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# INCREASING THE EFFICIENCY OF FIBER CLEANING ON STRAIGHT FIBER CLEANERS

***Abstract**: The article presents the results of experimental studies of the ways to increase the efficiency of cleaning cotton fiber in direct-flow fiber cleaners.*
***Key words**: fiber cleaner, fibers, serrated cylinder, lap, grate, brush, gauge.*
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## Introduction

Cotton has a special place among industrial crops, since the products obtained as a result of its processing are used in a wide variety of industries. Scientific professors R.V. Korabelnikov, E. T. Maksudov, Kh.K. Tursunov, D. Ya. Yakubov, Kh.T. Akhmadkhuzhaev, R. Muradov and others have developed and created a number of different highly effective gins equipped with a new device for fiber cleaning [1-7].

## The Main Part

In ginneries, raw cotton is used to produce fibre, seeds, lint and fibrous waste. In addition, cotton lint and fibrous waste are used to produce: cotton for clothes and hygroscopic, cellulose, nitrocellulose, cellulose acetate and many other types of products and articles mixed with other types of raw materials. In general, about three hundred types of products are obtained from cotton in combination with other types of raw materials. To isolate trash impurities from cotton fiber, and this is one of the main technological operations in the technological process of the cotton ginning industry, a large number of machines and fiber cleaners of various types have been created and are operating [8-11]. To clean the fiber from the constructed impurities, after the gins, direct-flow fiber-cleaners of the ZOVP and IVP types are sequentially installed, where the main release of vices and trash impurities into waste occurs with a simultaneous loss of fiber. The fibrous portion of the waste consists of loose fiber, fibrous beetle, and soft blemishes. On straight-through three-stage fiber-cleaners of the ZOVP and 1VP types, the cleaning effect, according to the passport data, is up to 40%. In fact, it does not exceed 30% and depends on the type of raw cotton being processed, its initial cotton waste and moisture content [12-17]. The low cleaning effect of direct-flow fiber-cleaners depends on a number of reasons inherent in the existing design. Such reasons include the following:

– when cleaning a fiber, first of all, it is necessary to create a condition for the cotton waste and damaged fiber to be on its surface, that is, on the surface of contact with the debris-striking surface. This can be achieved only by the formation of parallel-embedded fibers, i.e. the formation of its lap. Having already parallelized the fiber, it can be divided into strands without damaging them, relative movement can easily separate i.e. parallel fibers from each other.

– thickness of a lapping of cotton fibers, separated on the surface of the saw cylinder, is commensurate with the gap between the teeth of the saw cylinder and the gridiron;

– the location of the strand of fibers on the surface of the saw cylinder is chaotic, which makes it possible for some of the fibers to leave in transit with air through the space between the sawing, bypassing the gridiron;

– when air with fiber is supplied through the intake throat to the first cylinder in the zone of interaction of the strand of fibers with the toothed surface of the saws, the effect of aerodynamic cleaning occurs. The debris released in this case moves in the direction of the air flow and again enters the fiber.

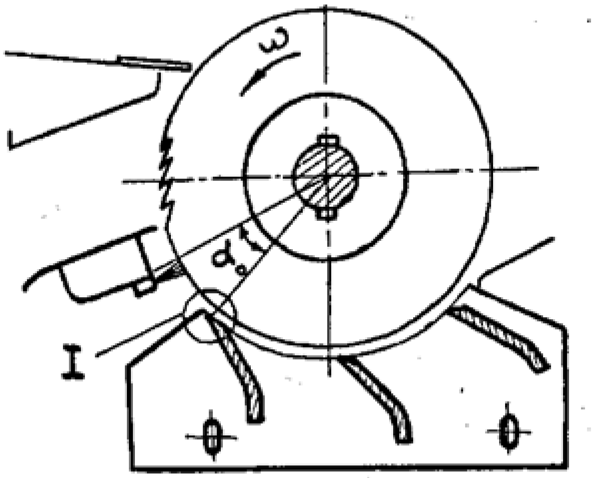

**Fig. 1. Fiber cleaner type 1VP**

It is known that the cleaning effect of an aerodynamic cleaner reaches 15%, i.e. if the design is changed in the direction of application of aerodynamic cleaning, then only due to this it is possible to increase the cleaning effect by 10-15% [18-22]. From the research carried out, it can be seen that the lap on the saw cylinder is formed from randomly located strand of fibers. We have found that from the standpoint of the probabilistic picture, up to 85 per cent of the strands of fibers will rely on 2 or more saws.

