesh surfaces on both sides, the air velocity inside the separator is significantly reduced and the main part of the incoming cotton falls directly into the vacuum valve. The cotton wool, which is attached to the surface of the net, is scraped with a scraper, which is also transferred to the vacuum valve. Leading scientists have conducted a lot of research work to improve the efficiency of the technological process, productivity, maintaining the quality of cotton by improving the design of equipment used in ginning plants.

Based on the analysis of the research work, the researchers developed a new efficient separator design.

The proposed separator for air separation of seed cotton can be introduced in ginneries. The function of this separator is to work while preserving the natural properties of the cotton, preventing damage to the seeds and fibers during the air separation process. An additional pair of mesh surfaces in a horizontal plane are placed in the proposed separator working chamber. The diameter of the mesh surfaces is equal to the diameter of the existing mesh surfaces, and the amount of air absorbed by an additional pair of mesh surfaces placed in a horizontal plane is divided into two. This reduces the likelihood that the first pair of cotton entering the working chamber will move toward the mesh surfaces. As a result, the factors that affect the quality of seed cotton, which have a mechanical effect, are eliminated.

The task of the new separator is to separate the seeded cotton from the air, which is transported by air in ginneries. In carrying out this task, it is advisable to prevent seed damage by violating the physical properties of the fiber and preventing dust from escaping with air. An additional pair of mesh surfaces in a horizontal plane are placed in the proposed separator working chamber. The diameter of the mesh surfaces is equal to the diameter of the existing mesh surfaces.



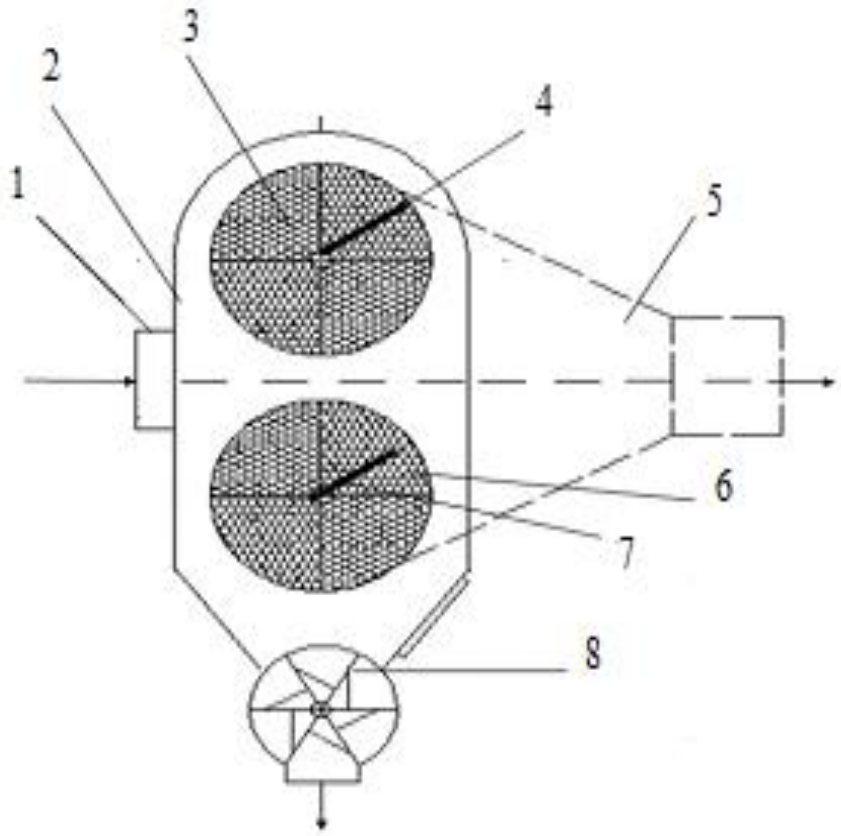

(Fig. 3) The condensing shear surface of the device
1 inlet pipe; 2- working camera; 3 - scraper; 4- mesh surface; 5 – shaft: 6-outlet pipe; 7 - vacuum valve; 8 - vacuum-valve shaft; 9 -editor; 10 - electric motor; 11, 13 - shkif; 12 - belt extension; 14 - basis; 15 - Vacuum-valve blades.

The task is performed in the following way. Unlike the separators used, the amount of air absorbed is divided by two using an additional pair of mesh surfaces placed in a horizontal plane. This reduces the likelihood that the first pair of cotton entering the working chamber will move toward the mesh surfaces. In turn, it will be possible to ensure the linear movement of cotton. As the air is absorbed from the inner side on the first pair of mesh surfaces, the nozzle will also be mounted in the same direction. In the second pair, the air is sucked from the outside of the mesh surface so that it is placed on the outside of the mesh.
Such placement of the mesh surface ensures a completely new way of separating the cotton from the air. Another advantage of this proposed separator is that it does not require additional energy when operating. To ensure the movement of the slider mounted on the second mesh surface, the movement is transmitted to the second mesh surface shaft through a belt drive mounted on the first mesh surface shaft.
The separator works in the following order: a certain part of the incoming cotton from the inlet pipe 1 moves towards the first pair of mesh surfaces 3 and another part towards the second pair of mesh surfaces 6, where the first pair of mesh surfaces is out, the second pair of mesh surfaces Due to the fact that the surfaces draw air in the same order, the speed of the cotton piece decreases sharply, the main part falls to the vacuum valve 10 through the guide 9. Also, the cotton, which is partially attached to the mesh surfaces, is lowered into the vacuum valve by means of screws 5 and 8, which are attached to the shafts 4 and 7. Vacuum-valve pads are passed to the next process of seed cotton, which falls to 12. Dusty air coming from the cotton is expelled through the mesh surface 3.6 s. Thus, due to the additional second pair of mesh surfaces installed in the separator working chamber for separating the cotton from the air, the cotton piece entering the working chamber drastically reduces its movement speed and falls into the vacuum valve through the guide. As a result, the efficient operation of the separator is ensured, allowing a significant reduction in seed damage and fiber leakage by dusty air. Currently, separators with mesh surfaces located in a single vertical plane are being introduced into production (Figure 4). In order to increase the usefulness of the mesh surface located in the separating chamber of the cotton separator device, a double mesh surface was placed, the shape and size were changed. That is, its useful mesh surface is laid in pairs and it is placed symmetrically with

