UDC 621,316

FEATURES OF RESEARCH WORKING SURFACE SERIAL CONTACTS

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The results of research structures working surfaces serial contact after testing them on elektroeroziynuyu stability.

Spraying, plasma torch, electric apparatus, starters, circuit breakers, contactors, contact detail.

Formulation of the problem. In-depth study of physical processes that take place on the working surface contact during operation, a prerequisite for further combat with electric erosion, which is one of the main causes of the destruction of electrical contacts.

Analysis of recent research. The microstructure is one of the main factors affecting the properties of electrical contact.

The microstructure depends on the production technology, the properties of raw materials, design features of the device, power electric arc of the surrounding atmosphere [1, 4, 5].

The object of research - Contact switching devices operated in electrical systems and livestock farms.

The purpose of research - Develop the principles of scientific research working surface contact by metallographic and X-ray structure analysis of composite work surfaces contact materials.

research Methods - Held metallographic and X-ray analysis work surfaces serial contact after testing them in electrical resistance.

Results. Fig. 1 shows the initial material microstructure contact type CpH-10 electromagnetic starter PML-1100 after switching 1h105.

As we approach the working surface of the grain size of the silver and nickel phase increases, resulting thermal action of the arc. The working surface is depleted silver component, which evaporated as the temperature of the evaporation of silver (2210 °) is much lower evaporation temperature nickel (2730 °) (Fig. 1).

On work surface and pores appear shallow bowls, which were clusters of silver and grains refractory component nickel.

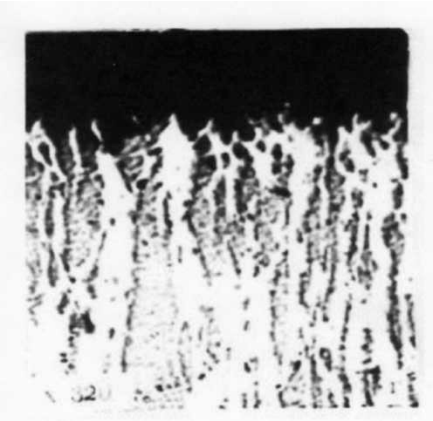


Fig. 1. Microstructure rolling contact with the material CpH-IO electromagnetic starter PML-1100 after switching 1h105 x 320.

The depth of the layer in which there microstructural changes reaches 0,05-0,08 mm. Nickel directly on the contact surface and a depth of 0.05 mm oxidized.

When the electrical contact is melting and evaporation intensive fusible component - silver on the working surface of the cathode, thus forming discrete, lumpy surface (Fig. 2) the degree of roughness depends on the current strength and the number of commutations. On the surface erosion were big performances in the pits light structures are included, which in this X-ray analysis are pure silver (3). Chemical analysis of the surface layer showed that the amount of nickel on the wo-rk surface increases significantly (from 10 to 20-25%), indicating the priority fumes silver with surface contact in the process of switching electric current.

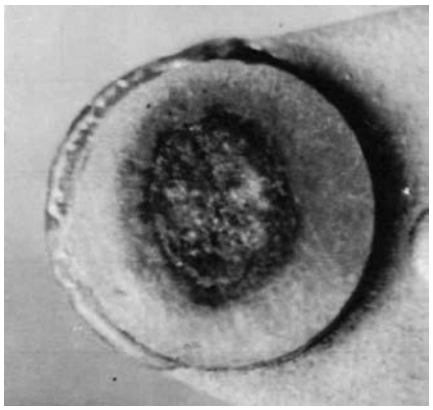
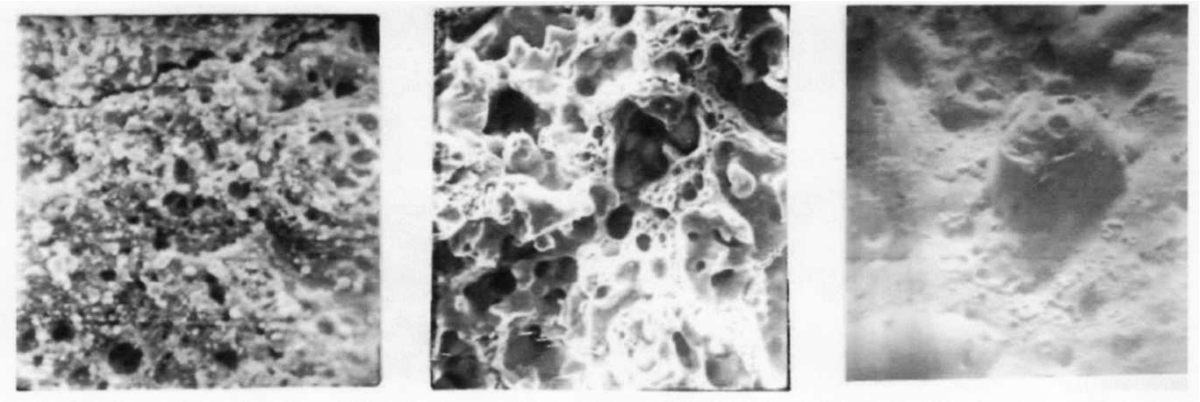


Fig. 2 Exterior rolling contact with the material CpH-10 electromagnetic starter PML-1100 after switching 1h105, h13.