The essence of the division process lies in the fact that under the influence of the divider, the process of pulling apart the strand of fibers fixed on the saw teeth occurs. Moreover, a part of the strand that has a stronger bond with one of the teeth will remain on this tooth, and the sections of the fibers that have a less strong bond with other saws, sliding from them, and as a result, the strand will be fixed on one of the saws. The process of dividing the lap into strands for our case should be considered from the position of the necessary movement of the divider relative to the saw cylinder, in which the strands are divided, i.e. fixing them on one saw and removing them from the teeth of other saws.

In this case, two cases of the arrangement of the strands of fibers on the saw cylinder are characteristic:

1. A strand of fibers is attached to one saw. This is the simplest case, in which the division process does not occur, and the interaction of the branches of the strand with division ensures the scraping of trash impurities from them (Fig. 1, a).

2. A strand of fibers is fixed on several saws and is positioned arbitrarily (Fig. 1, b). For simplicity, we will consider the strands as straight-line segments.

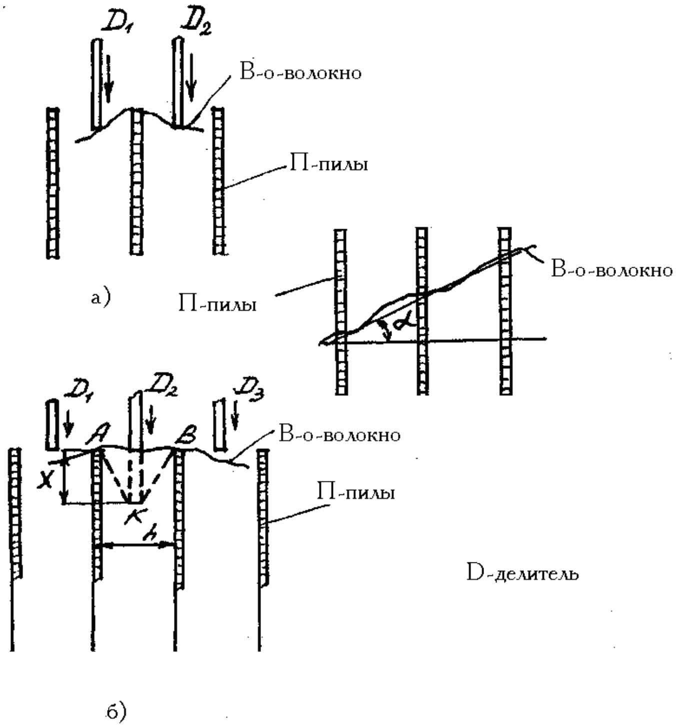


**Fig. 2 Diagram of the process of splitting a lap of fiber**

For example, a fiber strand of length 1 is fixed on two saws at an arbitrary angle to the generatrix of the saw cylinder. Then the required movement of the divider relative to the saw cylinder is determined by the formula

$$X_0 = \frac{1}{2}\sqrt{L^2 cos^2\alpha - h^2}$$

Obviously, the greatest movement of the divider will be when the strand of fibres is located perpendicular to the generatrix of the saw cylinder a = 0 (where h is the step between the saws of the saw cylinder)

$$X_{0\max} = \frac{1}{2}\sqrt{L^2 - h^2}$$

So, for example, with the length of the fiber strands L = 30 mm, the saw pitch h = 7 mm, the required movement of the divider will be about 14 mm.

**Conclusion**

During the action of the lap by the divider, several zones of bending by the fibers of both the saw blades and the divider elements are observed. In the process of bending around, intensive combing of the fibers takes place, their parallelization and scraping of trash impurities, which increases the efficiency of fiber cleaning by 15-25 per cent.

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