STUDY PARAMETERS OF THE ELECTRIC ARC CURRENT AT COMMUTATION RESTORE CONTACTS PARTS

I. Radko

Now the urgent task is to improve recovery technology contact switching devices operated in agriculture.

The purpose of research - to determine the time of the arc and the average value of the current in the arc, arc quenching conditions, and wear resistance of sprayed contact details magnetic actuators from different contact materials.

Materials and methods of research. In testing for electrical switching capacity and stability to determine the parameters switching (arcing time and the average value of the current in the arc) used oscillography current and voltage. The amount of current determined by the voltage drop on shunt 75SHSMZ-05.25. Oscillograms current and voltage obtained with a universal two-beam storage oscilloscope S8-14. Error of measured values did not exceed 5 %.

When switching AC current through each transition zero current at the time of sharply increasing arc voltage to the voltage arc ignition. Over half of arc voltage varies slightly on it. In low-voltage electrical installations in the second half of the arc of resistance increases significantly, resulting in increase of its regenerative strength. After the second current transition through zero arch collapses and fades. After this period can still maintain residual conductivity that matches one stage or another arc discharge. So defined waveforms sprayed contact details of electromagnetic actuators ПМЛ-3200 DC, because it is more informative.

Results. Rational conditions extinguishing the arc AC sprayed with contact details in actuators PML-3200 should be considered as commutation, in which the first arc is extinguished after opening contacts through zero current transition. Intuitively, this is illustrated in Fig. 2. It is established that the burning arc when closing the contacts in serial starters ПМЛ-3200- 04 in 75 ms, and the starters contact with research .detalyamy - 55 ms (Fig. 1).

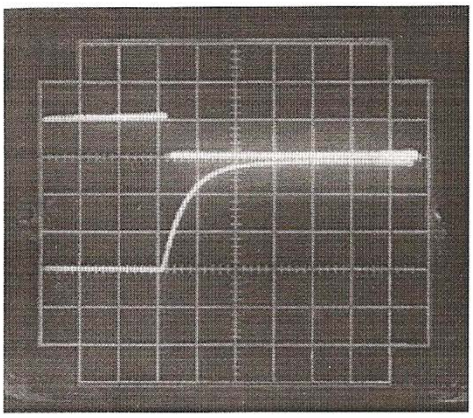
Reliability electrical contact primarily determined by its components, structure and properties of surface layers formed by erosion and the transfer contact material in an electric arc. When switching AC changing the polarity of the current flow through the junction and the experimental data set negative (ie reducing weight) ratio of intensity of electric erosion in the fixed contact parts (1, 2, 3, 4, 5, 6) and moving (bridge 1 2, 3-4, 5-6). But moving contact parts wear out more intensively on 10-27%. This phenomenon is typical for contacts AC and can explain our view that the tests temperature moving bridge was higher than the temperature fixed contacts, the magnitude of 25-30 ° C. Weight bridged type movable contact is reduced slightly larger than the mass of the fixed contacts so that the processes in arc erosion accompanied by intense evaporation and spray material contact details with a higher temperature.

According to the research built depending electro sprayed wear contact details starters ПМЛ with different contact materials (Fig. 2 and 3).

From these figures shows that with increasing switching current erosive wear increases and reaches its maximum value at a current of 10A. This is due to the fact that with increasing current in the contact processes more significant role played by factors increases plasma arc and arc erosion wear due to increase energy electric arc. Moreover, the arc erosion significantly affects the phase composition and structure of the contact material, as channel arc fixed on the structural components with low thermal and electrical conductivity.

