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THE DEVELOPMENT OF AN EFFECTIVE CONSTRUCTIVE SCHEME OF THE NEEDLE THREAD TENSION REGULATOR OF SEWING MACHINE

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Abstract. The article presents the results of analysis of existing needle thread tension regulators in sewing machines, the advantages and their disadvantages are presented. On the basis of the analysis an effective constructive scheme of the needle thread tension regulator is developed. The constructive elements and principles of operation of the regulator of needle thread of the sewing machine are described in detail.
Keywords. Sewing machine, needle regulator, thread tension, plate, elastic element, rubber, rod, washer, adjustable screw, rigidity, uniformity, efficiency.

Introduction. In the known design of the needle thread tension regulator sewing machine consists of a rod put on it two convex plates, between which pass the needle thread. On the plates rests shaped washer and conical spring put on the rod. To regulate the tension of the thread on the rod installed adjusting nut, the rotation of which deforms the spring. The other end of the rod is rigidly attached to the head of the sewing machine [1].

The disadvantage of the known regulator of needle thread tension is the limited interval of thread tension of different types, depending on the degree of mobility of the plates, the length of the taper and other parameters of the spring.

Known device for regulating the needle thread tension for sewing machine, containing two disks, between which passes the needle thread, a spring that presses the disks to each other, control disk to actuate the presser [2]. The mentioned tension regulator has the following disadvantages: the design of the pressure element with an end bevel creates a point pressure force, which can lead to variability of thread tension and, as a consequence, poor quality of the stitch, the complexity of the device and the limited possibility of its use in various types of sewing machines.

To simplify the design was recommended needle thread tension regulator containing a control disk to actuate the pressure element with a pressure spring that provides compression of two disks separated by a plate, a bushing placed between the spring and the disk and a pressure sleeve. All structural elements are made coaxially. In this case, the pressure bushing is placed in the threaded hole of the control disk and is made with a shaped hole in the shape of the shaft, rigidly fixed in the board. [3].

The main disadvantage of this design of the needle thread tension regulator is also limited intervals of regulation of the needle thread tension.

In another known upper thread tension regulator, comprising a rod on which two convex plates are slid. On the right side of the rod is put on a conical spring. The bent end of the spring is inserted into the longitudinal slot at the end of the rod. The rod is screwed into the bushing. In turn, the bushing is fixed in a

hole on the side or front surface of the machine head. In addition to the tension created by the spring pressure, the thread in the disc adjuster receives additional tension from the friction generated when it engages the rod. In order to raise the presser foot plate regulator freely pass the thread, its rod is made hollow, and in this cavity located in the pusher. When lifting the presser foot pusher presses on the lintel shaped washer, inserted in the slot rod. Since the pressure of the spring is transmitted to the plate through the washer, when this washer is moved under the action of the pusher, the pressure on the thread will be relieved [4].

The disadvantage of the known design of the needle thread tension regulator is frequent thread breakage due to the limited mobility of the plates, as well as limited intervals for measuring the needle thread tension.

In the design of the needle thread tension regulator, in order to increase the change interval and eliminate thread breakage, two identical thread tension regulators are used in series.[5].

The disadvantage of this regulator is the complexity of construction.In addition, because of the two-stage regulator, this design can not be used at high-speed modes of sewing materials.

In another known regulator needle thread tension sewing machine containing a rod, rigidly mounted in the head of the machine, put on it two convex plates, by means of a shaped washer on which rests a conical spring, adjusting nut,at the same time on both sides of the plates by means of shaped washers in the rod are installed conical springs, and the diameter of the large base of the first (right) conical spring is selected different diameter of the smaller base of the second (left) conical spring, the tension of which is regulated by the nut and fixed by the lock nut [6].

The disadvantage of this design of the sewing machine needle thread tension regulator is the limited mobility of convex plates, which move only along the axis of the rod.In this case, there are no angular oscillations relative to the vertical axis of the plates, which can lead to breakage of the needle thread at sharp changes in its tension.Known regulator of the needle thread tension sewing machine containing a rod, rigidly mounted in the head of the machine, put on it two convex plates, through a shaped washer, which rests on a conical spring, adjusting nut, with both sides of the plates through shaped washers in the rod installed rubber sleeves, and the width and diameter of the first (right) rubber sleeve selected twice less than the width and diameter of the second (left) rubber sleeve.[7]The disadvantage of this design of needle thread tension regulator is also limited mobility.At the same time there are no angular oscillations relative to the vertical axis of the plates, which can lead to breakage of the needle thread at sharp changes in its tension.

