ISSN 2181-8622

Manufacturing technology problems

Scientific and Technical Journal Namangan Institute of Engineering and Technology

INDEX COPERNICUS INTERNATIONAL

Google Scholar

Crossref doi

SLIB.UZ Scientific library of Uzbekistan

Volume 8
Issue 3
2023

IMPROVED GIN SAW CYLINDER

MIRJALOLZODA BOBIRMIRZO

Researcher of Namangan Institute of Engineering and Technology
Phone.: (+99894)155 11-55

ABDUVAKHIDOV MUTAKHKHIRKHON

Senior teacher of Namangan institute of engineering and technology
E-mail.: mutahhir_74@mail.ru, phone.: (+99891) 361 20-02

ADHAM UMAROV

Doctoral student of Namangan Institute of Engineering and Technology
Phone.: (+99877) 005 31-90

ALISHER AKBARALIYEV

Bachelor student of Namangan Institute of Engineering and Technology
Phone.: (+99877) 089 03-35

Abstract: The article discusses the design of the saw cylinder of the genie DP-130 family. Ways to improve performance have been studied. A shaft with a hexagonal cross-section was considered as an energy- and resource-saving design.

Keywords: saw cylinder, bending, stress, rigidity, energy and resource savings, circular section, hexagonal section.

Introduction. In modern mechanical engineering, especially in the textile industry, issues of energy and resource conservation are relevant. These problems require the solution and selection of the optimal design of the working body that meets the minimum requirements of technological parameters, which does not complicate the preparation of this working body from the point of view of the technological process.

The design of a gin saw cylinder [1] is known, containing a shaft, saw blades installed on it, spacers between the saws, washers and clamping nuts. The shaft is splined with transitional curves at the spline bases, and grooves, and the saw blades are equipped with tongues located with the possibility of contact with the grooves on the shaft, and the tongues and grooves are made symmetrically on both sides. However, the known design is characterized by complexity of design and manufacture.

Methods. The closest in technological essence to the proposed one is a gin saw cylinder [2], containing a shaft, saw blades with tongues installed on it, which fit into the groove of the shaft, spacers between the saws, washers and clamping nuts. The disadvantage of the known design is a significant deflection of the shaft, leading to a change in technological distances between saws and gaps, a large power requirement due to the massiveness of the saw cylinder, which lead to damage.

The gin saw cylinder was chosen as the prototype of the utility model [2].

The existing designs of gin saw cylinders are very massive, which causes deflections beyond the permissible limits (0.3-0.4 mm). As a result, there is a change in the position of the saws in the slot gap between the grates, leading to damage to the fibers when they are pulled by the teeth of the saws through the grates, a reduction in the service life of the saws and grates, as well as an increase in energy consumption due to friction of the saws on the grates. Therefore, the development of a new gin saw cylinder is of great importance.

The objective of the study is to increase the reliability of the gin saw cylinder, save resources and increase productivity.

The problem is solved by the fact that the saw cylinder contains a shaft, saw blades mounted on it, spacers between the saws, washers and clamping nuts, the shaft is made hexagonal, and the saw blades have a hexagonal inner surface located with the possibility of contact with the edges of the hexagonal shaft.

Making the shaft hexagonal can significantly reduce weight while maintaining the bending rigidity of the shaft, leading to resource saving, increased reliability and production of fiber with the required quality indicators.

The gin saw cylinder (Fig. 1), containing a shaft 1, saw blades 2 mounted on it, spacers 3 between the saws, washers 4 and clamping nuts 5, the shaft is made hexagonal, and the saw blades have a hexagonal inner surface, located with the possibility of contact with the edges of the hexagonal shaft.

