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Research Article

APPLICATION OF OPTOELECTRONIC TWO-WAVE GENERATOR

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ABSTRACT

The article considers a gas analyzer based on an optoelectronic two-wave generator in which optical feedback is used through a gas chamber. At the output of the generator of a positive pulse, optical feedback is provided at a wavelength of λ_1 and at a negative one - λ_2.

KEYWORDS

Generator, gas chamber, wavelength, LED, divider, impulse, radiation, spectral characteristic.

INTRODUCTION

With low requirements for control devices, a simple optoelectronic two-wave generator circuit can be used. Two-wave optoelectronic generators with two optocouplers can be successfully used to create portable gas analyzers for continuous monitoring of the degree of environmental pollution [1-7].

THE MAIN PART

The structural gas chamber of the optoelectronic two-wave generator is a hollow tube (Fig. 1), the inner surface of which has good reflectivity. At one end of the gas chamber, semiconductor emitters SD1 and SD2 are installed, respectively, with radiation wavelengths of λ_1 and λ_2, and at

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the other end, a photoresistor FR is installed, the spectral characteristic of which allows recording radiation from both sources. The choice of source type with the corresponding λ_1 and λ_2 is determined by the spectral characteristic of the controlled gas component [8-24].

A schematic diagram of an optoelectronic two-wave generator is shown in fig. 2. The principle of operation of the generator is based on the use of a photoresistor in the feedback circuit, optically connected through a controlled medium with an LED connected in anti-parallel at the output of the generator [25-41].

In the absence of a controlled substance (gas, smoke, etc.), by turning the knobs of the variable resistors R_1 R_2 and selecting the divider R_4 and R_5 at the output of the amplifier, the pulse durations of positive and reverse polarity are equal.

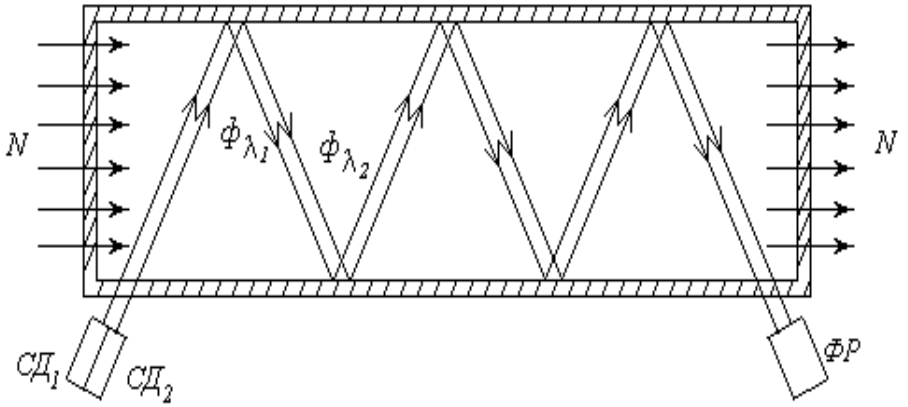

Fig.1. The design of the gas chamber of the gas analyzer.

In the presence of a controlled substance, the duration of a pulse of one polarity changes. The duration of a pulse of a different polarity depends on the values of non-informative parameters, since the wavelength of this LED lies outside the absorption band of the controlled parameter.

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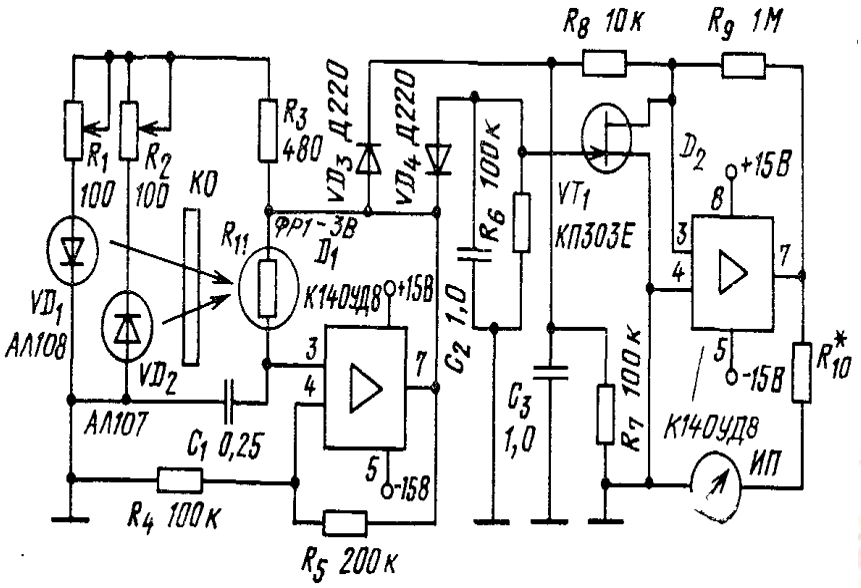

Fig. 2. Schematic diagram of a gas analyzer based on an optoelectronic two-wave generator.

Thus, the generator continuously generates a periodic sequence of rectangular pulses of different polarity [42-57]. The duration of a pulse of one polarity, for example, positive, depends on the controlled parameter, and the duration of a pulse of negative polarity depends on non-informative parameters (for example, when monitoring gas contamination, pollution, etc.). It should be noted that when the background illumination and temperature change, only the pulse repetition frequency of the generator changes and the ratio of the pulse durations of positive and negative polarity depends only on the value of the controlled parameter.

To implement the ratio of the durations of these pulses, a device made on a field-effect transistor VT_1 and an operational amplifier D_2 is connected to the output of the D_1 microcircuit. The separation of pulses of negative and positive polarity is carried out by diodes VD_3 and VD_4. Further, the separated pulses are integrated by the chains R_6 C_2 and R_7 C_5. The value of the controlled parameter is recorded by the measuring device - power source.

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