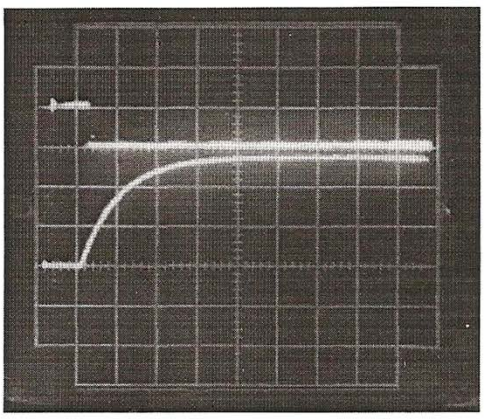
The greatest erosion resistance have contacts CCM-A10m (PML starter in 4200). Resistance material KVM-A10m at 13-30% higher than contacts with brass L62 and 35-45% higher than in the contact details of the material 85% Cu + Mo + 10% 2% 1% MoO3 + C + 2% Ni. High resistance contact KMC Electro-A10m achieved in our study the structure and characteristics of the material cadmium oxide SdO. So arc burns in an atmosphere of cadmium vapor and oxygen ionization potential which is higher than the vapor Ag. Single ionization potential of Ag - 7,54V, CD - 8,96V, O - 13,55V. Since the arc lights in pairs Cd and O, it

Матеріал КМК – 10м

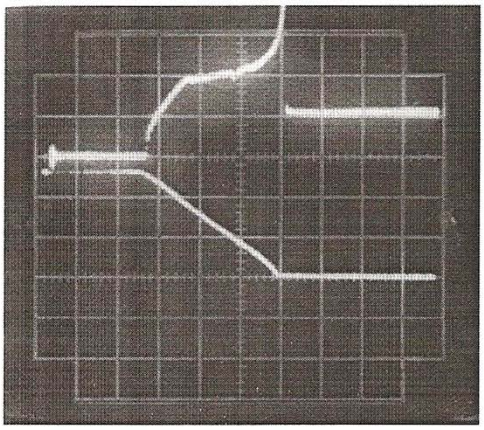


№1. Вмикання: U=65В; I=40А; τ=2мс;L=28мГн
(m_t=50 мс/под.;m_u=50V/под.; m_i=0,02V/под.)

Матеріал 81,3%Cu+10%Cr+

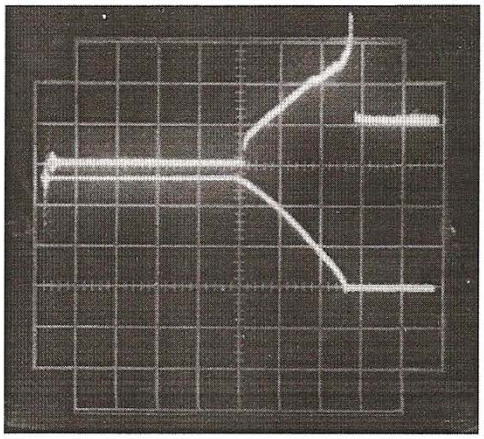


№2. Вмикання: U=65В; I=40А; τ=10мс;L=77мГн
(m_t=20 мс/под.;m_u=50V/под.; m_i=0,05V/под.)



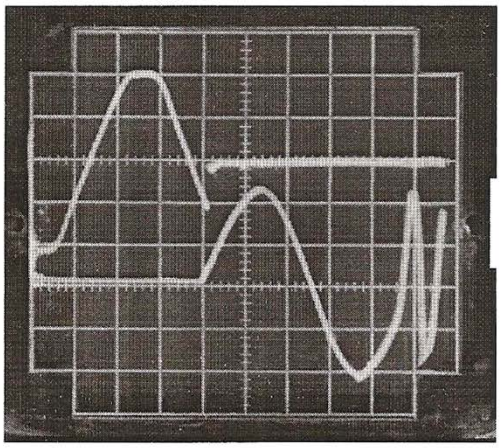
№3. Розмикання: U=65В; I=40А; τ=40мс;L=240мГн
(m_t=20 мс/под.;m_u=50V/под.; m_i=0,05V/под.)

Постійний струм



№4. Розмикання: U=65В; I=40А; τ=40мс;L=240мГн
(m_t=20 мс/под.;m_u=50V/под.; m_i=0,05V/под.)