A detailed study of the working surface contacts revealed that as a result of the arc melts not only fusible composition - the silver, but also grains of nickel (Fig. 3, a), as evidenced by the presence of characteristic

steps of curing the edges of nickel grains (Fig. 3, B) . Thickened nickel grains have a conical shape, which is typical bridged transfer (Fig. 3, B).



a) h85 b) X300 in) h400

Fig. 3. Electron microscopic images CpH-surface contact 10 after switching 1h105.

The results allow to state that at the time contact is made by points refractory component, which determines the slope material for welding.

The lowest electrical resistance have contact with the material CPM-0.2 [1], which corresponds to the chemical composition: Cu - 0,1-0,5%; Ni - 0,005-0,2%, Ag - rest [2].

When switching current 4; 6.3; 10 contacts of this material there obhoryannya melting and working surfaces contacts. Metallographic analysis showed that in the microstructure of the surface layers changes significantly.

From Fig. 4 shows that the switching current material is transferred to the stationary, heated to boiling, partially transferred to the surface of a cold real contact, and the rest is deposited over the surface rolling, forming a cavity (Fig. 4 black craters) and columnar grains perpendicular the working surface contact.

The microstructure of immovable and movable contact are different in structure. Fig. 5 anode surface is covered with small grains cathode metal vapor, which crystallized in extinguishing the electric discharge [5]. Also, on the surface, where the couple settled metal, you can see the increase of silver grains, formed due to recrystallization under temperature metal vapor.

When switching DC power is sent to the transfer of material from the movable contact on the fixed. Consequently, the crater formed at the cathode and the anode performance.

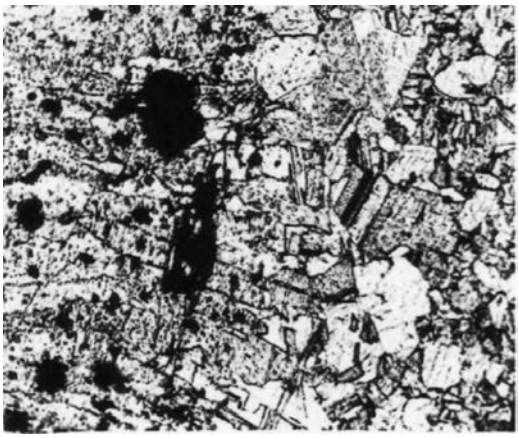
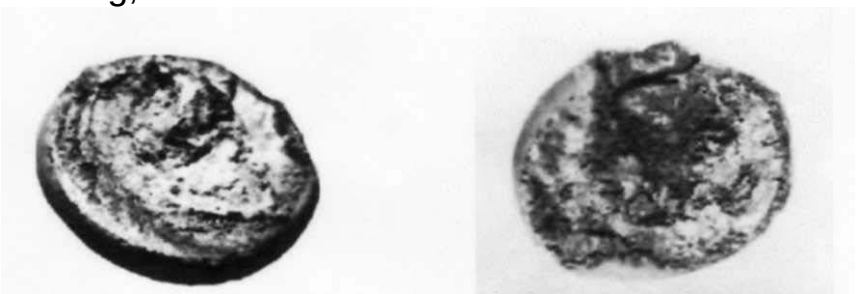


Fig. 4 Microstructure contact with the material CPM-0.2 after switching 1h105, h200.

Fig. 5 Microstructure contact with the anode material CPM-0.2 1h105 after switching,h200.



and) x7 b) x7

Fig. 6. Appearance contact with the material CPM-0,2 electromagnetic starter PML-1100V after switching 1h105 (I = 6,3A, and - the anode, - a cathode).

Conclusions

1. The structural diagram of the control kinetics of physical and mechanical properties, restoration of worn surfaces of the contact details of electrical apparatus. The particles of material distributed on the diameter of the circle, and the coating thickness is determined by Gaussian distribution.

2. The functional dependence of the impact strength of the current, the nature of the load, environmental parameters, physical and mechanical properties of the material (melting point, strength and background.) In the process of destruction of working surfaces contacts and contact reliability.

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Predstavlenы results of research structure workers seryynыh the contact surfaces after trials in эlektroэrozyynuyu s Stability.

Napылenye, plasma torch, electric apparatus, starters, circuit breakers, contactors, contact detail.

The results of studies of working surfaces' structure of serial contacts after electroerosion sustainability testing are presented.

Spraying, plasma, electrical apparatus, switch, contactor, pin-details.

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ENERHOZBEREZHENNYAV promising areas of technological process DEEP cultivation

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Directions reduce the energy intensity of deep tillage.

The unit, means enerhonasychenist, rotational bodies.