Development of an effective constructive scheme of the needle thread tension regulator. The main task is to increase the mobility of the convex plates of the interval and smoothness of regulation of the thread tension elimination of thread breakage at high-speed modes of sewing materials.

The set task is solved by improving the design of the tension regulator by increasing the mobility of the plates both along the axis of the rod and angular oscillations along their vertical axes and by using conical rubber sleeves with opposite direction of cones.

The essence of the design lies in the fact that the needle thread tension regulator sewing machine consists of a rod, put on it two convex plates, on both sides of which are installed two conical rubber bushings with the opposite direction of the cones. In this case, the ends of the conical rubber sleeves are made with a curvilinear shape, which enter the spherical in the shape of the made recesses of the corresponding plates. In addition, the inner holes of the plates mounted on the rod are also spherical in shape. Spherical shape of the ends with a smaller diameter of conical rubber sleeves and spherical shape of the inner holes of convex plates allow the movement of the plates not only along the axis of the rod, and angular movement relative to their vertical axis. This leads to increased mobility of the convex plates, which adjust to the change of tension, also to the direction of influence of thread tension, eliminate thread breakage.

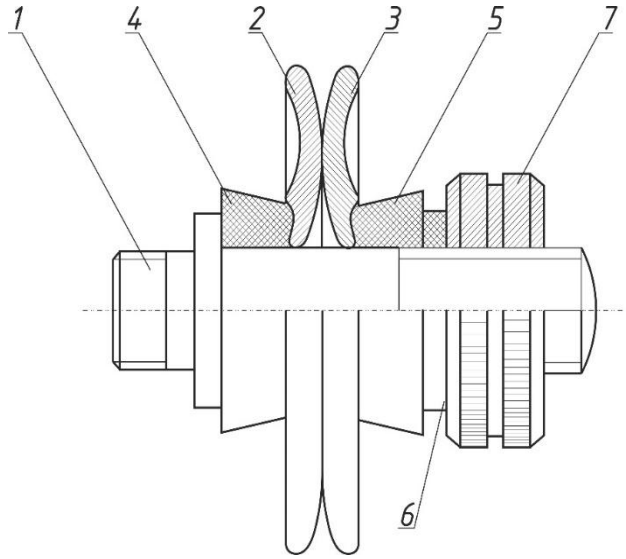

Fig.1. Sewing machine needle tension adjuster

The design is explained by the drawing, wherein Fig. 1. - shows the construction of the regulator with a section.

The needle thread tension regulator consists of a rod 1, which is rigidly fixed to the machine head. Two convex plates 2 and 3 are put on the rod 1, between which the needle thread passes (not shown in Fig.1). From the two old plates 2 and 3 are mounted two conical rubber bushings 4 and 5. Tapered rubber bushings 4 and 5, rest against the plates 2 and 3 by means of a washer 6 by means of an adjusting nut 7.

The tapered rubber bushings 4 and 5 are mounted on the rod 1 with opposite direction of taperedness. The small-diameter ends of the tapered rubber bushings 4, 5 are spherically shaped, which enter the identically shaped recesses of the convex plates 2 and 3. In addition, the inner holes of the plates 2 and 3 mounted on the rod 1 are also spherically shaped.

Operating principle of the regulator. The needle thread passes between the plates 2 and 3. When it is necessary to adjust the thread tension, the adjusting nut 7 is turned, which presses the plates 2 and 3 against each other by deforming the conical rubber sleeve 5. At the same time, the tapered rubber sleeve 4 is also deformed. Plates 2 and 3 not only press the thread, increasing its tension, but also oscillating in the longitudinal direction on the rod 1, as well as rotating relative to the vertical axis, automatically set the necessary values of the needle thread tension.

This practically eliminates sharp changes in thread tension, thereby reducing thread breakage.

Conclusions. By analyzing the existing regulators of thread tension, an effective constructive scheme of the needle thread tension regulator of the sewing machine was developed.

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