SCIENTIFIC AND TECHNOLOGICAL FOUNDATIONS FOR IMPROVING CAM MECHANISMS

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Abstract. This in the article textile industry Modern directions of development , automation and digitalization of production processes, increasing energy efficiency, and improving textile machines and mechanisms are analyzed. Particular attention is paid to the design of sleeve mechanisms, the choice of the law of impulse motion, the synthesis of the sleeve profile , and the reduction of dynamic loads.

Keywords: textile industry, mittens mechanism, pusher, roller thruster, nozzle profile, law of motion, energy efficiency, automation, digitalization.

Introduction. Textile industry country It is one of the important sectors of the economy, which is of great importance in the deep processing of raw materials, the creation of new jobs, the increase in export potential and the production of high value-added products. In modern market conditions, the competitiveness of enterprises is determined not only by production volume, but also by product quality, the accuracy of technological processes, energy consumption, reliability of equipment and the level of automation.

Increasing the productivity of textile machines is often associated with improving their working mechanisms. In machines, bushing mechanisms are used to transmit complex, periodic and high-speed movements to the working bodies. In

such mechanisms, the shape of the bushing profile determines the law of motion of the actuator. As a result, the correct selection of the profile affects the dynamic loads of the machine, vibration, noise and the accuracy of movement of the working bodies. directly impact shows.

Current in stages textile the main development directions in the industry are digitization, automation, energy saving, automatic product quality control, and deep processing of raw materials. Sensors, automatic control systems, computer vision, artificial intellect and digital technologies current it allows for real-time monitoring of technological processes.

Along with digital control systems, it is also important to improve the design of mechanical units, including sleeve mechanisms. Because the effectiveness of the control system is only possible if the mechanical movement of the working bodies is accurate and stable . complete manifestation will be.

Textile in their cars with a muzzle of mechanisms place. With a muzzle mechanism – muzzle profile geometric it is a mechanism that provides a predetermined law of motion to the actuator through its shape. In textile machinery, it can be used to bring working bodies into working position at a certain time, return them, hold them, or coordinate them with other mechanisms.

In a roller drive mechanism, when the sleeve rotates, its working profile is in contact with the roller . Roller of the center trajectory curve the line harvest The actual working profile is constructed equidistant from this curve, taking into account the roller radius. Since contact pressure, friction, wear, and vibration can increase at high speeds, a comprehensive optimization of the profile and the law of motion is necessary.

With a muzzle the mechanism improvement one of the important directions is the use of elastic elements. Elastic elements can create elastic deformation between certain links of the mechanism, softening the sharp transmission of shock loads. As a result, dynamic forces and vibrations in the contact pair can be reduced, and the smooth operation of the mechanism can be improved.

In such a design, the sleeve, roller pusher, lever and belt element are kinematically connected. When choosing a design, the stiffness, deformation, strength and operating cycles of the elastic element are taken into account. number into account is taken .

Muff profile synthesis and pusher movement law. Muzzle profile in design First, the required displacement law of the actuator is determined. Then, based on this law, the velocity, acceleration, and jerk values of the actuator are determined. The kinematic parameters are expressed as follows:

Pitch curve line and worker profile build Roller motivated the mechanism in design curve line roller is the trajectory of the center of the bearing in the coordinate system associated with the sleeve. The working profile is constructed as an equidistant curve located at a distance equal to the radius of the roller from this curve. A sharp change in the profile can increase the contact pressure and dynamic loads, therefore a smooth profile and an optimal radius of curvature must be ensured.

With a muzzle of the mechanism dynamic indicators of the mechanism work quality The evaluation takes into account parameters such as maximum speed, maximum acceleration, jerk, pressure angle, contact force and wear. An increase in pressure angle can increase lateral forces. Therefore, it is necessary to examine kinematic and dynamic parameters together in profile synthesis.

The use of flexible elements in the improved mechanism, optimization of the contact pair, and correct selection of the law of motion reduce shock loads, reduce vibration, and improve the movement of the working bodies. fluency increase possible.

Digital modeling and to practice current to be able to. With a muzzle mechanisms modern The use of CAD/CAE programs in design allows for quick verification of the geometric and kinematic parameters of the structure. In CAD systems such as KOMPAS-3D, the sleeve profile, pusher, roller and other details can be modeled and their mutual location can be checked.

When the results of numerical modeling are confirmed by experimental tests, the efficiency of introducing a new design into production increases. This approach combines scientific research with practical production problems. tie opportunity gives.

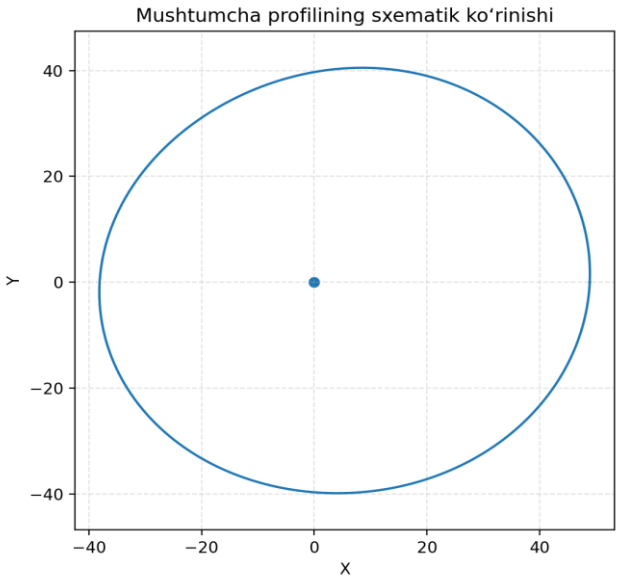
Textile industry develop prospects . In the future textile in the industry Along with the use of digital control, artificial intelligence, automatic quality control, energy-efficient electrical drives, and new materials, mechanical systems will continue to be improved. Especially in high-speed machines, reducing dynamic loads on mechanisms and ensuring precise movement of working bodies will become relevant.

In this regard, the improvement of sleeve mechanisms is one of the promising directions for improving the technical level of textile machinery. By optimizing the sleeve profile, selecting the driving force law, using flexible elements, and combining numerical modeling, the reliability and operating efficiency of the mechanism can be improved.

Conclusion. Textile industry modern the development of textile machinery requires the integration of science, technology and production. Improving the technical level of machines and mechanisms is an important component of this process. Sleeve mechanisms are an important functional element in textile machinery, as they provide precise and programmed movement to the working bodies.

The results obtained show that the synthesis of the nozzle profile, the thrust action law optimization , acceleration time according to change speed and pressure Controlling the angle of rotation, reducing the loads on the contact pair, and using flexible elements are important ways to improve the performance of the mechanism.

Here s is the displacement of the pusher, v is the velocity, a is the acceleration , and j is the acceleration. time according to change speed. High at speed working in mechanisms acceleration time according to change speed big values dynamic downloads and vibration to increase reason to be possible .



Schematic view of the nozzle profile

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