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APPLICATION OF FREQUENCY CONVERTER IN THE ELECTRIC DRIVE CONTROL SYSTEM METAL-WORKING MACHINE

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Relevance and formulation of the problem. The main element of modern adjustable alternating current electric drives is a frequency converter. They are increasingly used in electric drives of alternating current of pumps, fans, compressors, conveyors, metalworking machines, etc. [1-5].

Technological modes of metal-working machine tools at different stages of work require the motion of the working body at different speeds, which is provided by electrical control of the rate of electric drive. At the same time, the requirements for the range and accuracy of speed regulation may vary widely, depending on the application of the electric drive [1].

In general, you can distinguish two main tasks that are solved by an adjustable electric drive: the control of the moment and the speed of rotation of the electric motor.

The need to regulate the moment is dictated by the technical and technological requirements that are presented to the electric drive. For the normal functioning of the electric drive, it is necessary to limit the moment and engine current by admissible values in the transition processes of startup, inhibition and under the action of the load. For the mechanisms undergoing a significant overload until the working body stops, there is a need for continuous regulation of the moment of the electric motor in order to restrict dynamic shock loads. In many cases, an accurate dosage of efforts on the working body is also required, which first of all relates to electric drives of metal-working machine tools.

To solve the tasks of regulating the speed and moment in the modern electric drive, two basic frequency control methods are used: scalar and vector [1, 2, 4].

The main materials of the research. To create a deeply adjustable high-dynamic electric drive of the main motion of the universal-milling machine, the most appropriate control method is a vector control with the orientation of the rotor flow vector, while the speed control is most simply controlled when it is stabilized. For this control, the control system must contain two control channels: speed and flow combination, as well as coordinate transformation blocks. Each channel has two contours built on the principle of subordinate regulation.

Modern frequency converters with vector control of asynchronous motors allows you to perform a direct speed control when there is a feedback in the velocity and indirect when the speed value is calculated by the current voltage and current values. In addition, a streamline is determined indirectly. These calculations are carried out in a special block - observers.

The scheme of electric principle control (power circles) by an electric drive of a universal-milling machine is shown in Fig. 1. The A1 numerical control device contains two data exchange tires. To the first (basic) connected processor, logical computing

blocks, blocks of the higher rank computer interface ECM, operator panel and character information display. To the second connected blocks that are connected with a machine tool. The connection between the two tires occurs due to a substrate interface subs. Exchange of discrete signals with a machine tool is carried out through a block of input and output signals. As a device for adjusting the frequency converter A2 series "MICROMASTER Vector" of the Siemens company.