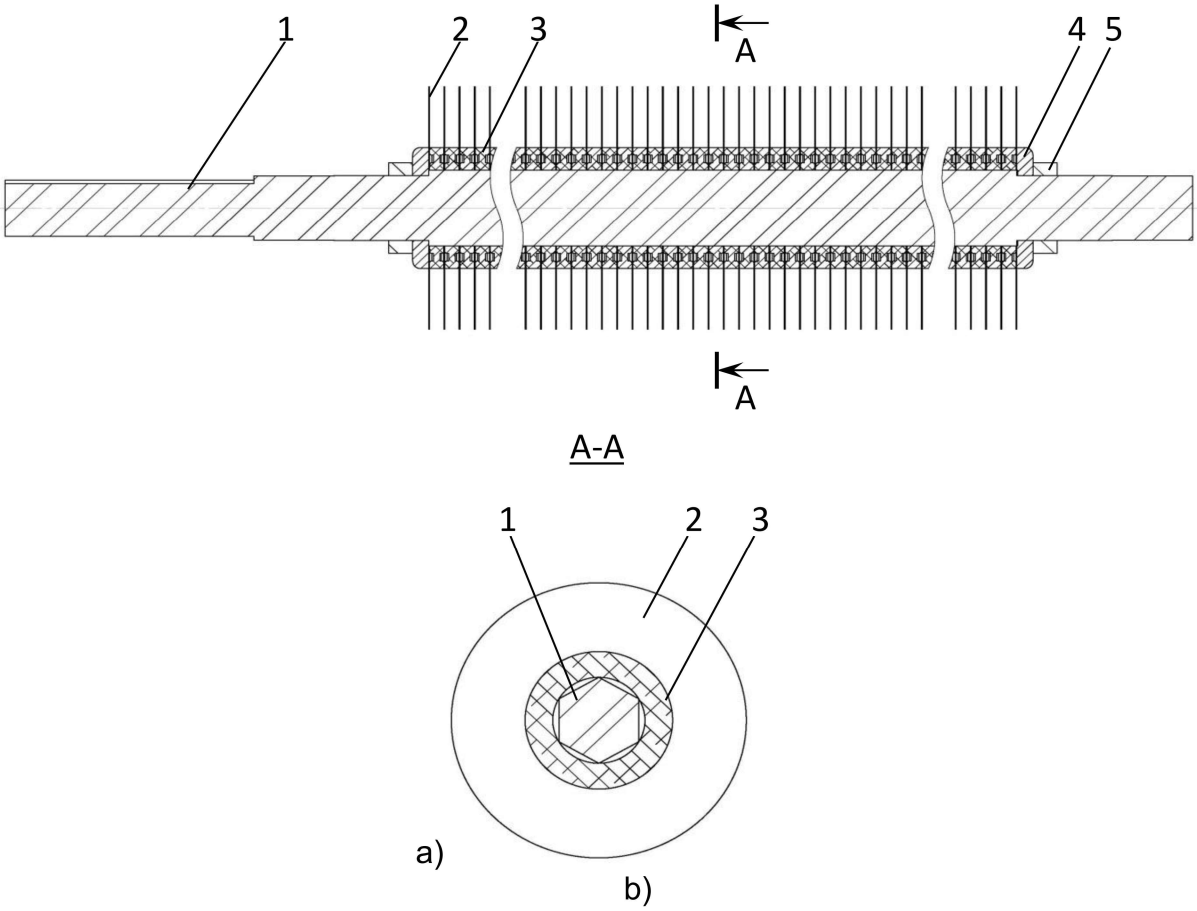


Fig.1. Improved gin saw cylinder

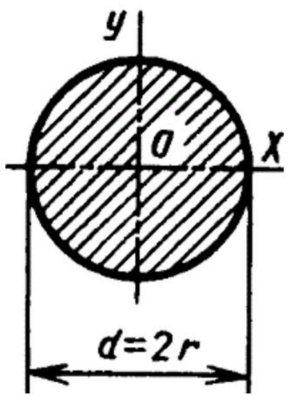
The design works as follows. During operation, when feeding raw cotton, saw blades 2 capture strands of fibers and drag them behind the grate bars (not shown in the figure), and the strands of fibers are torn off from the cotton seeds. Reducing the mass of the saw cylinder of the gin by making the shaft 1 hexagonal ensures the bending of the shaft 1 within acceptable limits, allows the required process of cotton fiber separation, and reduces the required power of the gin. The manufacture of saw blades 2 with a hexagonal inner surface during operation leads to a kind of balancing of the masses of the system relative to the axis of rotation.

The recommended design makes it possible to increase reliability, reduce the required power of the gin, and obtain high-quality fiber with high productivity.

In Fig. 1, a shows a general view of the saw cylinder of the gin, containing a shaft 1, saw blades 2 installed on it, spacers 3 between the saws, washers 4 and clamping nuts 5, the shaft is made hexagonal, and the saw blades have a hexagonal inner surface located with the possibility of contact with the edges hexagonal shaft, in Fig. 2, b – section A-A of the saw cylinder shown in Fig. 1, but with a shaft, a saw blade with a hexagonal inner surface and an intersaw spacer.

Analysis of the axial moment of inertia - J_x, sm^4, moment of resistance - $W_x,\ sm^3$, radii of inertia - $i_x,\ sm$ gives the following results:

Results.



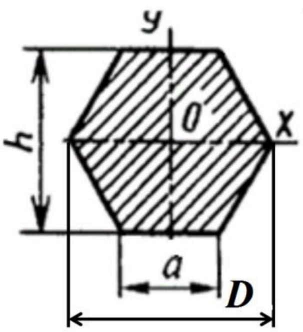
For round section:

Diameter $D = 100$ mm;

$$J_x = J_y = \frac{\pi d^4}{64} = \frac{\pi r^4}{4} \approx 0{,}05 \cdot d^4 \approx 0{,}05 \cdot 100^4 \approx 5000000\ sm^4$$

$$W_x = W_y = \frac{\pi d^3}{32} = \frac{\pi r^3}{4} \approx 0{,}1 \cdot d^3 \approx 0{,}1 \cdot 100^3 \approx 100000\ sm^3$$

$$i_x = i_y = \frac{d}{4} = \frac{r}{2} = \frac{50}{2} = 25\ sm$$



For hexagonal section:

$h = 86{,}60;\ a = 50\ ; D = 100$ mm

$$J_x = J_y = 0{,}06 \cdot h^4 = 0{,}541 \cdot a^4 = 0{,}06 \cdot 86{,}60^4 = 3374604\ sm^4$$

$$W_x = 0{,}12 \cdot h^3 = 0{,}625 a^3 = 78125\ sm^3$$

$$W_y = 0{,}541 \cdot a^3 = 67625\ sm^3$$

$$i_x = i_y = 0{,}4565 \cdot a = 0{,}257 \cdot h = 22{,}3\ sm$$

Conclusion. The obtained figures show that the axial moment of inertia J_x is reduced by approximately 32%, the moment of resistance - W_x is reduced by an average of 27%, the radii of inertia - $i_x$is reduced by 10%. This means completing the assigned task.

References

1. Dzhuraev A.D., Yunusov S.Z., Shin I.G., Mirzaumidov A.Sh. Gin saw cylinder. Patent No. IAP 06087. – Tashkent. 2019.

2. G.I. Miroshnichenko. Fundamentals of Cotton Machine Processing Design. "Mechanical Engineering", M. 1972, pp. 235-237.

C O N T E N T S