https://doi.org/10.53230/tgm.1310-912x.2025.1005.02

KINEMATIC CHAIN OF AN APPARATUS FOR BRAIDING AND WINDING HOLLOW CORDS

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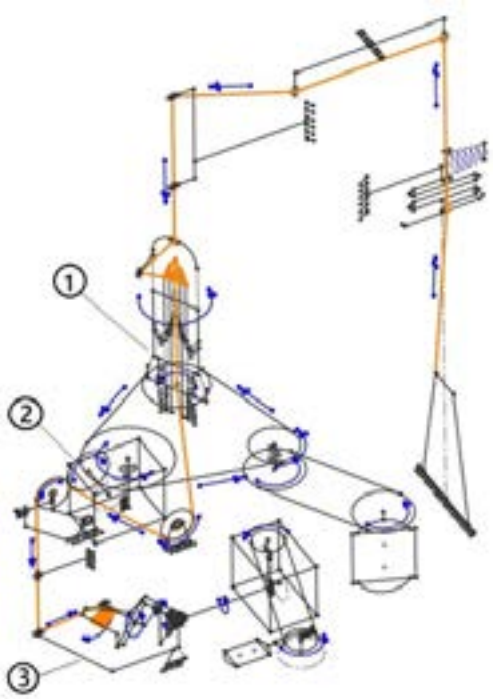
The production of braided cords includes two technological operations: braiding and winding and belongs to the circular knitting technology.

The peculiarity of the device is due to the large difference between the rotation speed of the knitting head of about $\omega \cong 1850\ min^{-1}$ and the linear speed of the outgoing cord of about $v \cong 5$ m/min. The angular velocity of the working elements for pulling and winding, adjusted to the structural dimensions of the machine elements, is about 30 times smaller than the rotation of the head. Another feature is the variable speed of the winding working element.

The pulling of the cord from the knitting working area is at a constant linear speed, which is maintained at the point of its winding onto the yarn body. The constantly increasing diameter of the yarn body requires a corresponding reduction in the angular velocity of the winding shaft to maintain constant tension on the cord. The above-mentioned features lead to the separation of 2 independent sources for driving the two main groups of mechanisms – the knitting and the winding.



There are three functional mechanisms in the overall design of the apparatus: (1) knitting, (2) pulling and (3) winding. The knitting mechanism consists of a knitting head spindle with longitudinal channels in which the knitting needles move linearly. The axial cams are fixedly mounted in the spindle, between which the needle consoles are located. The constant angular velocity of the spindle is converted into a sinusoidal reciprocating motion of the needles, which forms the loops of the cord.

The take-up cylinders take the knitted cord out of the knitting zone. The linear speed of the periphery of the take-up cylinders and, accordingly, the angular speed of their shafts, is synchronized with the spindle speed and determines the density of the loop rows of the cord. Synchronization and adjustment within small limits is a prerequisite for the overall propulsion of knitting and pulling. In this case, the pull speed adjustments are solely for the purpose of slightly changing the linear density of the linear textile product.

The third functional mechanism, or the winding mechanism, is self-powered for three reasons. Cord winding is an operation remote from the knitting work area. The mechanical connection between the knitting head and the winder complicates the overall design of the apparatus. Furthermore, the winding speed is a function of the constant tension of the cord and the increasing diameter of the yarn body.

The subject of the article is the kinematic chain of the hollow braided cord apparatus. The goal is to develop a mathematical apparatus and algorithm for controlling functional mechanisms.

Keywords: *knitted cord, textile engineering, kinematic chain*