Fifth Class Rotary Kinematic Pair Research Device in a Vegetable Oil Production Press

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Purpose:

The working body of the G-24 for press granulator used for the production of vegetable oil-the production of an experimental device of a technological machine with a newly developed fifth classrotary kinematic pair to determine the kinematic and dynamic parameters of the auger shaft.

Methods:

To reduce the friction in the fifth class kinematic pair contained in the G-24 for press granulator, a method of reducing friction and wear by opening the longitudinal grooves in the inner cylinder of the proposed design is given.

Results:

The prosed design of a fifth class rotating kinematic pair allows for a uniform lubrication of the surfaces of the elements of the kinematic pair doe to the stock of lubricants in the longitudinal grooves of the inner cylinder. Besides, the total area of contact between cylindrical surfaces is reduced, thereby reducing friction and wear, resulting in an increase in the service life of the kinematic pair.

Conclusions

The experimental device of the G-24 for press granulator allows to study the number of revolutions in the kinematic pair, torque, angular velocity between the cylinders and the degree of rotation in kinematic pairs and the rotationals speed available in the device

Key words: kinematic pair, cylindr, construction, steel, turning moment, friction, eating, bronze

INTRODUCTION

Today, the development of machine building in the country, the application of technological machines and equipment in the production of energy and resourse-saving, high-speed machinery and technologies, improving the operational reliability and competitiveness of machines are becoming increasingly important. At the same time, one of the important tasks is to create new designs of resource-saving machine parts and mechanisms, to ensure the strength of working bodies and to develop calculation methods.

METHODS

In order to verify the accuracy of the theoretical results in practice, an experimental device of a technological machine containing a newly improved fifth-class rotary kinematic pair was prepared and the kinematic and dynamic parameters of this device were studied in the laboratory.

The purpose of the experimental

Study was to determine the kinematic and dynamic parameters of the working body of the G-24 for press granulator used for the production of vegetable oil-the number of revolutions of the flanged joint, which is fixed to the shaft using a dowel joint is to study the laws of change of torque on the shaft and the degree of bending that occurs at the expense of friction in the kinematic pair.

A special experimental stand was prepared to measure the parameters to be studied in the experimental studies. The general view of the test stand is shown in Figure 1, and the kinematic scheme is shown in Figure2, and it consists of: electric motor1, couplings 2, reducer 3, fifth class rotary kinematic pairs (sliding bearings) 4, shaft 5, brake device 6, strain gages 7, magnetic-laser tachometer determining the number of revolutions 8.

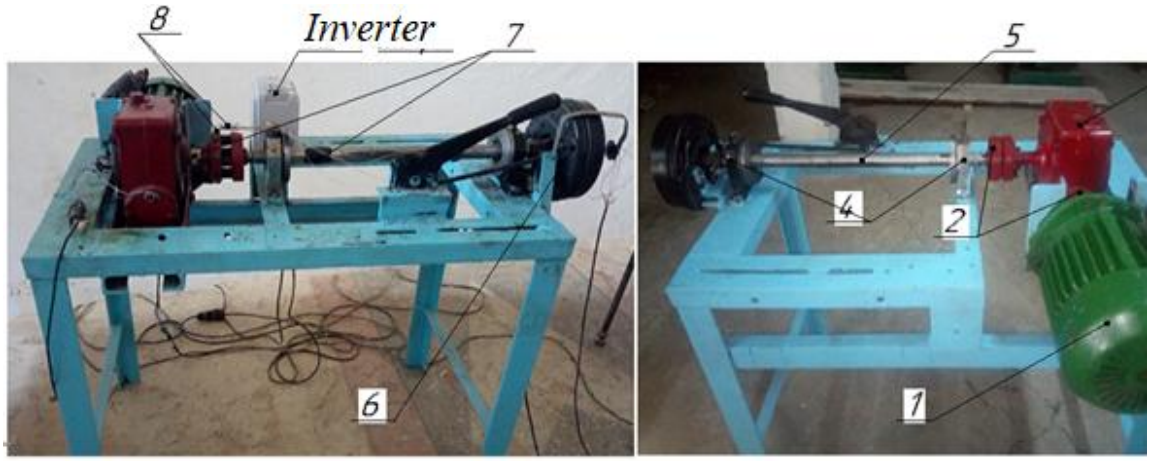

Figure 1. General view of the kinematic and dynamic parameter determination stand of the fifth class rotary kinematic pair.

Taking into account the conditions of friction of kinematic pairs, for the production of Litol-24 viscous oil and kinematic pair elements (Br O_8 S_{12}) steel with a concentration of bronze and carbon content of 0,25 was selected. Figure2 shows experimental copies of the elements of the fifth-class rotary kinematic pair construction.

