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ТЕХНОЛОГИЧЕСКОГО
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CONSTRUCTIVE PROPERTIES OF APPLICATION OF PLASTIC AND CONSTRUCTIVE FLEXIBLE ELEMENTAL MATERIALS ROPE ROLLER MECHANISMS WITH BELT CONVEYOR

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Abstract:

Objective. Instead of rolling bearings, which provide smooth rotational movement in the mechanisms of composite guide rollers of belt conveyors, lightweight high-strength plastic and composite materials of flexible elements are used and a new design of parts has been developed.

Methods. Development of new types of movable base of movable elements made of plastic and composite material of the roller mechanism and methods of their constructive, kinematic and dynamic calculation, as well as the development of new schemes of the mechanism, methods of modeling and calculation, optimization of operational characteristics, analysis and synthesis of mechanisms.

Results. It is known that the main factors affecting the performance of belt conveyors used in the mining industry are: the environment, temperature fluctuations and various loads. This leads to a significant increase in the exposure of the equipment parts. The main damage to the composite roller idler is caused by this rolling bearing. When using a part made on the basis of the proposed new design project, the frequency and efficiency of the mechanism increases.

Conclusion. The operating time of roller belt mechanisms with a belt conveyor used in the mining industry is 30,000 hours. When a new design part is used instead of a rolling bearing, the operating time of the movement is 35,000 hours. Therefore, it is recommended to

recommend the manufacture of a part from high-strength plastic and composite flexible element.

Keywords: mechanism, bearing, conveyor, rolling, flexible, graphitecapralon, kinematics, roller, base, grinding, technology, research.

Introduction.

One of the main tasks in the country today is to increase the production of metalworking and metalworking products in the field of mechanical engineering, as well as to improve the quality of engineering products and their constant control. As a result, metal and mirrors determine the level of demand for products from raw materials. It serves as a comprehensive program to ensure our technological progress and improve social well-being in our society. One of the important factors determining the reliability and durability of any machine tool in the manufacture of mechanisms will depend on the quality of manufacture of each element. In the manufacture of some machine elements in the mining industry, plastic and composite flexible elements with increased mirror strength are used instead of metal raw materials. This, in turn, leads to economic efficiency as a result of lower metal consumption.

In the mining industry, belt conveyors play an important role in transporting raw materials from one location to another. The main mechanism that performs the movement of the belt conveyor is the composite guide roller mechanisms. One of the parts that causes the rollers to rotate in a flat rotational motion is the bearing. Rollers mainly use rolling bearings. Rolling bearings (DC) are hubs widely used in machine mechanisms. Of course, rings and rolling elements of bearings are made of high-strength steels IIIХ6, IIIХ9 and IIIХ15 (chrome-plated ball bearing), as well as alloy steel 18ХГТ, 20Х2Н4А after heat treatment and polishing. It is obvious that the production of bearings is a high-quality raw material, high manufacturing accuracy is one of the main factors that determine its cost [1].

Methods.

The use of high-strength plastic and composite material of flexible elements instead of rolling bearings makes it possible to achieve profitability by reducing the metal consumption in the production of machine mechanisms.

To do this, it is necessary to find a solution to this urgent problem using the following research methods:

- Wide application of plastics and flexible elements in mechanical engineering;
- Testing the resistance of the recommended raw materials (graphitecapralone and rubber) to abrasion, deformation, impact;
- Increasing the frequency of product release by improving the surface quality of the workpiece;
- Development of experimental research methods.

High-strength plastics and composite materials for flexible elements are widely used in industry today. This, in turn, leads to high economic efficiency with low metal consumption in the manufacture of some machine parts. For this, high-strength mirror materials are used; for example, the brands graphitecapralon, phtaroplast, and rubber have achieved a number of successes by choosing and using several types of similar materials in production. Another advantage of using mirror materials is that the machine allows you to create relatively inexpensive, relatively high-strength machine mechanisms, as well as to manufacture some of the mechanism elements.



Figure.1. Roller mechanism (Belt conveyor)

Instead of a rolling bearing in the idler roller mechanism shown in the picture above, we use a sliding bearing piece made of graphitecaprolon material, which provides a smooth rotational motion and acts as a bearing.

Plain bearings are known to have a high coefficient of friction ($f = 0.0015 - 0.006$) in comparison with rolling bearings and a high torque (5 ... 10 times). we are open. It goes without saying that the coefficient of friction and the moment of inertia of the manufactured part are reduced several times [2].

The performance of the work piece when sliding about the axis is largely determined by the image of wear. That is, depending on the state of use of the surface fluid, the friction surfaces will be separated by a layer of viscous oil. The most favorable condition for the normal operation of the sliding part is friction in the fluid. When rubbed into a liquid, the surfaces are separated by common oil.

