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SEWING MACHINE FABRIC TRANSPORT MECHANISMS

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ABSTRACT:

This article considers the mechanisms of transporting fabrics of sewing machines and the most common in sewing machines are transporting mechanisms, in which the working body is the toothed rack, as teeth of the rack protect the materials from the formation of folds when tightening the stitch on one side, on the other hand the sewing materials are pressed down by the presser foot.

Keywords: sewing machine, material, mechanism, needle, toothed rack, plate, kinematics, fabric.

INTRODUCTION:

The material transport mechanism of the sewing machine is designed for periodic discrete movement of sewing materials for a given stitch length [1, 312]. Moving materials in the sewing machine is made periodically according to the cyclogram of the sewing machine. As a rule, the movement of the materials to be sewn is made: gear rack (slats), roller (roller), a special device (carriage, cassette, hoop, etc.) with clamped materials.

The most common in sewing machines are conveying mechanisms, in which the working body is the toothed rack, because the teeth rack prevents the formation of folds when tightening the stitches on one side, on the other hand stitched materials are pressed by presser foot (see Fig. 1.22, a). For sewing textiles, the slatted fabric mechanism is the only suitable mechanism.

RESULTS AND DISCUSSION:

As well as their advantages, rack and pinion mechanisms also have some disadvantages. First, when advancing the material with the slat, it is necessary to hold it with hands, because otherwise it can spontaneously rotate relative to the needle axis, which requires constant presence of the operator to carry out the stitching process. Secondly, when advancing materials placed in several layers, the batten captures only the lower layer with its teeth, which, with a low friction coefficient between the fabric layers, can cause slippage of the lower layer against the upper one. This phenomenon is called "seating" [2,232].

Sewing machines use an upper batten in addition to the lower batten to avoid "seating", and in particularly heavy cases the needle helps the battens to move the fabric. If you make the movement of the upper and lower slats adjustable individually, this is called differential feeding.

The material transport cycle of a rack and pinion machine consists of a working stroke (see figure 1a) and an idle stroke (see figure 1б). The materials to be sewn 1 (figure 1. a) are placed on the needle plate 2 and pressed against it by the presser foot 3.

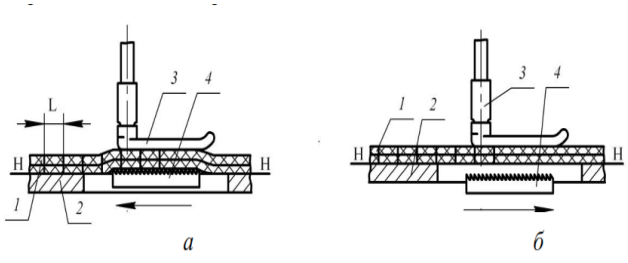

Figure 1 - Material handling with a toothed rack: a - running gear, б - idle gear

At the moment of transporting materials, toothed rack 4 is lifted in the slot above the H-H surface of the needle plate 2 at a height p1, captures the materials 1 with its teeth and moves them to the required stitch length L. The toothed rack 4 is secured to the materials 1 by the presser foot 3, which exerts pressure on the materials. When the transport is finished (see figure 1, б), the toothed rack 4 goes down under the needle plate 2 and, moving under the needle plate in the opposite direction to the materials movement, returns to the starting position to start the next transport cycle.

As an example, figure 2 shows the kinematic diagram of the transport mechanism of a 131-grade sewing machine with one toothed rack.

In some special purpose sewing machines as well as in footwear and leather goods sewing machines for sewing leather, canvas etc., rack and pinion mechanisms do not reliably move the materials to be sewn, which are also very rigid [2,232].

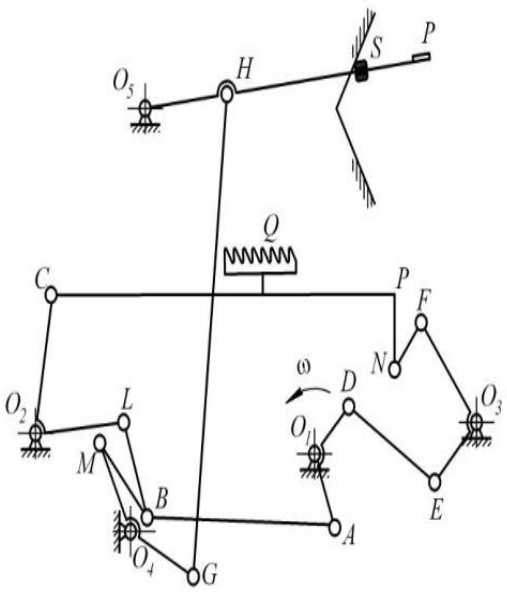

Figure 2 - Kinematic diagram of the fabric transport mechanism

In this case, conveying rollers are used, of which there can be one (figure 3, а), or two: one (figure 3, б) or both (figure 3, в) are leading.

