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Studying Yarn Incorpectiveness Operated on the Improved Exhaust Extractor

Nurilla Dadakhanov and Rustam Karimov
Namangan Engineering-Technological Institute, Namangan, Uzbekistan

Abstract: This article studies the friction force field and the design of the exhaust cylinder of drafting devices, the effect of the design of rollers and corrugated cylinder on the friction force field. New designs of a corrugated cylinder are proposed that improve the field of friction forces. The optimization parameters of the new fume hood are determined and proposed. In existing designs of drafting devices and devices, improved control over the movement of fibers is achieved in various ways, for example, by installing additional straps, rollers, clutches, guides, trays, etc. A common drawback of this design is that by correcting one drawback, others are promoted, for example, the design of the assembly becomes more complicated or maintenance is difficult, etc.

Keywords: Ring Spinning Machines, Fibers, Flatness, Exhaust Device, Grooved Cylinder, Pressure Roller, Field Of Friction Forces, Roller, Strap.

The world's leading machine-building enterprises are conducting research in search of improving ring spinning machines and its individual parts, increasing its reliability and productivity, and the quality of products [1].

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When designing ring spinning machines, the choice o Γ the design spinning line, i.e. lines of passage of sliver-yam from the drafting device to the spool. In some ring spinning machines, the front pressure roller is tilted forward by about 5^n to rcduce the sweep angle The streamline angle y for different types of ring spinning machines is different depending on the rise of the ring strips, Por main ring spinning machines with a stroke of 220 mm, $\gamma_1 = 2^0 - 3^0$, $\gamma_2 = 17^0$ [2].

If the filling line is chosen incorrectly, then the dimensions of the machine can increase, and the breakage of the product increases. When examining the spinning line of NIIEKIPMash, suggest that by choosing A=40 mm, b=110mm, c=150 mm, at which the bending angles correspond to the above, we obtain a spinning line with the following parameters:

- streamline angle from 2^0 30′ to 12^0;
- bend angle corresponding to half of the angle at the top of the balloon and varying from 16^0 in the upper position of the annular strip to 8^0 in the lower position of the annular bar [2].

If the spinning line is executed on the basis of the above recommendations, the dimensions of the machine increase in height and in width. This will complicate the maintenance of the machine additional difficulties will arise when loading the pressure rollers of the drafting device.

The main stage of the study is the selection of the optimal design and technological parameters of the new exhaust device, since the efficiency, reliability, ease of use, manufacture and cost of the exhaust device depend on it.

The contact area of the roller with dynamic interaction with the lobe gets the possibility of small circumferential and radial displacements relative to the static position. The dynamic analysis of the considered mechanical system shows the possibility of the appearance of modes of unstable rotation of the bead if the frequencies of the radial and circumferential vibrations of the contact area are equal or exceed one another by 2 times. Initially, small deformations of the bead take on large value which leads to a violation of the stationary of the stretching process [3].

The installed rollers in this form increase the angle of wrap around the fibrous masses, and (he installation of the magnet in the exhaust zone, being attracted to the lower bar, presses the straps to each other, thereby improving the field of friction forces (Fig. I). For this purpose, the drafting system was equipped with a double pressure roller on the exhaust cylinder and a pressure magnet on the straps [3, 4, 5].