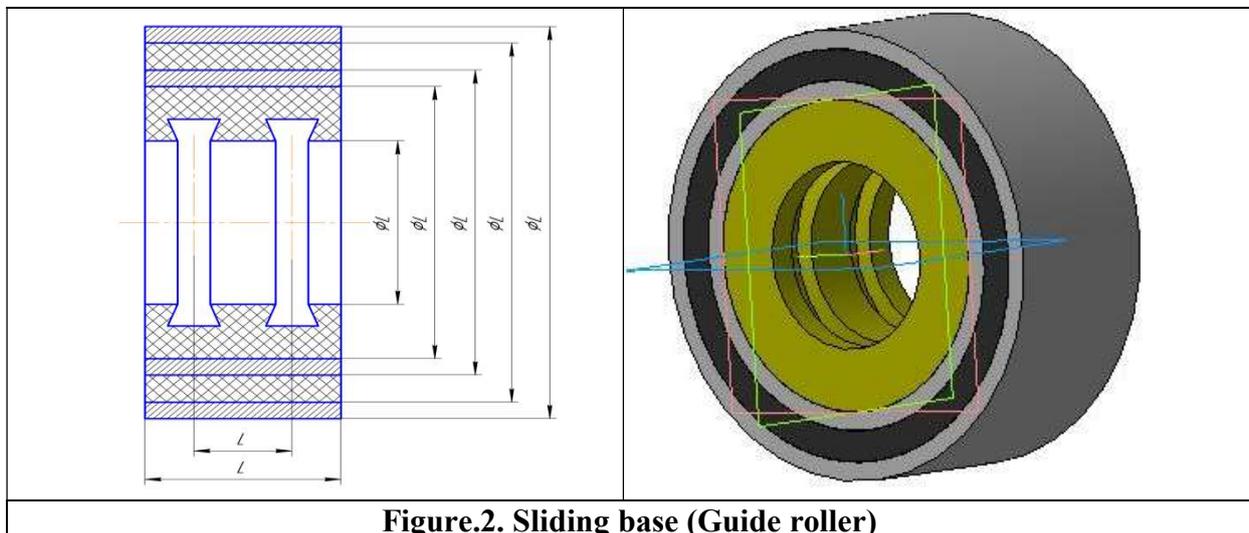


Figure.2. Sliding base (Guide roller)

As you can see in the picture above, two trapezoidal grooves are opened so that the part works normally when sliding along the inner surface. These trapezoidal grooves are 60% filled with viscous fluid. In this case, the thickness of the oil layer - h should be greater than the sum of the irregularities formed by the surface treatment, i.e. the following condition must be met. $h > Rz1 + Rz2$

When the above condition is met, the external load is absorbed by the oil layer, as a result of which the surfaces do not come into contact with each other and are not destroyed.

Friction coefficient $f = 0.001 - 0.005$. When the above condition is not met, that is, with dry friction, the coefficient of friction is $f = 0.1 - 0.2$. It can be seen that as a result of dry friction, the part that plays the role of a sliding base (graphitecaprolon) is destroyed and the frequency of operation decreases [3].

We know that the following three conditions must be met to create a friction mode in a fluid:

The gap between the reciprocating surfaces should be ponasa-shaped;

It is known that the viscosity of the oil must be sufficient to continuously fill the voids;

The speed of the bodies should be such that they can create a hydrodynamic pressure in the oil layer equal to the external load:

Results.

The results of experimental studies show that the friction regime in a fluid is based on the hydrodynamic theory of lubrication. In doing so, it combines factors such as pressure, velocity, and resistance to displacement in a fluid using differential equations related to the hydrodynamics of a viscous fluid.

Many factors are known that contribute to the rapid repair of parts that serve as a sliding support in the guide roller mechanism. For example, studies have shown that quartz particles enter the bearing block as a result of wear on the protective caps. In these cases, it is observed that the service life of roller mechanisms is often 350-600 hours. It is characterized not by the number of revolutions of the guide roller mechanisms as a result of an increase in the level of dust and moisture, but by the amount of abrasive dust accumulated in the oil. The dustiness of the oil is expressed as a percentage of the weight of the dust particles in the oil (%). In addition, a regressive dependence of the amount of oil dust on the test time is given:

$$m = pt^u M^k, \% p \quad (1)$$

where t - is time, hour; M - air dust, kg / m^3 ; p, u, k are empirical constants that depend on the constructive performance of the part acting as a sliding base.

The radial clearance of the inner surface of the part acting as a sliding base is determined by the following formula.

$$\Delta = \delta_0 + 12,23 \cdot 10^{-6} m, \quad (2)$$

where δ_0 – is the initial working radial clearance for parts with an internal diameter $d = 30mm, \delta_0 \approx 10mkm$ and a test sliding base with a load of 100 N.