КМК-10м



Змінний струм

КМК-10м

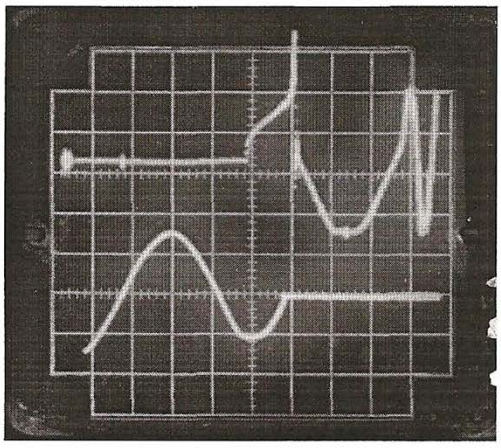


Fig. 1. Oscillograms arc in electromagnetic actuators

ПМЛ - 3200

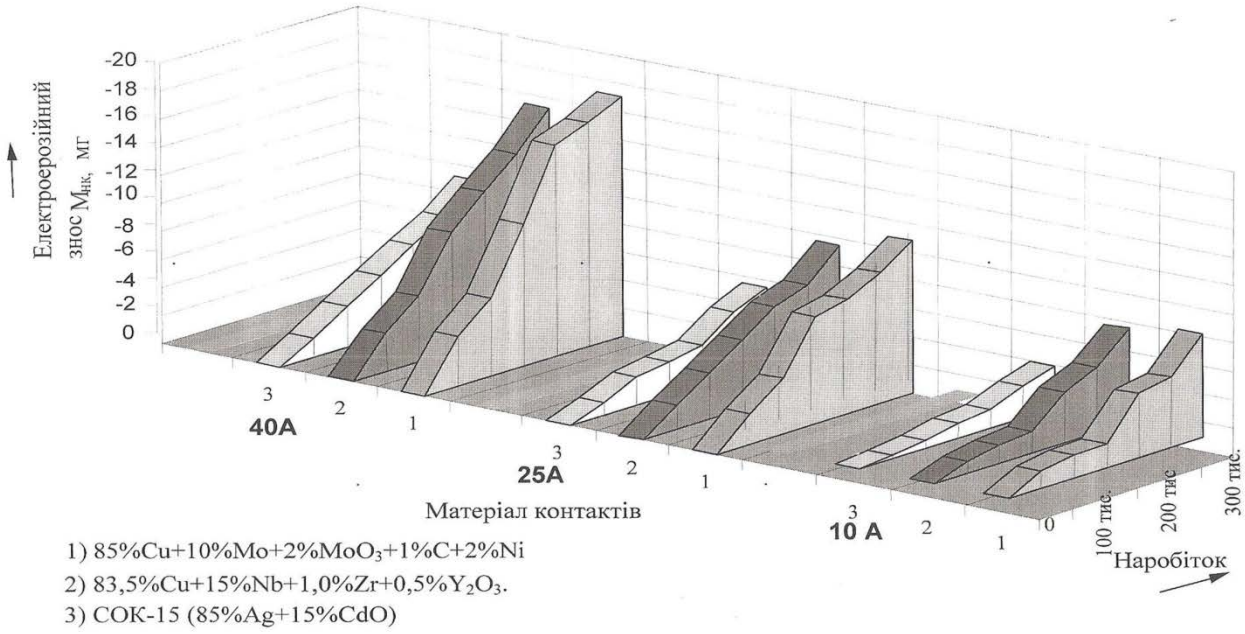


Fig. 2. Dependence electro erosive wear sprayed fixed contact details ПМЛ-starter 3200-04, AC-3 (switching currents 10; 25; 40A)

