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Reduction of Vibration of Mechanisms of Sewing Machines for Bonding Upper Shoes of Shoes for Patients with Diabetes Mellitus by Improving their Designs

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ABSTRACT: This article describes various problems with sewing machines due to a variety of reasons. The more complex the machine's workflow, the more mechanisms it contains, the greater the likelihood of various malfunctions and their elimination, as well as the reduction in the vibration of the sewing machine mechanisms for fastening the upper shoe parts for patients with diabetes by improving their designs.

KEYWORDS: needle, sewing machine, vibration, mechanism of movement of fabric, presser foot, thread take-up, material, semi-automatic machines, crank-slide mechanism.

I. INTRODUCTION

In recent years, the republic's sewing enterprises have been equipped with new modern equipment. High-performance shuttle, overcast sewing machines from Juki (Japan), sewing machines with electronic controls and semi-automatic machines from Pfaff (Germany), universal and special sewing machines from Durkopp (Germany), as well as household sewing machines are being introduced at the enterprises firms "Singer" and "Brother".

The future development of the clothing industry largely depends on the implementation of the latest achievements of science and technology as well as on the integration between production and science.

II. SIGNIFICANCE OF THE SYSTEM

The clothing industry plays an important role directly in the life of every person, and therefore the state of the clothing industry in the state is reflected in each of its citizens. The development of the sewing industry in various directions, both in the field of modernization of sewing equipment and in the field of improving the technology of sewing production, has a positive effect on the well-being of each person. Modernization and improving the reliability of sewing equipment will lead to lower costs and an increase in the quality of garments [1].

III. LITERATURE SURVEY

The modern stage of sewing engineering is characterized by the creation of automated machines, semi-automatic machines and assemblies. The main features of these machines are the presence of a device for starting and stopping the machine with a fixed needle position, automatic thread trimming, raising the presser foot, securing the

stitch, monitoring the breakage of the threads, etc. In modern semi-automatic machines, the tasks of separating parts from the bundle, automatically feeding them to the sewing area, their orientation during the joining process and, finally, automatic removal after the end of the operation were solved. In the future, the combination of a loading and unloading robot with a semi-automatic machine led to the creation of sewing units. The sewing unit is reliable, high-performance, and electronic control makes it possible to minimize the operator's labor, reducing its actions only to loading parts of the robot hopper cut and changing cassettes [2].

There may be various malfunctions in the operation of the sewing machines due to a wide variety of reasons. The more complicated the workflow of a machine, the more mechanisms it has, the greater the likelihood of various problems. The machine will never work correctly if, for one reason or another, the necessary coordination of the movements of its working bodies is violated, if these working bodies are improperly installed or are so worn out during operation that they require replacement.

IV. METHODOLOGY

Many malfunctions are easily eliminated by appropriate adjustment and commissioning of the machine and the correction of seemingly very small defects, which, however, significantly affect the operation of the machine[3].

The main problems with each sewing machine include skipped stitches, broken threads, incorrect stitching, needle breakage, and poor fabric advancement.

The following can be attributed to malfunctions of the material transfer mechanism:

- ❖ poor material progression (stitches of different lengths). The main reason is blunting or clogging of the teeth of the conveying roller (or lath), causing it to slip relative to the lower material;
- ❖ poor advancement may occur if the teeth of the rail or the transporting roller above the needle plate are not sufficiently raised (raised), especially when sewing thick materials;
- ❖ the rough supporting surface at the presser foot, causing excessive friction, can impede the advancement of the upper material and cause the lower one to fit;
- ❖ poor material advancement can also be caused by inappropriate presser foot pressure on the material. If the pressure is too weak, the teeth of the rail (or roller) will not sufficiently capture the material, on the other hand, too much pressure, causing considerable friction, can slow down the progress of the material;
- ❖ in case of inconsistency in the operation of the needle mechanisms and material transportation (if in machines with a non-tilting needle, the material transportation process begins when the needle has not yet left the material) inevitably there are violations in the process of material transportation and deformation of the holes punctured by the needle;
- ❖ the defective feed should also include a curved line, which is caused by improperly setting the foot in relation to the rail. If the support plane of the foot and the plane of the tops of the teeth of the staff are not parallel, this defect causes a shift of the material during sewing.

Known mechanisms for moving material, for example, to a single-needle shuttle shoe sewing machine, are made in the form of a device for moving a needle together with material, a lower call sign and an upper pressure roller. The pressure roller from the pinion on the call sign shaft uses pinion-driven rollers placed under the machine platform in the vertical and horizontal parts.

V. EXPERIMENTAL RESULTS

The disadvantage of these mechanisms is its inaccurate operation and installation difficulties.

