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WAYS TO OVERCOME THE DEFECTS OF THE COTTON SEPARATOR VACUUM VALVE

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At present, pneumatic transport is widely used in the existing ginneries for the transfer of cotton to the production process and the transportation of separated cotton fiber, down and fiber waste. Simplicity of construction of pneumatic transport components, ease of installation, low level, high-speed delivery of products to the designated places on any complex routes, preserving their natural properties, as well as cleaning the transported raw materials from various contaminants and does not impede the movement of vehicles. The availability of capacity has led to its widespread use in ginning plants.

One of the main elements of a pneumotransport device is a separator.

Why do you need a separator?

When transported by pneumatic method, the seed cotton is wrapped around the fan blades when moving at high speeds, resulting in damage to the fibers and seeds. For this purpose, a separator device is installed in front of the fans in order to separate the seed cotton from the air in the pneumatic transport devices. Its main function is to separate cotton from the air.

In this case, cotton is divided into types based on gravity, inertia and centrifugal force, mainly from the flow of moving aerospace.

It is known that separators can be installed in a portable or stationary environment, and they consist of two main working parts: separation and discharge parts. These parts, in turn, are divided into structural elements. For example, the separating part consists of a mesh surface and a nozzle, and the discharge part (vacuum-valve) consists of a cylindrical wall (surface) and vane drums. SS-15A separators are mainly used in ginneries (Fig. 1).

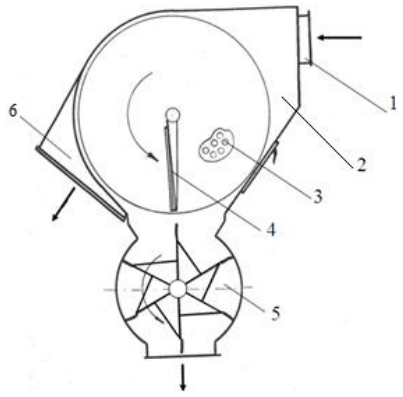

Fig. 1. SS-15A separator
1 – inlet pipe, 2 – separation chamber, 3 – mesh surface, 4 – scrapper, 5 – vacuum-valve, 6 – air outlet pipe

When the separator is running, air enters the separation chamber (2) through a short tube (1) of cotton. In this chamber the speed of the cotton decreases, more of which moves properly under the influence of the force of inertia, and falls into the vacuum-valve by hitting its wall. A small part of it goes to the surface of the net (3)

under the influence of air flow. The cotton stuck to the mesh surface is removed with a squeegee (4) and fed to a vacuum valve. During air transport, fine impurities separated from the cotton are absorbed through the mesh surface by means of a pipe (6) [1].

The vacuum valve, which is the main part of the separator, also plays an important role in the normal operation of the separator. In the working chamber of the separator, the function of the vacuum valve is to remove the air separated from the air in a timely manner.

As with a number of shortcomings in all areas, the separator also has its own shortcomings:

First, when the separator is running, the vacuum-valve sections are filled with air-separated cotton. As a result of the rotation of the vacuum valve, the cotton in its sections falls under its own weight and is transferred to the next machine in the process, but due to the weight of the cotton falling into the vacuum valve sections due to compression and rotation below or above the norm, the vacuum remains in the valve sections. goes;

The second is the amount of air entering the working chamber through the vacuum valve during the operation of the separator.

This causes the amount of air to enter the working chamber by the structure of the vacuum valve. This is because during the operation of the separator, when the cotton is separated from the air, under the influence of its own weight, it falls into the vacuum-valve section and fills it. As a result of the rotation of the vacuum-valve blades, the cotton in its sections falls down under the influence of its own weight.

The vacuum-valve section emptied of cotton is filled with air, and as a result of its circulation a certain amount of air is sucked into the working chamber.

This amount of absorbed air leads to the loss of excess air in the separator. In addition, entering the working chamber from the inlet pipe, under the influence of its own weight, the cotton falling into the vacuum valve rises towards the surface of the net and causes damage by hitting its surface.

