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CLASSIFICATION OF COMPLEX TECHNOLOGICAL PROCESSES

The development of technology leads to increased complexity and diversity of technical systems and processes in various industrial sectors. Professionals need to have deep knowledge and understanding of these processes to work with them effectively. The classification of complex technical processes is crucial for mastering the material in the process of professional development. The classification of technological processes helps to structure and systematize these processes according to specific characteristics, allowing us to understand their essence and interrelationships.

The mechanism for transporting materials in a sewing machine must meet a number of requirements. One of the basic requirements is that transportation occurs periodically according to the sewing machine's cycle. The most common mechanisms are multi-link lever mechanisms, where material movement is achieved through periodic interaction between the transporting element (usually a feed dog) and the sewing material. These mechanisms must provide sufficient gripping force between the transporting element and the material.

Movement of materials using this class of mechanisms is realized through the following methods:

1. Movement of materials along the stitch is achieved using a single feed dog, while material pressure is provided by a spring-loaded presser foot.

2. Material movement is accomplished using two feed dogs located on one side of the material with different amplitudes of motion, and pressure is applied by a presser foot - this method is known as the differential method of material movement.

3. Material transportation is carried out using two feed dogs located on opposite sides of the material, which are synchronized. During movement, the materials are alternately pressed between the foot and the lower feed dog, and then between both feed dogs - this is known as the "walking foot" principle.

Let's consider the first method of transportation and its possible implementation. This method is facilitated by three components of the mechanism: the feed dog together with the multi-link lever mechanism, the throat plate, and the presser foot along with the pressure device.

This method operates as follows. The presser foot presses the textile material against the feed dog or the throat plate. The multi-link lever drive mechanism ensures cyclic movement of the feed dog. This movement consists of several components: the feed dog rises, moves horizontally above the throat plate, lowers, and then moves backward under the throat plate. As the feed dog moves above the throat plate, it transports the material.

The main task in implementing this method is to ensure the movement of the feed dog. Additionally, mechanisms must provide for the adjustment of stitch length and enable reverse movement of the feed dog.

Let's consider possible ways to implement this transportation method, focusing on kinematic chains to ensure the movement of the feed dog.

One mechanism involves two driving links - levers. They receive motion from the main shaft of the machine through corresponding kinematic chains. The first lever provides horizontal movement of the feed dog, while the second lever provides its vertical movement. This mechanism includes a kinematic pair consisting of a connecting rod and a slider. They are connected by rotary kinematic pairs to the

levers and perform a planar parallel motion. The feed dog is attached to the connecting rod.

Another mechanism, also with two driving links - levers, includes a kinematic pair consisting of two connecting rods. The connecting rods are connected by rotary kinematic pairs to the levers. They perform a planar parallel motion. The feed dog is also attached to the connecting rod.

Among the advantages of these designs are their relative simplicity and the ability to adjust stitch length. However, they have several drawbacks.

One drawback is the different trajectories of motion for points on the feed dog. The peculiarity of the planar parallel motion of the connecting rod in mechanisms of this structure cannot ensure identical trajectories of motion for each point of the feed dog. Different points of its working surface interact with the material differently. At the beginning and end of the material movement process, the feed dog interacts only with a portion of its working surface. Inside the interaction, each part of the working surface has a different inclination to the material surface. (Horobets, V. A., & Manoylenko, O. P. (2009). Designing the profile of the working surface of sewing machine transport mechanisms).

Another drawback is the lifting of the presser foot from the material. This phenomenon, known as "foot bounce," occurs due to the impact force exerted by the feed dog through the material. As a result, the kinematic connection in the "feed dog - material - presser foot" system is lost.

REFERENCES

1. Horobets V. A., & Manoylenko O. P. (2009). Designing the profile of the working surface of sewing machine transport mechanisms. Bulletin of Kyiv National University of Technologies and Design. https://er.knutd.edu.ua/bitstream/123456789/6938/1/V46_P007-009.pdf