Transformer of constant voltage

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Annotation.

There is a broad class of transformers of alternating voltage and current; however, the problem of the creation of the transformer of constant voltage is not thus far solved. In the article the construction of the transformer of constant voltage with the adjustable transformation ratio is given. The operating principle of this transformer is based on the use of laws of parametric self-induction.

The keywords: voltage, transformer, capacity, the transformer of constant voltage.

1. Introduction

There is a broad class of transformers of alternating voltage and current; however, the problem of the creation of the transformer of constant voltage is not thus far solved. In the article the construction of the transformer of constant voltage with the adjustable transformation ratio is given. The operating principle of this transformer is based on the use of laws of the parametric self-induction [1-4].

2 Operating principle of constant-potential generator

If there is a capacitor, whose capacity C , and this capacitor it is charged to a potential difference U , that the energy, accumulated in it, is determined by the relationship

$$W_C = \frac{1}{2} C_1 U^2 . \tag{2.1}$$

But charge Q , accumulated in the capacity, is equal

$$Q_{C,U} = CU \,. \tag{2.2}$$

From relationship (2.1) it is evident that if the charge, accumulated in the capacity, remains constant, then voltage on it can be changed by changing the capacity. In this case is fulfilled the relationship

$$Q_{C,U} = CU = C_0 U_0 = const \,,$$

where C, U - instantaneous values, and C_0, U_0 - initial values of these parameters.

The voltage on the capacity and the energy, accumulated in it, will be in this case determined by the relationships:

$$U = \frac{C_0 U_0}{C} = KU_0 \tag{2.3}$$

$$W_C = \frac{1}{2} \frac{\left(C_0 U_0\right)^2}{C} \tag{2.4}$$

Let us name $K = \frac{C_0}{C}$ coefficient the transformation ratio of constant voltage. It is easy this coefficient by the passing track of changing the relation of capacities.

The schematic of voltage transformer, which realizes the principle examined, is represented in Fig. 1.

In this diagram to the variable capacitor by means of the diode the source of transformed voltage is connected U_0.

The incremental voltage, which can ensure this transformer, is determined from the relationship

$$\Delta U_C = \left(\frac{C_0}{C} - 1 \right) U_0 \,.$$

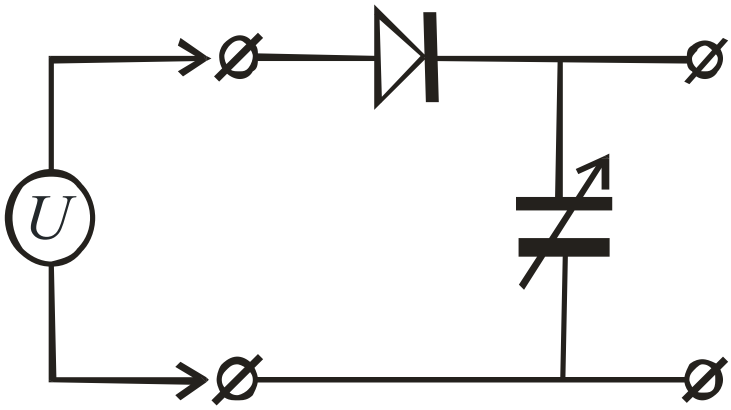

Fig. 1. Schematic of the transformer of constant voltage

As follows from the relationships (2.3) and (2.4) with the decrease of capacitance of capacitor on it increases not only voltage, but also the energy, stored up in capacitor. This energy is selected in the mechanical energy source, which ensures a change in the capacity. Therefore the transformer in question can be considered, and as the converter of mechanical energy into the electrical.

An increase in the energy, accumulated in the capacitor, with a change in its capacity is determined from the relationship

$$\Delta W_C = \frac{1}{2}\left(C_0 U_0\right)^2 \left(\frac{1}{C} - \frac{1}{C_0}\right).$$

It should be noted that this transformer can work only in the regime of an increase in the voltage, since. with the attempt to obtain the decrease of voltage across capacitor this cannot be made for that reason, that the diode ensures the single-pole connection of the voltage source to the capacitor and therefore voltage across capacitor decrease cannot.

The merit of the transformer examined is its simplicity.

Conclusion

In the article the construction of the transformer of constant voltage with the adjustable transformation ratio is given. The operating principle of this transformer is based on the use of laws of parametric self-induction.

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