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Development Of A Principal Diagram Of A High-Efficiency Coefficient Of A Frequency Inverter

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ABSTRACT

The article developed frequency converters with increased efficiency for industrial enterprises. The principle of operation of existing methods and circuits of frequency converters has been studied and a schematic diagram of a highly efficient coefficient of a frequency converter has been developed.

Analyzes switching currents in power switches of frequency converters, energy losses associated with switching, losses associated with output rectifiers, improves analysis of the main power consumption in a switching power supply, high-frequency variable frequency control system efficiency, high power dissipation and high timing diagram for automated systems explaining the principle of operation of frequency variables with a useful operating coefficient, a new block diagram of improved frequency variables were developed, the circuit was changed, and an increase in efficiency was achieved.

KEYWORDS

Frequency converters, rectifiers, switches, transformer, automation, thyristors.

INTRODUCTION

There is a shortage of electricity due to limited natural resources [1-4]. In this case, the main consumer of energy at industrial enterprises is the facility. It is known that about 60-70% of the energy produced in the world is consumed by electric motors of various mechanisms and equipment. The remaining 30-40% of energy is transferred to the consumption of the population and other categories of consumers.

Therefore, one of the main issues is the creation of energy-saving devices that are economical in terms of the characteristics of technical and economic power plants used in practice. This requires the revision of the existing equipment and the study of modern options for various design schemes, the creation of energy-efficient frequency converters that change alternating voltage and increase their efficiency remains one of the most pressing problems.

MATERIALS AND METHODS

The structural diagrams of the existing frequency converters are analyzed and their advantages and disadvantages are revealed. A block diagram of high-efficiency frequency converters has been developed. A schematic diagram of highly efficient operating frequency converters has been developed, and compensation systems have been proposed to reduce transitions of frequency variables [5-9]. As a result of the research, a scheme for reducing the transitions of frequency variables has been developed. The studied technical developments opened up the possibility of effective use of energy-saving frequency converters. This project can be used on farms, homes, frequency converters and all devices using frequency converters, and the results obtained in the article can be applied in the educational process.

Due to the high efficiency (0.95-0.97) of thyristor variables, relatively small overall dimensions and other similar parameters, the widespread use of thyristor electric drives is established. The use of thyristors and corresponding control systems solves the problem of starting both AC and DC motors and makes it possible to obtain the required control characteristics and dynamic modes.

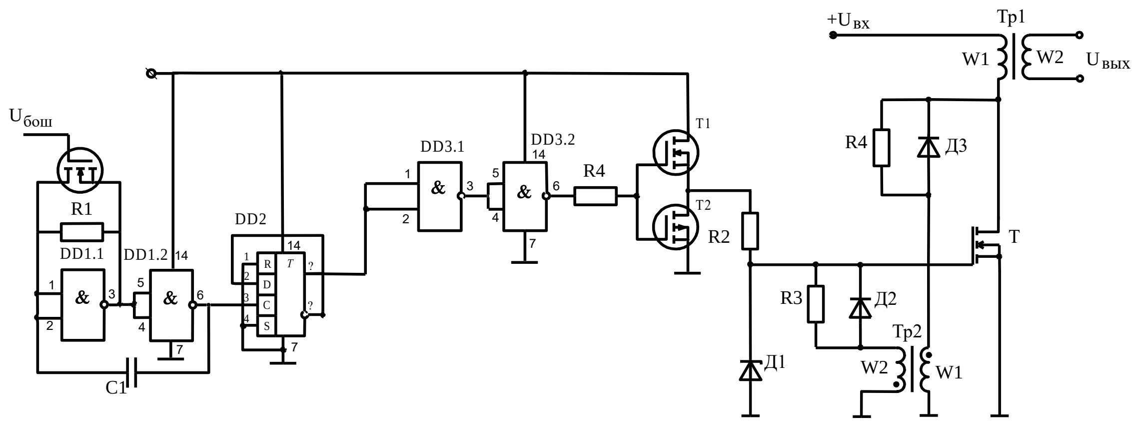
The secondary winding W2 has a pulse shape, the duration of which is determined by the discharge time of the inductance of the magnet of the transformer T2. The amplitude of the gate gain voltage pulse depends on the value of the resistance of the resistor R2. Therefore, in the time phase of the MIS transistor connection, the gate voltage should decrease due to the discharge and the effect of the gate-to-gate capacitance, but in this circuit, it increases due to the gate-voltage voltage.

As a result, the speed of the transistor switch increases, which, in turn, reduces the duration of the voltage drop. After the end of the decrease in the supply voltage margin, the increased voltage across the transistor T continues to take its place, and the termination of this pulse occurs after the discharge of the inductance of the magnet of the transformer T2. A regulator D1 is installed at the input of transistor T to protect the gate circuit from voltage ripples, which limits the input voltage of transistor T to the stabilization voltage of D1 [8-11]. This ensures that there is no correlation between the pulse amplitude and changes in the timing or potential of the circuit.

When the inductance of the transformer magnet is discharged, the gate voltage adjustment in transistor T remains equal to the generator pulse amplitude.

In this case, the MOS transistor is open and the current flows to the primary winding of the transformer Tr1. At the end of the generator control pulse, T reaches the limit voltage when the transistor is turned off.

As in the previous step, increasing the drain-source voltage negatively affects the Miller effect due to the gate bandwidth, which increases the duration of the drain-source voltage front.



1-figure. Schematic diagram of a converter that converts DC to AC

However, increasing the drain-source voltage causes the transformer Tr2 to generate a current in the primary winding of W1. The current in it is limited to the required value through the resistor R4. In the secondary circuit W2, a current pulse is generated, the duration of which is determined by the duration from the linear mode of operation of the transformer core Tr2 to the saturation state.

This pulse reduces the voltage in the circuit, and the rate of voltage drop is determined by the voltage fraction, which consists of resistors R2 and R3. The value of the resistance of the resistor R3 is determined by a sufficiently small shunt of the positive signal of the control pulse of the generator in the phase state of the connected transistor T. The valve is protected from negative voltage by a Zener diode D1.

Therefore, when the MOS transistor T is turned off, a current accumulates in the magnet inductance of the transformer Tr2, which is discharged to the drain-source during the connecting phase of the transistor T. As a result, the introduction of a differential transformer Tr2 with a discharge of the magnetic inductance into the open transistor T leads to an increase in the gate voltage, which compensates for the decrease in the gate voltage created by the Miller effect when the stock voltage drop pulse is formed. Charging the magnetic inductance of a differential transformer with a current T increases the voltage drop across the gate of the transistor.

With such measures, the speed of the MOS transistor T increases, and the power dissipation during the switching torque, which is important for double-circuit AC circuits, decreases.

CONCLUSION

Consequently, the introduction of a differential transformer with charging and discharging conditions with an appropriate magnet inductance increases the gate-source voltage level and makes the power MIS transistor and control pulses independent of the parameters of the connecting line between the source and the characteristics of the internal resistance. The use of the specified inverter increases the speed of the transistor switch in the converter, reduces the power of switching losses. At the same time, the secondary power supply expands its functionality due to the application of the technical solution presented in modern highly efficient systems.

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