

Analysis of the Optimal Control of Electric Drives of the Ekg-10 Excavator

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Abstract: *This article discusses topical issues of optimal excavator control ECG-10. This article deals with the switching of electric motors of the EKG-8I excavator and safe control of electric machines during switching.*

Keywords: Driver, contactless, block, DC, AC, block, excavator.

Introduction

The most laborious process in the open method of mining is mining and loading. Mechanization should focus on them. The most progressive non-transport schemes of excavation with the use of high-performance machines, capable of moving rocks for a considerable distance. Despite the development of transport systems, the most prevalent are the transport methods of introducing works using excavators. Excavators are used for overburden mining and for the extraction of coal, ores, and construction materials by the open method [1].

Excavator is a machine for scooping up rock mass, moving it to relatively small distances and loading onto vehicles or dumping. In the field of application, excavators are divided into mountain and construction. Mountain excavators, in comparison with construction, are characterized by greater mass, size, power and more severe working conditions. Career crawler excavators have a multi-motor drive consisting of the main drives: drives of the head, lift, turn and stroke mechanisms, as well as auxiliary ones: compressor, pump and fan drives, motors [2].

Electromagnetic starters are switching devices that work with electromagnetic actions that are designed to start and protect the electric motors of the ECG-10 excavator. Previously, electromagnetic starters have been used widely, but the progress of progress has shown that semiconductor elements are positive since, these elements include the selectivity and reliability of starting and stopping electric motors during a voltage fluctuation or voltage avalanche [3].

Materials and methods

The mining industry pays much attention to the development of rational solutions for electromechanical equipment of mining machines and since the management of contactless devices is important for the management of mining electromechanical equipment. The use of electronic switching devices improves the quality of switching devices and especially their switching and mechanical wear resistance [4].

These power semiconductor devices (one operating and two operating devices using thyristors, optocouplers, powerful bipolar transistors and triacs), which today are able to commute currents in electrical circuits from a hundred amps to several thousand at operating voltages of hundreds and thousands of volts and power management.

This time, to control the electric drives of the auxiliary parts of the ECG-10, contact electromagnetic starters and contactors are used. Contact electromagnetic starters and contactors are used for the reversal start and control of auxiliary parts by electric drives ECG-10, auxiliary parts of mining machines, drilling units and automatic circuits of electrical installations. But the increase in electricity consumption and the complication of electrical installation systems require enormous attention to the quality of switching installations.

It was observed that, during the commutations of contactors and electromagnetic starters, contacts were burned and contacts were stuck. In addition, during switching, contact electromagnetic starters and contactors could not carry out a large number of commutations in the ECC-8I. The proposed contactless device is characterized in that it has a simple control circuit and a structure. This device can be used as a switching device in DC and AC circuits.

Result and discussion

The purpose of this work is to create a semiconductor automatic device for starting and controlling electric drives ECC-10. For this purpose, semiconductor automatic devices are used, for reversing starting and braking of electric drives. An important advantage of semiconductor devices is their speed, high speed and switching frequency, durability, ease of maintenance, mechanical stability ability to work in explosive and polluted environments, reduced level of radio interference, noiselessness, and small size. Semiconductor automatic blocks use triac and thyristor semiconductor devices which have the ability to carry out a large number of commutations and simultaneous phase-out

of the supply network and a significant reduction in the power consumption by the control circuits for starting and controlling the electric drives of the caterpillar-type excavator.

Fig.1 and 2 shows the supply circuit for the main and auxiliary circuits of the ECG-10 excavator.

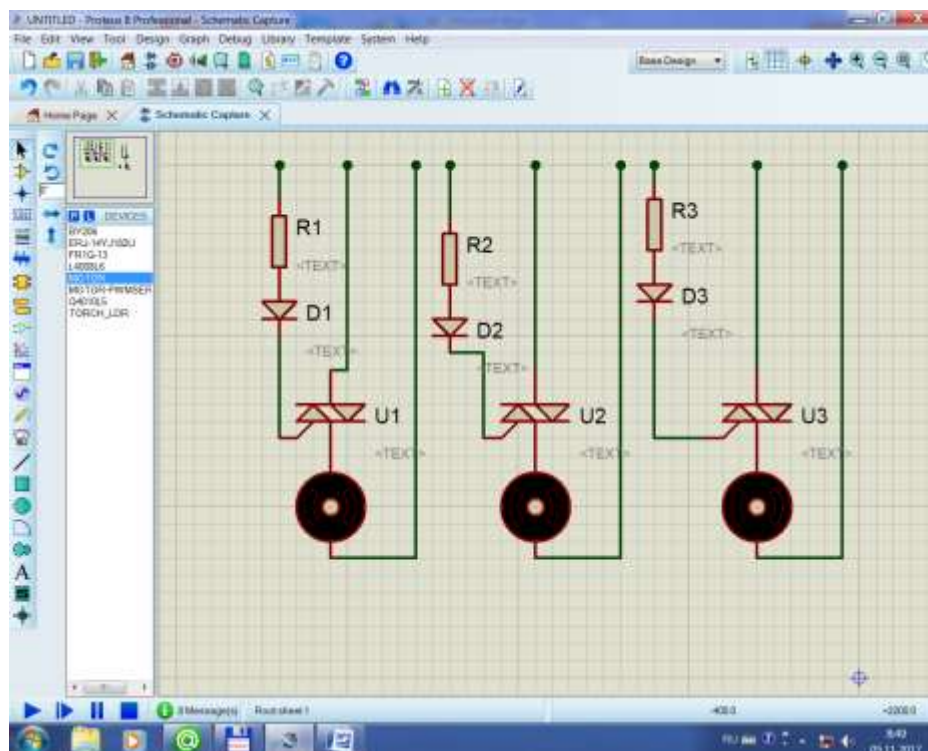


Fig.3. The scheme for starting a DC motor with a non-contact device.

In fig.3, the UNTITLED-Proteus 8 Professional laboratory program for connecting electrical circuits is shown, this program allowed us to analyze the contactless method of controlling the basic equipment of the ECG-10 excavator.

Before, to perform any operation, we got acquainted with the technological passport data of electric motors and chose a DC motor having an active power of 50 kW. Accordingly, with the constant-current motor parameter, we connected the semiconductor triacs VS1, VS2, VS3, to each electric drive of the excavator. After the semiconductor is installed on the motor, we check the control electrode of the triac, then we can determine how much electric current is transferred to the reference control electrode it opens. that we determined the pulsed current of the semiconductor electronic key, then we select the diode VD1, VD2, VD3, for the open control electrode on each triac.

According to the rules of electronics, each electrical circuit must be connected to an appropriate resistance parameter to ensure stable operation of electrical circuits and to prevent short circuits of electrical equipment. Then, according to the rules of electronics, a resistance resistor was connected to the diode and a positive analysis of the contactless start-up of electric drives of mining electric machines was obtained.

Conclusion

The use of contactless elements in the control of electric motors, environmentally friendly and in many enterprises protects against damage to electric motors and warns against a fire. At present, non-contact electronic devices using low power, noiselessness, small size, accurately and reliably operate in electrical installations.

Experiments have shown that semiconductor devices for switching in electrical circuits, in particular start-up electrical equipment are used in local conditions in industrial enterprises. The use of thyristors for switching in electrical installations and their circuit operating in a new way is important and economical.

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