Formulation of the problem. Analysis of the state and trends of crop mechanization leads to the conclusion that modern technologies of

mechanized operations using machine-tractor units is quite energy intensive. The current stage of development of energy resources is characterized by the completion of traction and the emergence of a new, traction-energy concept under which the tractor is already power-Pull tool. Growth last engine power is not accompanied with a corresponding change in its operating weight. Creation of appropriate agricultural machines for traction and power tools as part of Pull-energy concept currently significantly behind. Perspective direction of reducing the energy intensity of cultivation, provided always ensure quality loosening accordance with the processes of growing crops is the use of energy-saving principles of action on it.

Analysis of recent research. The energy technology of farming operations is largely determined by the operating characteristics of cars and modes of machine-tractor units (AIT) [4]. Most modern tillage machines working bodies built on the concept of traction, cutting, moving and loosening the soil is carried out by the forward movement of the machine [3]. This basic principle of the working of the soil layer is in compression principle, which is the most energy-intensive. To Crumble soil stratum structural components as agronomic requirements cultivating units must have operating speeds above 4 m / s. This, among other things, further increases energy costs [3]. Therefore, we can consider the alternative direction of traktoro- and agricultural engineering, which justifies the need to replace traktora- tractor, while increasing its enerhonachyschennosti on Tractor Pull-energy concept and creation on its basis traction-drive machine and tractor units that require the development of innovative working authorities for deep tillage. [4] Improve the energy efficiency of tillage machines possible by using the active work of the rotary type [5]. In general, resistance to cutting rotary soil working bodies expressed by the following formula [5]:

$$P = f(\sigma, \tau, \rho, p, W, a, b, s, v, vo, va), \quad (1)$$

where: σ, τ - boundary stretching stress (compression and shear); ρ, p, W - density, hardness and soil moisture; a, b, s - depth, width and feed the knife; v, vo, va - progressive, circular and absolute speed cutting.

The purpose of research. Investigate areas reduce energy cultivation by applying the principles of energy saving actions on it.

Results. In the solution of the problem was assessed for the possibility of deep tillage active workers of the rotary type with a vertical axis of rotation, which makes movement in the vertical plane. This machine-tractor unit performs incremental movements on the field with a stop, to drive working bodies and deep tillage. To manning machine-tractor units involved tractors Pull-energy concept with high enerhonasychenosti and lower operating weight.

In general, soil resistance to cutting such rotary machine may be expressed by the following relationship:

$$P = f(\sigma, \tau, \rho, p, W, b, s, vo), \quad (2)$$

where: s - feed on the working edge in a vertical plane.

We use the universal law of resistance in industrial processes developed by VP Horyachkinym [1], according to which the rotational resistance of the workers can be represented by the sum of resistance:

$$P = PT + Pr + Pvid. \quad (3)$$

Where: PT - resistance to friction against the ground rotary blades; Pr - resistance to cutting chips; Pvid - resistance to speed chips are attached.

According to S. Leontiev [2], rotational friction force working bodies have little value because they close during the calculation can be neglected.

Resistance to cutting chips can introduce dependence:

$$Pr = k\ p\ \delta s\ lk, \quad (4)$$

where: k p coefficient of resistivity cutting soil; δs - average thickness of the chip; lk - the length of the cutting edge.

$$lk = rh / cos\beta, \quad (5)$$

Where: rh - radius surface rotary screw working body; β - the angle to the horizontal surface of the screw; Pvid - resistance to chips attached to the speed at rejection developed in your body is missing.

During the working body, cut chips moving on spiral surface subjected to the resistance of friction (PT). In general, soil resistance to cutting work by rotational type with a vertical axis of rotation, which makes movement in the vertical plane. perhaps expressed by the following relationship:

$$P = PT + Pr. \quad (6)$$

where: Pr - the resistance of friction on the surface of the screw body.

Eliminating the impact of soil depth and forward speed of movement makes it possible to significantly reduce energy consumption for deep tillage. As a result of search operations developed constructive-technological scheme of a machine that has active working bodies of rotary-type vertical axis of rotation, carrying out movement in the vertical plane. The use of these machines makes it possible to carry out all kinds of cultivation (from shallow to deep) with stratified by cutting with a blow without forward movement. This type of interaction with soil working body provides a significant reduction efforts on crushing and formation of the physical state of the soil. This made the local cultivation. Using the principles of energy saving actions working body of the machine on the ground reduces the power consumption of the process of cultivation.

Conclusions

1. Eliminating the impact of soil depth and forward speed of movement makes it possible to significantly reduce energy consumption for deep tillage.
2. Rotary working bodies of the vertical axis of rotation engaged in

the vertical plane displacement provide cutting layers of soil with a blow without forward movement.

3. Using the principles of energy saving actions working body of the machine on the ground reduces the power consumption of the process of cultivation.

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Predlozhenы direction Reduction эnerhoemkosty Deep obrabotku soil.

Aggregate assets, эnerhonasыschennost, rotatsyonnыe bodies.

Directions to reduce energy intensity of deep tillage.

Machine tool, energy saturation, rotary parts.