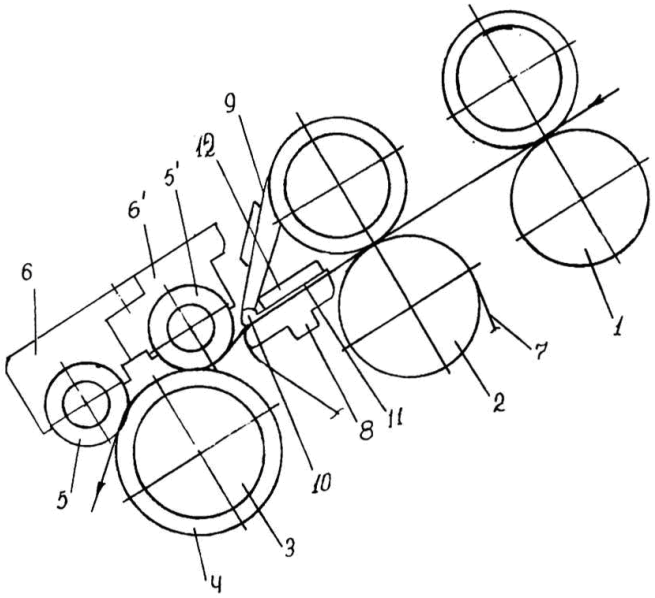

FIG.I. DOUBLE-BELT DRAFTING DEVICE

1-supply pair; 2,3-cxhaust pairs; 4-bottom cylinder; 5, 5'-rollers; 6, 6'-saddles; 7, 9-straps; 8-planks; 10-guide; 11-plate; 12-permanent magnet.

For the experiments, the method of full factorial experiment was used [6, 7]. Analysis of literature data and our experiments made it possible to establish the main factors influencing the unevenness of the yarn. 1 factor - the value of the load on the pressure roller of the exhaust pair; 2 factor - the distance between the rollers in the double pressure roller. The coded values of the factors will be designated X_1, X2 - respectively - the load on the pressure roller, the distance between the rollers in the double pressure roller. For the optimization parameter “Y” we take the unevenness of the pulled product.

Preliminary experiments in production conditions have shown that the minimum load on the pressure roller should not be less than 100 H. because with a double roller, the rubber coating is put on the cylinders, and the rollers are metal. According to the recommendation of the SKF company, for the load lever of the RK-225 type, the load is taken from 100 II to 180 II. Therefore, in our experiments, the minimum load is 100 H. and the maximum load is 180 H. The distance between the rollers in the double pressure roller is selected for design reasons in the range of 15 - 19 mm.

On the basis of the previous analysis, intervals and levels of variation of factors were established (Table I), as well as the optimization parameter. Therefore, we will compose a planning matrix for a lull factorial experiment for linear yam densities of 25 tex and 28 tex. Accordingly, all experiments were carried out in triplicate.

TABLE 1 LEVELS AND INTERVALS OF VARIATION OF THE STL'DIEP FACTORS

Identification of factors	Name Factors	Variation level			Variation interval
		- 1	0	+ 1	
X_1	Exhaust steam load, H	100	140	180	40
X_2	Distance between two rollers, mm	15	17	19	2

The minimum unevenness of the pulled product is achieved with the following values of the investigated factors:

For yarn 25 texl: P_1 = 180 H; $\boldsymbol{L}$ = 15 mm;

For yarn 28 text: P_1 = 180 H; $\boldsymbol{L}$ = 19 mm.

Analysis of the obtained values allows us to conclude that the load on the pressure roller and the distance between the rollers affect the unevenness of the pulled product in different ways. Thus, when producing different types of yarn (25, 28 text), it is recommended to select the appropriate values of load P_2 and distance L.

TABLE 2 THE OPTIMAL CONDITION FOR REDUCING THE UNEV ENNESS OF THE PULLED PRODUCT IN THE HOOD

Linear density yarn, text	Designation of factors	Factor values are coded	Natural values of factors
25	$X_1(P_1)$	+1	180 H
	$X_2(L)$	-1	15 mm
28	$X_1(P_1)$	+1	180 H
	$X_2(L)$	+1	19 mm

As you can see from the table 2, the optimal values found by calculation and experiment is close to each other. As a result of experiments, on the existing drafting device, the following parameter values were obtained: for 25 text - 21.7%, and for 28 text - 20.8%, which confirms the effectiveness of using a magnet to clamp the straps in the exhaust zone and a double pressure roller in the exhaust pair of the machines.

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