respect to the input axis. The rest of the mesh surfaces are located in the form of circular mesh surfaces at both ends of the working chamber, which serve to quickly and easily separate the air from the cotton.

The separator device consists of the following main elements: inlet pipe 1, working chamber 2, mesh surfaces 3, 5, nozzle 4, 7,6, vacuum valve

Important features of the separator In order to prevent clogging of the cotton in the working chamber and to effectively separate the cotton from the air, the circular mesh surfaces will be a pair in a single vertical plane, symmetrically relative to the axis of the inlet pipe. The diameter of the holes in the lower mesh surface is twice smaller than the diameter of the holes in the upper mesh surface.



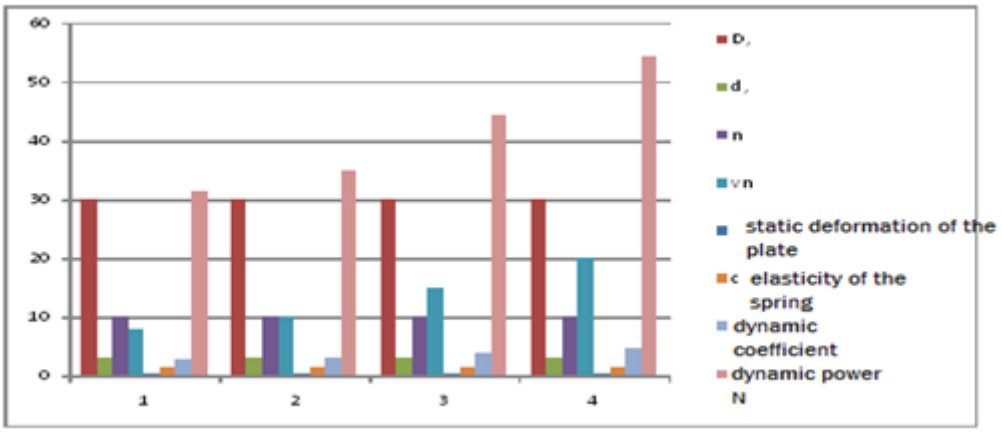

(Figure 4). Side view of the device

1 inlet pipe; 2 working cameras; 3 upper mesh surface; 4 upper lattice surface ridge; 5 air outlet pipe; 6 bottom mesh surface; 7 bottom mesh surface slide; 8-vacuum valve.

As a result of the suction of air in the air duct by the fan operation, the cotton raw material moves along with the air flow and the cotton falls into the vacuum valve (8) under the influence of its inertia as it enters the working chamber (2) through the inlet pipe (1) to the separator. A piece of cotton is glued to the mesh surfaces (3.6), which are arranged in a pair of circles in a single vertical plane at both ends of the working chamber. The sticky cotton on the mesh surface is separated by means of pins 4 and 7 and lowered into the vacuum-valve 8.

The doubling of the useful surface area of the circular mesh ensures that the separation of fine impurities in the cotton content is also doubled. The amount of suction force also decreases due to the increase in the useful surface area of the mesh. This in turn reduces the addition of fibers to contaminants. In an air-carrying device, the variation of the distance between the drying and cleaning shop and the bales causes the speed of the cotton moving in it to change. Therefore, the velocity of the air in the tube was changed. The results obtained are presented in Table 1.

Table 1 The effect of a change in air velocity on a change in the amount of dynamic force




| № | D, мм | d, мм | n | $v_n$ | $\Delta_{CT}$ $\Delta_{пруж}$ | elasticity of s-spring | coefficient dynamic | coefficient dynamic force, N |
|---|---|---|---|---|---|---|---|---|
| 1 | 30 | 3 | 10 | 8 | 0,38 | 1,5 | 2,75 | 31,51 |
| 2 | 30 | 3 | 10 | 10 | 0,38 | 1,5 | 3,06 | 35 |
| 3 | 30 | 3 | 10 | 15 | 0,38 | 1,5 | 3,88 | 44,38 |
| 4 | 30 | 3 | 10 | 20 | 0,38 | 1,5 | 4,74 | 54,23 |

In Table 1, a speed of 15 m / c in which the cotton could move more in the separator chamber was selected, and it was found that the amount of dynamic force generated in it was 1.5 times less than the amount of force that could damage the seed.

## CONCLUSION

The following conclusions have been drawn from the results of theoretical and practical research on improving the performance of the separator, which is a key element of the air-transport device in order to preserve the natural properties of cotton fiber and seeds.

Based on the analysis of scientific research, a working scheme of a new cotton separator was prepared. The advantage of this device is that the air direction is changed and the probability of cotton encountering these mesh surfaces is reduced as the mesh surface in the separator working chamber is changed by setting it upwards. Research on the improvement of the design of the pneumo-separator, as well as the new designs created, provide an opportunity to effectively increase the process of separating cotton from the air flow and preserve the natural properties of cotton.

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