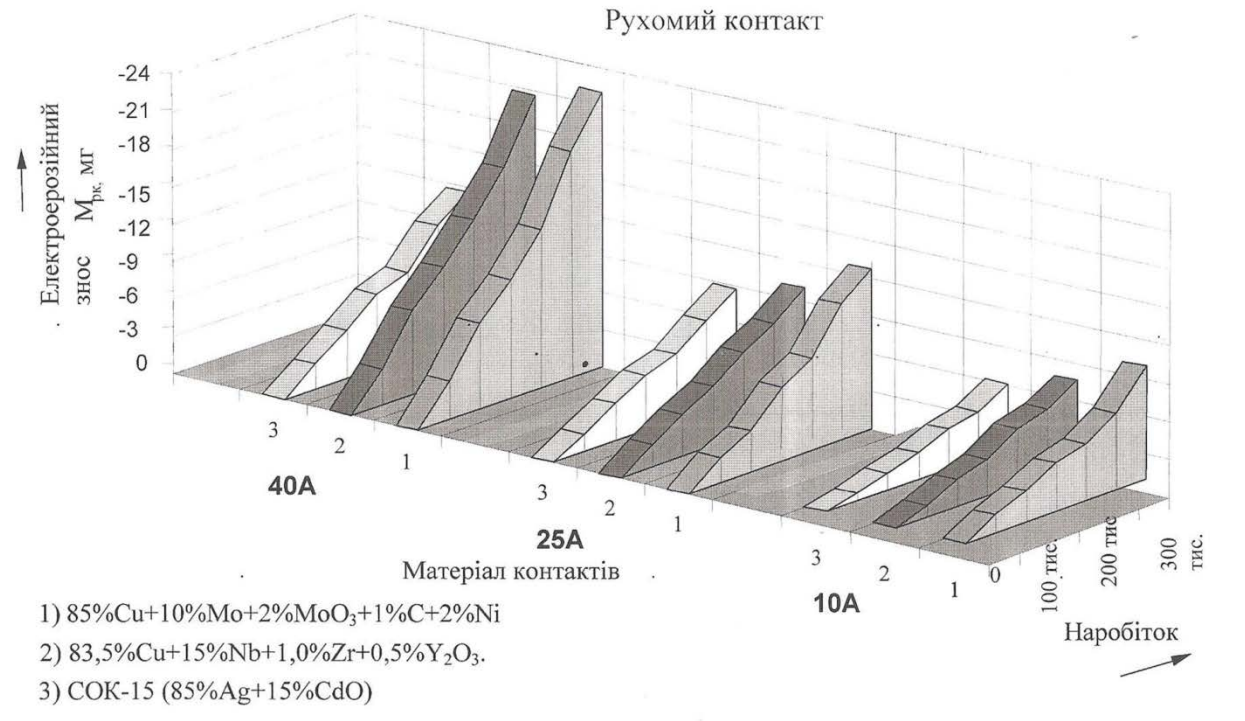


Figure 3. Dependence electro erosive wear sprayed moving contact details (bridges) starters ПМЛ-3200-О4, AC-3. (switching currents 10; 25; 40A)

goes out faster than in pairs Ag. Precipitate cadmium oxide, which is formed by oxidation of vapor return cadmium in lower temperatures, is deposited on the contacts, prevents welding of the closure, without violating the conductivity.

Somewhat lower Spark resistance in the contact details of the material 83.5% Cu + 15% Nb + 1,0% Zr + 0,5% Y2O3. This material provides short duration burning electric arc has good performance, but unfortunately has low heat resistance. This leads to obhoryannya, melting and welding electrical contacts at high loads. Wear occurs over the entire surface evenly contact details. A significant drawback of this material is still insufficient resistance of sulphide against corrosion.

Thermal performance arc causes evaporation and spray material contact surfaces contact details oxidized. In the process, possible significant changes in the surface layer. On the surface oxides formed contacts silver, copper, nickel. Silver oxide have low electrical conductivity, which is close to the conductivity of pure silver, but silver oxide that is formed during thermal action of the arc is different from Ag2O, which is formed in static mode. Copper oxide, crowded in some spots, able to increase the transition resistance for a short time several times.

Thus, the most erosion-resistant contacts have KVM-A10m starter PML-2100.V). Resistance material KVM-A10m higher by 15-25% than contact with material 85% Cu + Mo + 10% 2% 1% MoO3 + C + 2% Ni and 35-40% higher than in the contact details of brass L62. High resistance contact KMC Electro-A10m achieved in our study the structure and characteristics of the material cadmium oxide SdO.

Conclutions

Structure destruction contact materials associated with the nature of the materials. In the arc erosion affects the phase composition and structure of the contact material. Arc phase composition and structure of components with low heat and electrical conductivity.

Studied electrical contact resistance reduction parts.