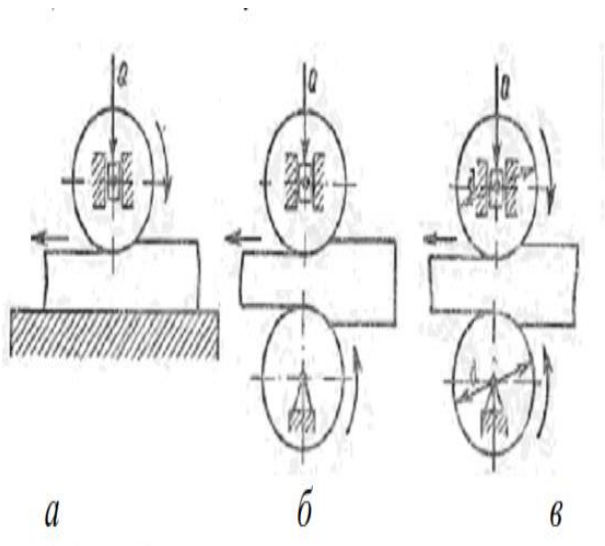

Figure 3 - Material transport by rollers

Instead of a conveyor belt or rollers, semi-automatic sewing machines use a carriage which automatically transports the fabric not only to a set length, but also in a set direction. The carriage can be transported in the following ways:

- Cam-type mechanisms, the cams of which are called copy disks;
- A series of articulated links rotating at different angular speeds (copyless method);
- By reading the drawing of the conductive line on the workpiece surface, for example, or the contours of the workpiece with a photoelectric cell, with a tracking device;
- By digital control of the carriage drives.

The transport pitch in most sewing machines is adjustable from 1.0 to 5.0 mm, and in some special machines it can reach 10 - 12 mm [4,10209].

A classification of transport mechanisms for sewing machines, is presented in [5,24].

E.V. Juravlev, A.M. Koptev, A.Ya. Kurzenkov, V.S. Moskatelnikov offer [18] a mechanism for moving the material of a sewing machine with a stitch length changing device (figure 4), containing a fixed to the main shaft of the machine eccentric, spanned by a connecting rod pivotally connected to the needle bar lever and kinematically to the clutch overrunning the feed disk, the device for changing the stitch

length with a handle-lock. A needle bar lever is made double-armed, whereby the second arm of the lever is hinged by means of a rod with a groove of the long arm of the second lever, and the short arm of the second lever with a rod and ball joints - with the clutch of the overrunning of the feeding disk. It is possible to change the position of the rod connected to the arms by moving its hinged end into the slot of the second arm with the aid of the lever on the same axis with the catching lever. The end of the lever is designed as a sleeve enclosing the rod. L.S. Mazin, A.V. Markovets, A.R. Faizulov and A.B. Kikin suggest two modifications of a material transporting mechanism for high loaded slow speed and high speed sewing machines.

In the "low-speed" variant (figure 5) the modification is achieved by using in the kinematic chain of vertical motion of the toothed rack a six-link hinge mechanism with a rising hoist arm at the extreme upper position of the toothed rack at the simultaneous simplification of the design of the vertical support lever and changing the hoist arm connection to the lever bearing the toothed rack [6,60].

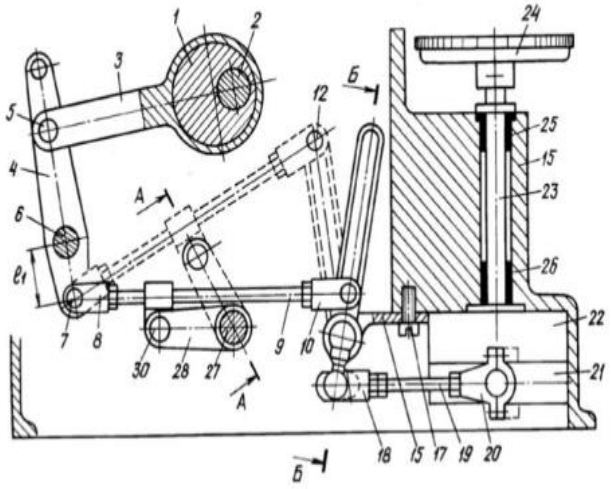

Figure 4 - Sewing machine fabric movement with stitch length adjustment

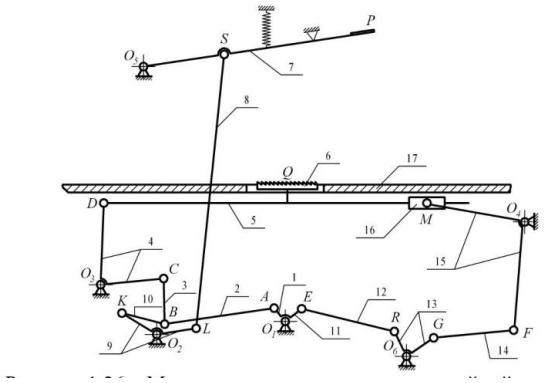

Figure 5 - Sewing machine transport mechanism (for slow-running machines)

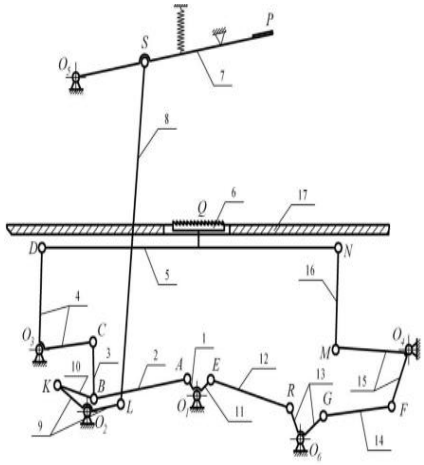

Figure 6 - Sewing machine transport mechanism (for high-speed machines)

High-speed variant (figure 6) of modification is achieved by using in kinematic chain of rack vertical motion the six-link hinge mechanism with lifting arm outstripping in extreme upper position of rack vertical motion with simultaneous simplification of design of connection of support arm with connecting rods of six-link kinematic chain of rack vertical motion.

CONCLUSION:

The proposed device, compared to the known ones, has the positive effect of making the parts of the unit more technologically feasible and making the adjustment of the sewing machine easier.

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