ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 7 | Issue: 3 | March 2021|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2021:7.147 ||ISI Value: 1.188

UNLOADING KINEMATIC PAIRS IN SEWING MACHINES

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ANNOTATION

In the given article there is designed problem speakers mechanism of the needle with springy relationship at account inert, springy-dissipating parameter mechanism, as well as power of the resistance sutured material by sewing machine, experimental certain parameters and nature power load of mechanism with springy element and without it, is determined rational state of working sewing machine when use the springy drive to energy.

KEY WORDS: ***needle, sewing machine, mechanism, springy element, crawler, crank, dynamic madel, air-cushion.***

One of the decisive conditions for improving the quality of production of services, the efficiency of the industry is the further acceleration of scientific and technological progress, improving the technical level of enterprises through the development of new high-performance equipment, as well as ensuring high operational reliability of technological equipment [1].

The existing level of development of technology and technologies of light industry suggests the use of machines, mechanisms and working bodies that perform reciprocating, swinging or complex combined movements. Such mechanisms are used both in machines of periodic and continuous action (mechanisms of removable combs of cards, ball mechanisms of cards and draw frames). As a rule, machines containing such mechanisms are vibroactive and require the use of vibration dampers. However, vibration isolation, protecting the foundation and floors of the production room from the effects of dynamic loads from the machines, does not change either the magnitude or the nature of the loads in the machine itself and therefore cannot serve as a means of guaranteeing the normal operation of the machine.

Dynamic loads in the machine are a consequence of the movement of its executive mechanisms and working bodies, the speeds of which, in accordance with the requirement to increase productivity, increase all the time, and inertial loads in the links of the mechanisms also increase.

These loads lead to a decrease in the service life of the kinematic pairs connecting the links of the mechanisms, to their frequent breakdowns, to a decrease in the volume of produced products, which sometimes makes it economically inexpedient to increase the speed.

However, if you find a way to reduce the inertial loads in the kinematic pairs of mechanisms, then it becomes possible to further, and sometimes significantly increase the speed modes of the mechanism while maintaining or even reducing operating costs. Currently, the sewing machine industry is undergoing a renewal of its fleet of machines. New basic machines are being developed, the design of operating machines is brought up to modern technical requirements, that is, the sewing machine-building industry is being reconstructed.

Let us determine the accuracy of unloading the kinematic pairs of the mechanism from the action of the force $P(S)$ at a nominal frequency n of rotation of the crank and at an arbitrary frequency

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$$\omega = k\omega_n \tag{1}$$

where: constant k> 1, k <1.

To assess the quality of the unloading of the kinematic pairs of the mechanism from the action of the unbalanced force P (S), we take the dimensionless value

$$\gamma_{PK} = \frac{P_m(S) - |P_{mk}(S) - Q_m(S)|}{P_m(S)}, \tag{2}$$

where: $P_m(S)$ and $Q_m(S)$ represent the largest values of the forces $P(S)$ and $Q(S)$ in the segment (4) at the nominal crank speed, i.e. for k = 1; $P_{mk}(S)$ is the value of the force $P_m(S)$ at $k \neq 1$.

Since the forces $P(S)$ and $Q(S)$ reach the greatest values on the segment (4) at $S = 0$, then

$$\left.\begin{aligned} P_m(S) &= P(0) = k_1 m\omega_n^2 OA(1+\lambda); \\ Q_m(S) &= Q(0) = k_1 m\omega_n^2 OA\left(1+\frac{\lambda}{4}\right) \end{aligned}\right\} \tag{3}$$

If $k \neq 1$, then the force $Q_m(S)$ remains unchanged, and the unbalanced force takes on the value

$$P_m(S) = k_1 m k^2 \omega_n^2 OA(1+\lambda). \tag{4}$$

Substituting expressions (3) and (4) in (2), we obtain the formula for the coefficient of unloading of kinematic pairs from the action of the unbalanced force $P(S)$ created by the translationally moving mass of the central crank-slider mechanism at an arbitrary frequency (1) of rotation of the crank:

$$\gamma_{PK} = \left(1 - \left|k^2 - \frac{4+\lambda}{4(1+\lambda)}\right|\right)100\%. \tag{5}$$

Assuming that in formula (5) k = 1, we obtain the unloading factor of the kinematic pairs of the central crank-slider mechanism from the action of the unbalanced force P (S) at the nominal crank speed:

$$\gamma_{PK} = \frac{4+\lambda}{4(1+\lambda)}100\%. \tag{6}$$

The dependence of the γ_{PK} coefficient urk on the λ parameter at various values of the constant k is shown in Fig. 1. It is seen that for any central crank-slider mechanism, the λ geometric parameter of which is in the interval

$$1/20 \le \lambda \le 1/2,$$

it is possible to unload at the nominal frequency ω of rotation of the crank the kinematic pairs from the action of the unbalanced force $P(S)$ created by the translationally moving mass, on average by about 86%, but not less than 75%, by installing an elastic connection between the slide and the stand. nina of the mechanism. Если $\omega = k\omega_H$,, then the γ_{PK} coefficient changes, as shown in Fig. 1., depending on the constant k.