In addition, the suction of air into the working chamber also depends on the speed of rotation of the vacuum valve and the degree of tightness.

Thirdly, in the process of lowering the cotton into the vacuum valve, when the tips of its feathers and the entrance edge of the cylindrical wall (surface) meet, certain pieces of cotton are squeezed between them, and the seeds and fibers are damaged. As a result, subsequent processing of technological processes leads to a decrease in productivity, the appearance of defects in the seed and fiber.

In order to overcome the above shortcomings, scientists have proposed several variants of separators.

The urgent task is to increase the efficiency of the technological process, productivity, maintaining the quality of raw cotton by improving the design of separators currently used in ginneries. A number of theoretical and practical works are being carried out in this regard.

The author has developed a new improved small cleaning chamber separator design (Fig. 2) in order to overcome the above-mentioned shortcomings of the separators.

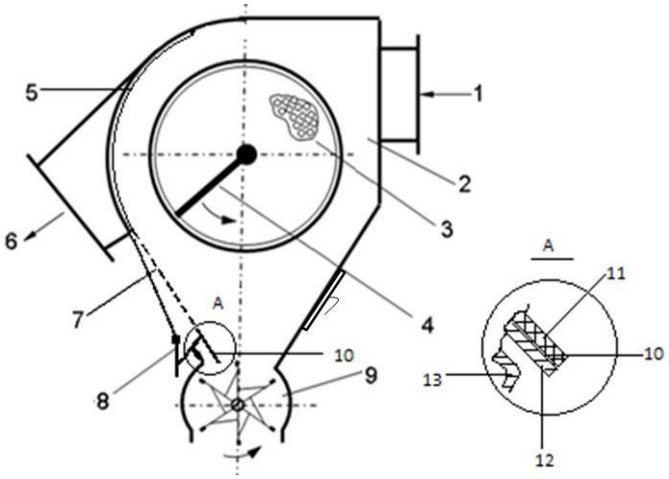

Fig. 2. The proposed new separator
1 –inlet pipe, 2 – working chambers, 3 – mesh surfaces, 4 – scrapper, 5 – rubber-based mesh surfaces, 6 – air outlet pipe, 7 – oblique mesh surface, 8 – cover, 9 – vacuum valve, 10 – fixed hose, 11 – rubber cover, 12 – metal plate, 13 – vacuum valve shell

In addition to the elimination of defects, it is also cleaned of contaminants. This proposed new separator works as follows: As a result of air suction in the air duct with fan operation, the cotton raw material moves along the air stream, enters the working chamber (2) through the inlet pipe (1) to the separator, sticks to the mesh surface (3) and the raw cotton stuck through the squeegee (4) is removed and thrown to the bottom of the working chamber. A piece of cotton hits the back wall of the working chamber under the influence of inertial force. Here, a mesh surface (5) mounted on a rubber base is installed to reduce the impact force and prevent the steel wall from slipping. Air passing through the mesh surface (3) is sucked from the outlet pipe (6) to the fan through the pipe. The raw cotton, which falls to the bottom of the working chamber, hits the sloping mesh surface (7) and the fine impurities in it pass under the sloping mesh surface under the influence of inertia and accumulate under this mesh surface. After filling for a certain period of time, it is discharged through the lid (8). To prevent damage to the raw cotton, which is free of fine contaminants, a fixed plate (10) is mounted on three parts of the sloping mesh surface so that it touches the vacuum-valve blades. The suction (12) is coated with a rubber coating (11) to reduce the impact force. The raw cotton taken out of the working chamber is delivered to the next technological process in a short time, while maintaining the quality indicators.

The improved design of the proposed separator ensures that the cotton hits the rubber coating and, after separation from the air, falls directly into the slots between the vacuum-valve wings. As a result, the cotton is prevented from sticking between the vacuum-valve wings and the walls and the seeds are protected from damage. This, in turn, leads to a reduction in various defects in the fiber content obtained during the ginning of cotton and an improvement in fiber quality.

References

1. R. Muradov. Fundamentals of increasing the efficiency of air transport of cotton. Fan. Toshkent, 2014 y. pp.63-64