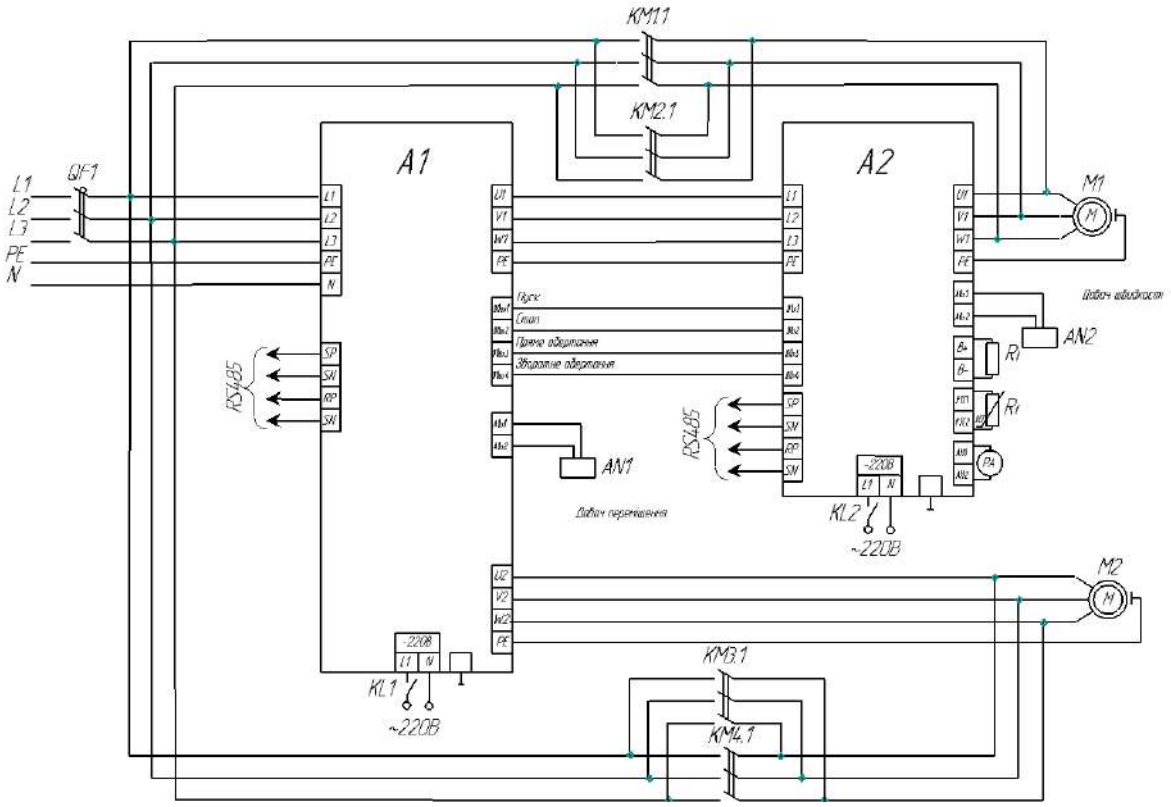

Figure 1. Scheme of electrical basic control (power circles) the electric drive of the universal milling machine

When using a frequency converter, the start of an electric motor is smoothly, without launchers and strikes, which reduces the load on the engine and mechanics, increases the term of their service.

The use of frequency feedback converters provides precise support for rotational speed in variable load, which in many tasks can significantly improve the quality of the technological process.

The use of an adjustable frequency electric drive allows you to save energy directly proportional to unproductive consumption, up to 80%.

The frequency converter allows you to adjust the output frequency in the range from 0 to 400 Hz. Excluding and braking engine is carried out smoothly (by linear law), over clocking and braking time can be set in the range from 0.1 to 30 seconds. Possible smooth engine reverse. When dispersed, an automatic increase in the moment to compensate inertial loads. The moment when starting reaches 150 % of the nominal.

The frequency converter provides a complete protection of the converter and an electric motor from overloads, overheating, leakage on the ground and the breaking of the

transmission lines. The converter allows you to track and display on a digital remote control, the basic parameters of the system - a given speed, output frequency, current and engine voltage, output power and moment, the state of discrete inputs, the total time of the converter.

As noted earlier, for the implementation of vector control, it is necessary to adjust the following values: rotor flow, an angular rotor velocity and a stator current in the axes of X and Y axes. The frequency converter "MICROMASTER Vector" uses an indirect control speed control, that is, the current value of the rotor speed and the flow calculation are calculated by the current values of the current and the state voltage. With this method of managing a speed support error does not exceed 1...5 %. To increase accuracy, it is possible to connect a speed sensor. When using a tachen generator in the system, a measurement error is entered, which reduces the accuracy of speed support.

To adjust the speed of the main motion, three types of sensors are used: speed, current and voltage. Moreover, current and voltage sensors are constructively executed in frequency converters, and the velocity sensor is implemented on the basis of a photovoltaic converter.

Conclusions. Thus, to create a deeply adjustable high-dynamic electric drive of the universal-milling machine in the machine control system, the machine tool is proposed to use a frequency converter with a vector control. The developed control system for the machine tool allowed to expand the technological capabilities, to increase productivity and reduce operating costs.

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