Dust of the external environment $M : M = (0,5 - 3,4) \cdot 10^{-3} \kappa z - m^3$. In this case, the abrasive wear of the friction surface of the part acting as a sliding base is often observed (cracks).

If we generalize formulas (1) and (2) and the experimental studies take into account the rotational speed of the differential roller mechanisms, we get (3).

$$\Delta \cong \delta_0 + \frac{12,23 \cdot 10^{-6} (1 + d/8)}{700^u \cdot 4,75} pt^u M^k n^u. \quad (3)$$

However, experimental studies take into account that the idler roller mechanisms, which are identical to the actual parts used in the manufacturing environment, operate at rotational speeds, and that contaminants penetrating the protective caps are closely related to the rotational speed value [4].

However, taking into account that the graphite-caprolon material is a hard, corrosion-resistant, but brittle material, we cover it with a sleeve made of external elastic elements and develop a new type of roller mechanism. In the design process, the roller mechanism consists in creating a mechanism with a large light weight and low strength, as well as in creating relatively optimal variants of the mechanism parts. To do this, we will study several grades of

plastic and rubber and select the grade of material with maximum strength. Of course, we must take into account the chemical, physical and mechanical properties of these materials.

Discussions.

When studying the physical properties of a material - the physical aspects of the interaction during the relative motion of contact surfaces. When studying the mechanical properties of a material - studies the mechanics of the interaction of friction surfaces in friction. He studies the distribution of energy and momentum, mechanical similarity in friction, relaxation vibrations, reverse friction, hydrodynamic equations, and others in relation to friction, wear, and lubrication. Surface quality affects the wear resistance of the part to corrosion, corrosion and erosion, the strength of the tight joint and the reliability of the movable and immovable bonded density.

Although the details are represented by smooth lines in a rigid form in the drawing, in reality their real shape differs from the ideal shape. Depending on the formation of the geometric irregularity of the detail is divided into three types: macrogeometric (formal) wave microgeometric (rough) irregularities.

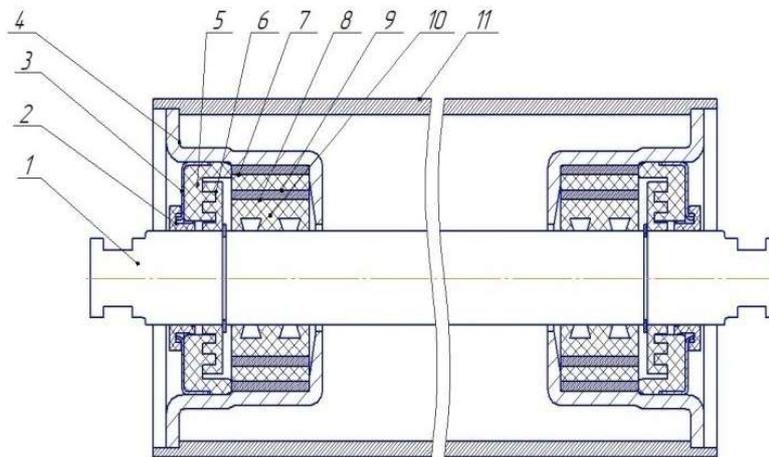


Figure.3. Roller mechanism (Belt conveyor)

- 1- bullet, 2- labyrinth cover, 3- metal cover, 4- stupitsa, 5- labyrinth protective coating¹, 6- labyrinth protective coating², 7- ring¹, 8- ring², 9- elastic element, 10- sliding base (graphitecaprolone) , 11- obeychayka
2-

A rolling bearing is the part that causes the roller mechanism to rotate and acts as a support relative to the axis. As a result of exposure to the external environment (dust, water, high humidity), the roller mechanism stops due to uneven movement or hardening of the grooves and balls of the rolling bearing.

To prevent this, instead of a rolling bearing, we use a flexible element and plastic (graphitecaprolone), which acts as a sliding support relative to the shaft (Fig. 3).

In figure (3) shown above, it is necessary to create new types of parts that act as a sliding base of the elastic element of the roller mechanism, and to develop methods for their constructive, kinematic and dynamic calculation. For this, it is necessary to see the effectiveness of research on the design, modeling and calculation of new schemes of machines and mechanisms, optimization of operational characteristics, analysis and synthesis of mechanisms, the creation of new designs of flexible joints and flexible elements of roller mechanisms.

The laws of belt conveyor motion show that the vibration amplitude in the absence of a flexible element in the base of the roller mechanism providing rotational motion is 0.46 rad. , while in the case of a flexible element with a coefficient of $1.2 \cdot 10^2 \text{ Nm / rad.}$ it is reduced to 0.41 rad. . At the same time, the angular displacement increases by $0.16-0.21 \pi$

when the roller mechanism is mounted on a sliding base with a coefficient of stiffness of $3.0 \cdot 10^2 \text{ Nm / rad}$.