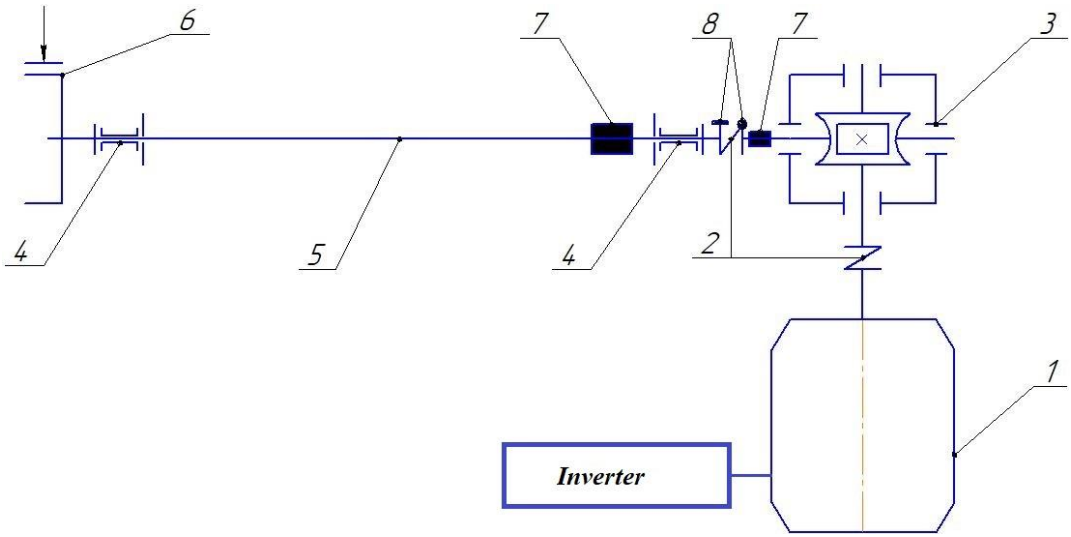

Figure 2. Kinematic scheme of the experimental stand.

The test stand operates in an open contour and the resistance forces acting on the fifth-class kinematic pair design are applied by means of a handbrake. The number of revolutions leaving the motor is changed by 1/40 using the reducer and the number of revolutions on the shaft is provided in the range of 15-30 rpm due to the change in the frequency of the motor using the inverter.

The resistance torque on the kinematic pair shaft can be varied from 10 to 400 Nm using the handbrake. Experimental replicas of the fifth-class rotary kinematic pair design, which used only rotary motion in technological machines, were created.

Firure3. Fifth class rotational kinematic pair components

a) **25 steel bushing;** ***b)*** **bronze bushing Br O_8 S_{12}**

Figure4. Fifth class rotary kinematic pair bushings

a) ***b)*** ***v)*** ***g)***

Figure 5.Fifth class rotating kinematic pair inner cylindrs the number of a) channels is 12; b) number of channels is 8; v)-number of ditchen 6, g) flat surface (without ditchen).

RESULTS

In the experimental study, an outer cylindr made of two different materials (bronze and steel) formed an fifth cylindr rotating kinematic pair. i.e, the angular velocities between the kinematic pairs occuring during the movement of the flanged joints, the number of revolutions in the shaft and the values of the torque change during their variation at four different speeds were do served.

DISCUSSIONS

Experience from all over the world shows that at present, sufficient research has been conducted on the construction of structural, kinematic and dynamic schemes of mechanisms, their analysis and synthesis. However, methods to reduce the degree of erosion of the fifth-class rotating kinematic pair design of frictional moving surfaces haven't been sufficiently studied. Therefore, it is important to develop a new improved design of the fifth-class rotary kinematic pair and substantiate their parameters, to conduct fundamental and applied research to ensure that technological machines move rotating working bodies in accordance with established laws.

CONCLUSION

In summary, the fifth-class rotary kinematic pair, which is the working body of the G-24 formopress granulator used to produce vegetable oil, reduces the friction contact surface by 3-7% by opening longitudinal grooves with a certain pitch and depth into the inter cylinder the filling of the reservoirs with reserve oil is achieved. It has been found that a uniform lubrication of the inner cylinder of the rotating kinematic pair.

Due to the depth of the longitudinal grooves in the inner cylinder of the rotating kinematic pair, the metal surface in this part doesn't come into contact with the bushing and doesn't rub and the plastic oils collected in these grooves lubricate the bushing evenly due to the rotation of the cylinder resource increase can be observed.

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