UDC 621.924.7

DEVELOPMENT OF A DRIVE THAT PROVIDES TORQUE TRANSMISSION TO THE DRIVE SHAFT PERFORMING ADDITIONAL RECIPROCATING MOTION

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Keywords: spatial mechanism, kinematic pair, connecting rod, slider.

A machine drive that transmits the torque [1] to the movable drive shaft has been designed. The kinematic chain of the machine (with technological drive) is presented in Fig. 1.
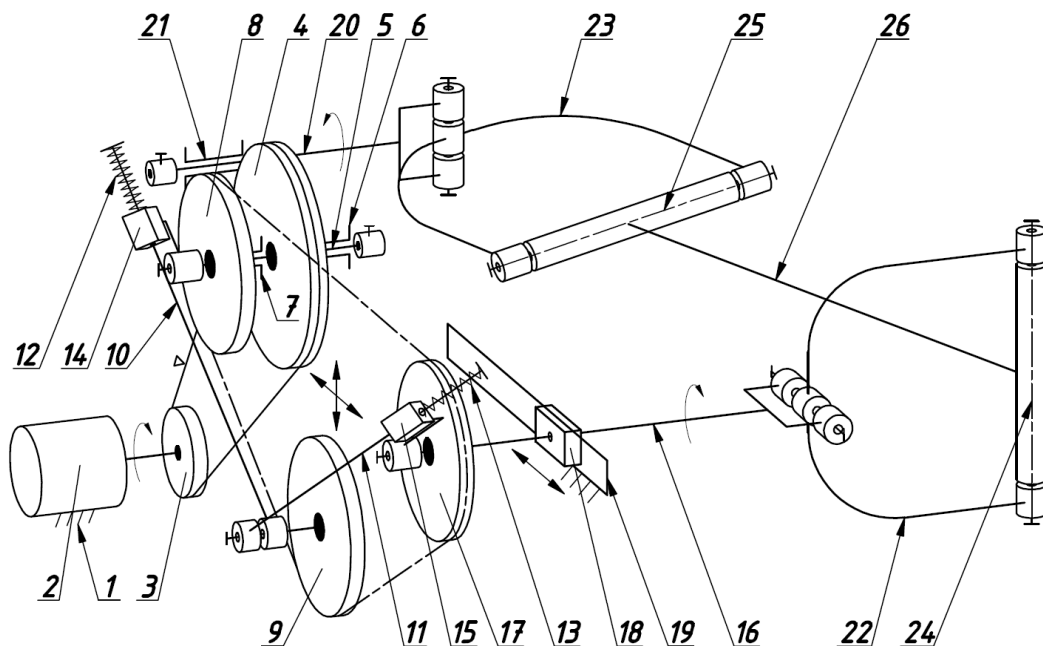

Figure 1 - The hinged component of the machine drive

The machine for processing parts contains [2] frame 1 that houses motor 2 on the shaft of which drive pulley 3 of the belt drive is rigidly fixed; driven pulley 4 is placed on drive shaft 5 that is mounted in bearing supports 6 and 7. On drive shaft 5, there is rigidly fixed drive sprocket 8 of the chain drive. Intermediate sprocket 9 of the chain drive is kinematically connected to first and second slides 10 and 11 which by means of rocker arms 12 and 13, respectively, are installed in rocker dies 14 and 15, respectively. Rocker die 14 is kinematically connected to drive shaft 5 to rotate, and rocker die 15 is kinematically connected to drive shaft 16 for rotation. Driven sprocket 17 is rigidly mounted on drive shaft 16 fixed in the bearing support of slider 18 that may reciprocate along horizontal guide 19; driven shaft 20 is mounted in bearing support 21. The drive and driven shafts 16 and 20 are hinged at the other ends with drive and driven forks 22 and 23; their diametrically orthogonal axes 24 and 25 are the mounting axes of working tank 26.

The operation of this drive is ensured by its hinged component that is kinematically connected to the chain drive. The hinged component of the machine drive at the two extreme positions of slider *18* is shown in Fig. 2 (the notation of the links in Fig. 2 coincides with that of the kinematic chain in Fig. 1).
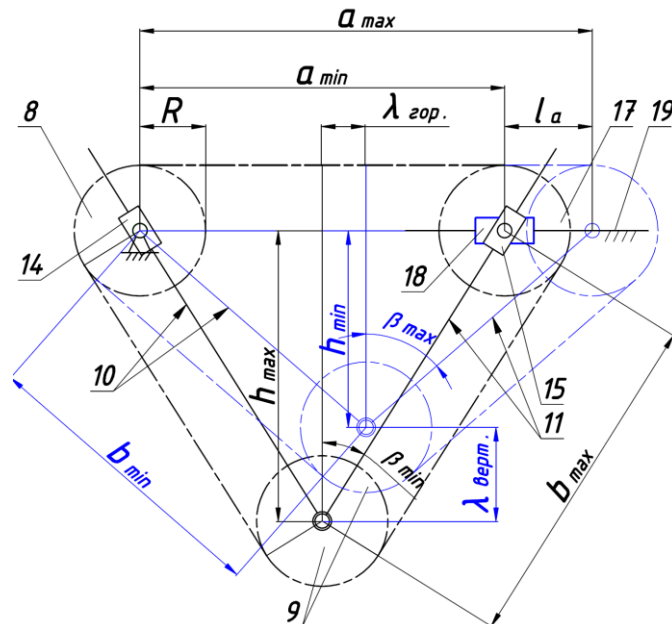

Figure 2 - Component that is kinematically connected to the chain drive

The mathematical dependences for the calculation of the basic structural parameters of the hinged component of the drive for keeping the pressure angle in the mechanism kinematic pair within the permissible limits have been obtained. The obtained results enable implementing new configurations of the equipment.

$$\lambda_{гор.} = 0,5\sqrt{l_{PЄ}(2l_B + l_{PЄ})} - 0,5\sqrt{l_{PЄ}^2 + 4(l_B \cos 45°)^2}. \tag{1}$$

$$\lambda_{верт.} = \sqrt{\frac{(l_л - a_{min} - 2\pi R)^2 - 4(0,5a_{min})^2}{4}} - \sqrt{\frac{(l_л - a_{max} - 2\pi R)^2 - 4(0,5a_{max})^2}{4}}. \tag{2}$$

The obtained expressions to determine the vertical amplitude vertical and the horizontal component of the displacement of the center of rotation of the intermediate sprocket 9

References

1. Zalyubovs'kyi M. G. Synthesis and analysis of redundant-free seven-link spatial mechanisms of part processing machine / M.G. Zalyubovs'kyi, I.V. Panasyuk, S.O. Koshel', G.V. Koshel'// International Applied Mechanics, 57, No. 4, July 2021, 466 – 476;

2. Zalyubovskii M. G. On the study of the basic design parameters of a seven-link Spatial mechanism of a part processing machine / M. G. Zalyubovskii, I. V. Panasyuk // International Applied Mechanics, 56, issue 1, April 2020, 54 – 64.