Note that for

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$$k = k_0 = \frac{1}{2}\sqrt{\frac{8+5\lambda}{1+\lambda}},$$

where: k_0 is the root of the equation γ_{PK}=0, the unloading of the kinematic pairs of the mechanism from the force *P (S)* completely disappears, despite the elastic connection in the mechanism and the balance of the rotating masses.

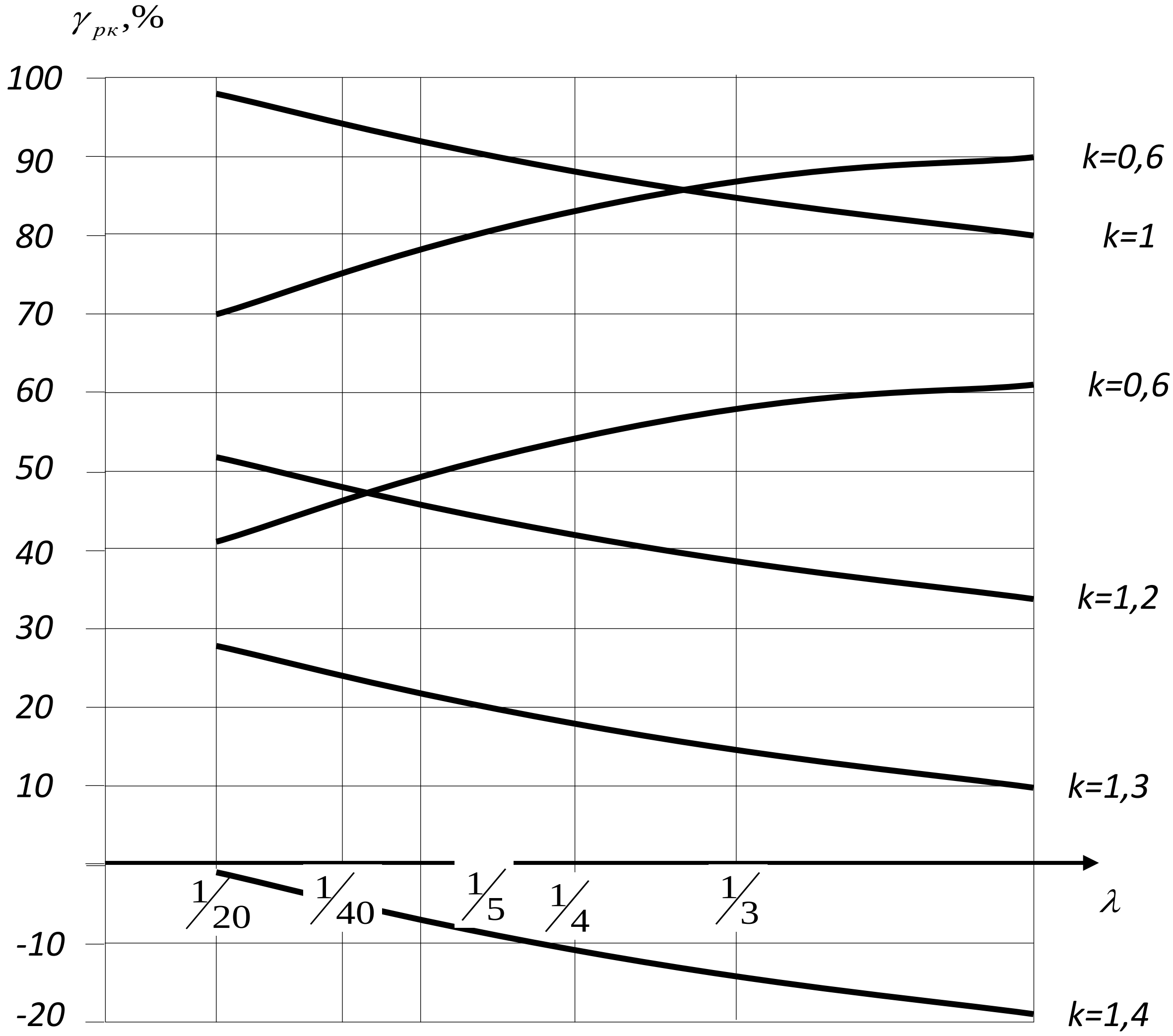

Fig. 1. Change of an arbitrary crank speed from the unloading factor of the kinematic pairs of the mechanism

