

# High-Voltage Power Supply Based on Piezoelectric Transformer

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**Abstract** – High-voltage power supply based on piezoelectric transformer instead of traditional electromagnetic transformer is offered in the paper. The structure of the power supply is represented. The power supply operation principle is described, the diagrams that illustrate its operation are given.

**Keywords** – high-voltage power supply, piezoelectric transformer, resonance frequency.

## I. INTRODUCTION

Now there are various technical areas where high electrical voltage is necessary for supply special devices. As a rule, high-voltage power supplies are constructed using step-up electromagnetic transformers. However there is the information about replacing traditional electromagnetic transformers in structure of high-voltage power supplies for electromechanical elements – piezoelectric transformers (PT) [1, 2]. In the works [1, 2, 3] it is accented on high technical and operational properties of PT.

Thus, the investigations of parameters and characteristics of high-voltage power supplies based on PT are seemed to be interesting.

In this paper the structure and operation principle of high-voltage power supply based on PT are considered.

## II. THE POWER SUPPLY STRUCTURE AND OPERATION PRINCIPLE

The offered high-voltage power supply based on PT belongs to a class of pulse devices.

The structure of the power supply is shown on Fig. 1.

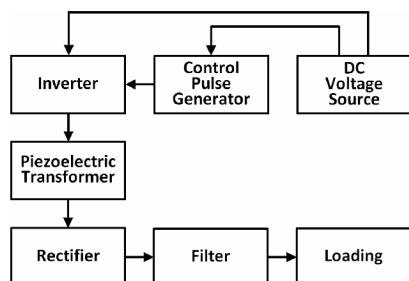


Fig.1 The structure of high-voltage power supply based on piezoelectric transformer

DC Voltage Source supplies the device. As a DC voltage source can be used a battery or a rectifier.

Control Pulse Generator generates the rectangular pulses for Inverter control. It is very important to provide equality of control pulses frequency to PT mechanical resonance frequency for achieving maximum level of output voltage [3].

Inverter converts the DC voltage to AC voltage according to control signals.

Piezoelectric Transformer converts low AC voltage (about several volts) to high AC voltage (about several kilovolts). The frequency response function of PT is represented on Fig. 2.

Rectifier converts AC voltage from PT to DC voltage. Filter smoothes pulsations in rectified voltage.

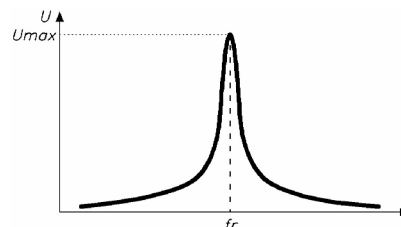


Fig.2 The frequency response of piezoelectric transformer

The diagrams on Fig. 3 illustrate the operation principle of high-voltage power supply based on PT: 1 – voltage of DC Voltage Source; 2,3 – control signals for Inverter; 4 – excitation pulses for Piezoelectric Transformer; 5 – Piezoelectric Transformer output voltage; 6 – rectified and smoothed voltage in Loading.

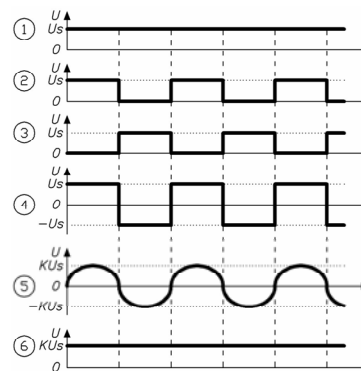


Fig.3 The diagrams illustrating the power supply operation principle

## III. CONCLUSION

The high-voltage power supply based on piezoelectric transformer is offered. The structure and operation principle of the power supply are described. The further investigations may be directed to developing the methods of maintaining the power supply operation on resonant frequency of PT.

## REFERENCES

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