So, in the drive of the upper pressure roller of the aforementioned mechanism there is a chain gear, the presence of which reduces the accuracy of the mechanism (especially at the time of starting the machine and due to the choice of gaps in the chain gear). As a result, the upper roller will slow down the upper layer of the material, and the stitches corresponding to the start of the machine may turn out to be unsatisfactory in quality.

The proposed mechanism does not have these drawbacks.

In order to improve the accuracy and ease of installation, the drive to the pressure roller is equipped with a vertical key shaft. This shaft is connected to the horizontal shaft in the machine sleeve by means of helical gears and ends with a blade that engages with the groove of the vertical roller. The latter is connected by a pair of bevel gears with a pressure roller. The shaft is mounted on a frame detachable from the machine head.

Figure 1 shows the kinematic diagram of the sewing machine in which the proposed mechanism for moving the material is applied.

The mechanism is made in the form of a device for moving the needle 1 together with the material, the lower call sign of the wheel 2 and the upper pressure roller 8. The drive of the wheel 2 is characterized by the use of an adjustable gear gear 4, as well as a gear 5, allowing to obtain different lengths of stitches. The drive of the roller 3 starts from gear 6 on the shaft 7 of the wheel 2 and it uses rollers connected by gears, the latter being placed under the platform 8 of the machine, and the vertical and horizontal parts of its sleeve 9.

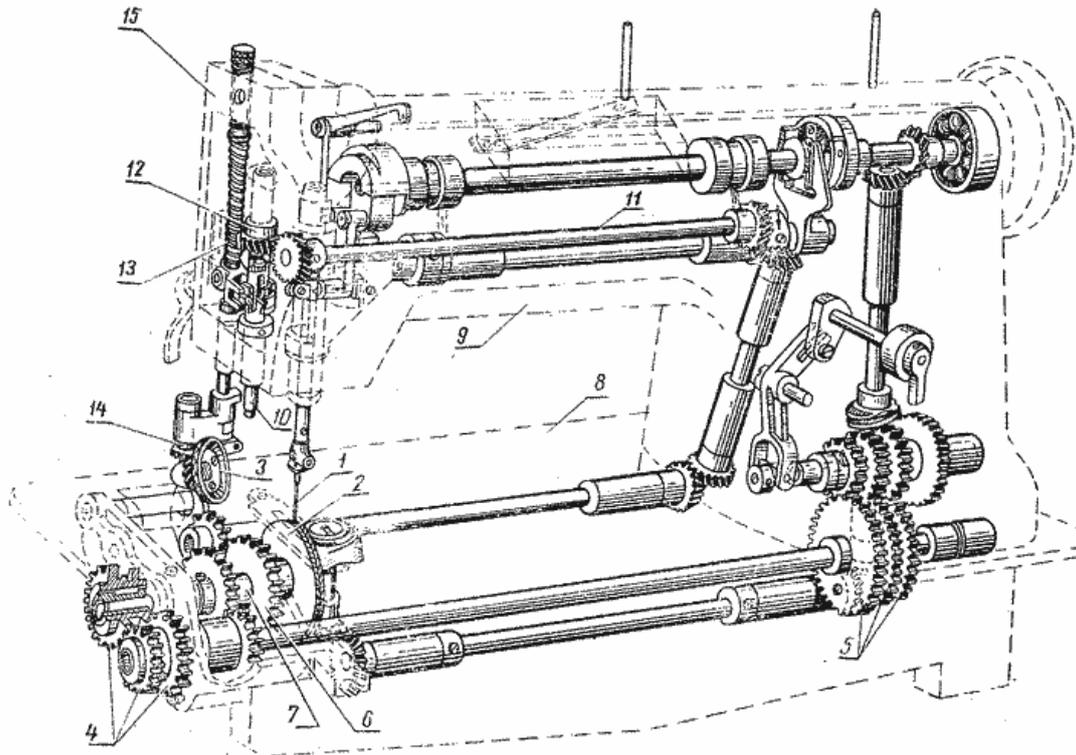


Fig. 1. Kinematic diagram of a sewing machine.

A feature of this drive is its vertical telescopic shaft 10 connected to the horizontal shaft 11 in the sleeve 9 of the machine by means of helical gears 12. The shaft 10 ends with a blade coupled to the shaft of the vertical roller 13 connected by a pair of bevel gears 14 with a pressure roller 3. For convenience Mounting shaft 10 is mounted on the frame 15, detachable from the head of the machine.

During operation, the upper pressure roller 3 is lowered onto the material that rests on the call sign 2. Rotating synchronously, the call sign 2 and the roller 3 carry out the transportation of material during sewing.

The proposed mechanism to improve the transportation of material, the accuracy of the mechanism (especially at the time of starting the machine and due to the choice of gaps in the chain drive) and the quality of the thread joints formed by the machine and is used on the prototype of a shoe sewing machine.

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