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At an even higher crank speed, when k> k_0, the γ_{PK} coefficient becomes negative, $\gamma_{PK} < 0$.
This will indicate that the load of the kinematic pairs not only does not decrease, but, on the contrary, increases by γ_{PK} percent and becomes equal to

$$(1+\gamma_{PK})P_m(S)$$

If the crank speed is less
where:

$$\omega = k^0 \omega_н ,$$

$$k^0 = \sqrt{\frac{4+\lambda}{4(1+\lambda)}},$$

root of the equation

$$P_{mk}(S) - Q_m(S) = 0,$$

then the balanced force reaches the initial value that it had before the elastic connection was introduced into the mechanism.

Let's look at an example. Let the central crank-slider mechanism with $\lambda = \frac{1}{5}$ a geometric parameter have m = 100 kg; $\omega_н$=50 $с^{-1}$; r=0,1м.

After balancing in the mechanism of rotating masses in accordance with the condition, but before establishing an elastic connection with the characteristic *Q (S)* between the slider and the bed, the unbalanced force created by the progressively moving mass at *S = 0*,

$$P_m(S) = r\omega_н^2(1+\lambda)m = 0{,}1 \cdot 50^2\left(1+\frac{1}{5}\right)100 = 3000H$$

If we introduce into the mechanism an elastic connection with the characteristic *q (s),* realizing the uniform best approximation to the function *P (S),* as described above, then the unbalanced force at *S-0* decreases from the value *Pt (S)* to the value

$$P'_m(S) = P_m(S) - Q_m(S) = 375H\ ,$$

where: Q_m *(S)* is the force with which the elastic connection acts on the slider at *S = 0*, is determined by the formula

$$Q_m(S) = r\omega_н^2 m\left(1+\frac{\lambda}{4}\right) = 26215H\ ,$$

In this case, the unloading factor of the kinematic pairs of the mechanism at the rated crank speed

$$\gamma_{PK} = \frac{(4+\lambda)100\%}{4(1+\lambda)} = 87{,}5\%$$

It should be borne in mind that during the operation of the machine, the crank speed may differ from the nominal value, therefore, the coefficient of unloading of the kinematic pairs from the force *P (S)* will not be stable.

If, for example, the crank speed is increased by 20%, then $k = 1{,}2n,\ \ \gamma_{PK} = 43{,}5\%$ the pressure in the kinematic pairs of the mechanism will increase by almost 4.5 times.

Suppose now that the crank speed ω=68,5 $с^{-1}$, corresponds to a constant k=k_0=1.37 and the coefficient of unloading of kinematic pairs γ_{PK}=0.

This value of the γ РК coefficient shows that the same unbalanced force $P_m(S)$ = 3000 daN will act in the mechanism at the crank speed ω =68,5c^{-1}, as in the mechanism without elastic coupling, but at the nominal rotational speed crank ω_n =50c^{-1}.

With a further increase in the crank speed, constant k will satisfy the inequality

$$k > k_0$$

Further research should be aimed at improving the designs of both the needle and the mechanism of the needle, providing an increase in the speed of modes and technological capabilities of sewing machines.

LITERATURE

1. *Rakhmonov I.M. Development and substantiation of the parameters of the mechanism of a needle with an elastic element of universal sewing machines. Thesis. Tashkent, 2008.182 p.*
2. *Inomzhon M. Rahmonov, Azimzhon Abdullaev, Shahriyor Hajdarov, Mahliyo Nodirova. Dynamics of the machine unit with the elastic element of the mechanism of a needle of a sewing machine, Eurasian Journal of Science and Technology. Vol. 1 (1). 2019.S. 9-10. Scope Academic House, England.*
3. *Rakhmonov Inomjon Mukhtorovich, Otamurodov Zhurabek Otanazarovich. Vibration damping materials to reduce vibration in the garment industry. International Journal of Advanced Research in Science, Engineering and Technology, Vol. 7, Issue 1 , January 2020, C.449-453.*
4. *I M Rakhmonov, L P Uzakova, D N Naimova, J O Otamurodov and N Z Adizova. Method for determining damping coefficient, characteristic friction forcein the needle mechanism. Participated in the II International Scientific Conference "MIP: Engineering-2020 - Modernization, Innovations, Progress: Advanced Technologies in Material Science, Mechanical and Automation Engineering" in April 16-18, 2020 in Krasnoyarsk, Russia. (2020) 1-10 P.*