Conclusion.

The operating conditions and characteristics of belt conveyors of mining enterprises are considered, special requirements for the design of their main units are established. The designs of the roller mechanisms of belt conveyors are developed on the basis of design solutions, parts and protective covers and sealing devices that act as a sliding support. The importance of lubricants for increasing the frequency of machining a part that acts as a sliding base was considered. Many factors have been analyzed to quickly repair parts that act as slide bearings in the idler roller mechanism.

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TO ENSURE SAFETY WHEN THERE ARE SITUATIONS IN THE FACULTY OF NATURAL TONES DURING THE MOVEMENT OF TRAINS

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Abstract.

This article discusses the natural emergencies in the mountainous regions of the Republic in the spring and autumn, especially the impact of floods and landslides on railway transport. Ensuring safety on the railways is one of the important tasks for railway transport personnel. There is a very high probability of emergencies during train movement. The article provides insights on these issues.

Keywords: Transport safety, mountainous areas, floods, landslides, emergencies, protected areas, emergency rescue operations, landslides, landslides, railways, train traffic, spring months, emergencies, resettlement.

Introduction.

Articles 23 and 24 of the Law of the Republic of Uzbekistan "On Railway Transport" No. 766-I of April 15, 1999 state that the protection of railways is one of the most important tasks in the event of natural disasters. The law stipulates the use of railway transport and its safety in the following cases: [1].

Z.A.Shodmonkulov, I.G.Shin, N.K.Iskandarova, H.T.Akhmedhodjaev. Physical and mechanical phenomena during abrasive blasting of working surfaces of critical machine.....	96
B.R.Azimov. Construction of a cubic spline for values of functions obtained at unequal intervals.....	102
K.D.Astanakulov, A.D.Rasulov. Characteristic indicators and sizes of the mash bean seed that are important for cleaning.....	109
Sh.Sh.Kenjaboev, A.N.Akbarov, A.Tursunov. New improved construction of rotated kinematic couples.....	115
I.Askarov, R.Jumanov. The design features and technical operation of the main gear of isuzu cars.....	120
A.Azimov. Factors affecting noise reduction on automobile roads.....	126
A.Tukhtakuziev, K.G.Abdulkhaev, Sh.N.Barlibaev. Determining the optimal values of the parameters of the enhanced harrow leveller.....	133
N.Karimxodjayev, I.B.Erkinov, R.M.Dadaboyev. Justifying an optimal dimensions of trommel used for tillage of rice planting areas.....	139
N.Karimxodjayev, I.B.Erkinov, R.M.Dadaboyev. R.A.Vaxobov. Estimation of the influence of fuel quality on the reliability of operation and environmental efficiency of automotive.....	144
I.R.Mavlonova. Universal sewing machine new construction presser foot.....	152
Sh.Kh.Abdazimov. Protection of railway transport and other economic facilities from natural disasters (on the example of floods and landslides).....	157
A.S.Jumaev, A.J.Juraev, S.A.Imamov, A.T.Majidov. Constructive properties of application of plastic and constructive flexible elemental materials rope roller mechanisms with belt conveyor.....	167
Sh.Kh.Abdazimov, S.K.Khudaiberganov. To ensure safety when there are situations in the faculty of natural tones during the movement of trains.....	173
D.J.Kholbaev. Mathematical modelling for the estimation of seasonal variation of hydroelectric power generation parameters: a case study at the chartaq hydroelectric facility, namangan region, Uzbekistan.....	181
Sh.N.Sayitov. Application of cascade control systems in the automation of technological processes.	192
<u>ADVANCED PEDAGOGICAL TECHNOLOGIES IN EDUCATION</u>	
O.K.Raxmatova. The effectiveness of the application of information and communication technologies in the russian language classes.....	197
X.X.Saidova, M.R.Ergasheva. Pedagogical diagnosis and its role in pedagogical activity.....	201
M.M.Chorieva. An analysis of the winter climate in order to study the special clothing package for oil and gas industry workers designed for cold climates.....	206
D.F.Djalolova, F.F.Jalolov. Organization of experimental work to develop independent and creative abilities of students in general professional disciplines.....	206
S.N.Makhmudova. Students use of the moodel system in higher educational institutions.....	214
D.A.Sayfullayeva. "Five-stage" technology of teaching special subjects in the professional training of students with disabilities.....	220
J.U.Juraev. Digital signal processing with polynomial and dobeshi wavlets.....	225
O.P.Uralova. From the history of the comparative study of english and uzbek languages at paremiological level.....	233
I.I.Kurbanova, S.F.Mukhamedjanova. The oretical and practical research on cotton machine and ip time filling calculation.....	236