American Journal of Interdisciplinary Research and Development
ISSN Online: 2771-8948
Website: www.ajird.journalspark.org
Volume 07, Aug., 2022

KILOVOLTMETER FOR X-RAY EQUIPMENT

Elmurotova Dilnoza Baxtiyorovna
Doctor of Philosophy, Physics and Mathematics, PhD

Tursunbayev Qobiljon Nigmatullayevich
Master's 2nd Year
I.A. Tashkent State Technical University Named after Karimov

Meyliyev Laziz Orziqulovich
Doctor of Philosophy, Physics and Mathematics, PhD

Xo'jamberdiyeva Jamila Norqobilovna
Assistant Karshi State University
Faculty of Physics, Department of "General Physics

Abstract
The paper considers a simplified form of kilovoltmeter, where its design is studied. It is shown that this kilovoltmeter contains two semiconductor silicon radiation detectors, which are not sensitive to light.

Keywords: X-ray engineering, kilovoltmeter, receiver, silicon, semiconductor, detector, tube, beryllium.

Introduction

Kilovoltmeter in X-ray technology is used to measure high voltage on the tubes of X-ray machines, for example, when adjusting or repairing X-ray machines. There are two types of kilovoltmeters for measuring high voltage on the tube of X-ray machines with registration of electrical quantities in the circuit of the apparatus, such as a rotary kilovoltmeter, structurally complex, a kilovoltmeter with parallel connection to the primary winding of a high-voltage transformer, which has a low measurement accuracy [1] and with registration with analysis X-ray radiation of the tube, uniquely related to the magnitude of the high voltage on the tube, operating, for example, on the principle of comparing the radiation intensities in beams of different intensities recorded by semiconductor receivers [2].

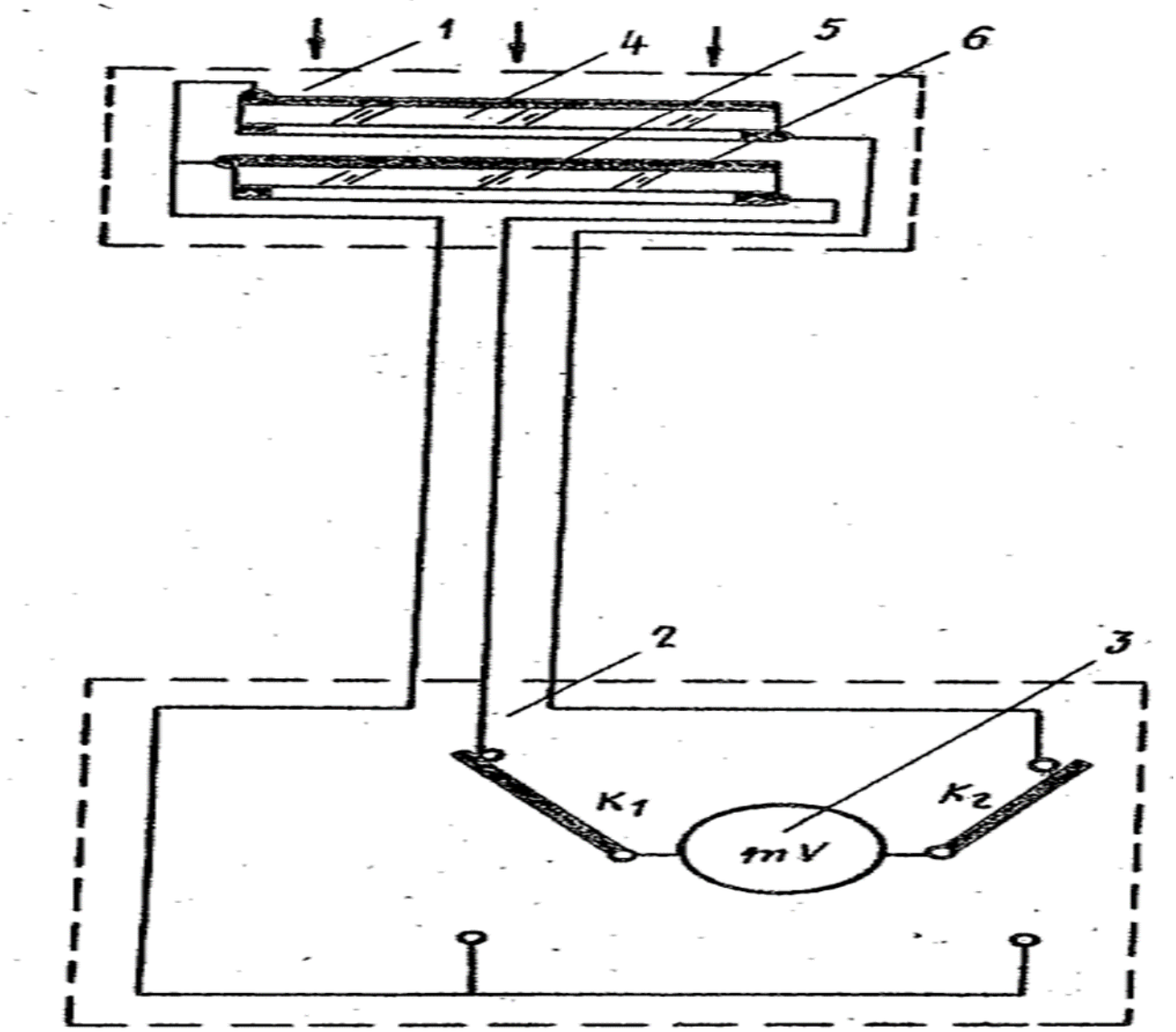
The disadvantage of kilovoltmeters of this type is the complexity of the design of the detectors. Closest to the invention is a kilovoltmeter, which operates on the principle of comparing the intensities of beams that have passed through different zones of the absorber. The detector of this kilovoltmeter consists of a body, a metal diaphragm with holes dividing the beam into two zones, an absorber in the form of aluminum plates of unequal thickness, a beryllium light-shielding plate, and p-Si Semiconductor X-ray

receivers that record unequally converted beams [3]. The disadvantage of the known x-ray kilovoltmeter is the complexity of its design.

The goal is to study the design of a simplified kilovoltmeter.

In kilovoltmeter containing two semiconductor silicon radiation receivers, a switching circuit and a recorder, the receivers are placed in series one after the other and face the radiation source with substrate zones that are not sensitive to light. With this design, the bodies of p-Si receivers simultaneously perform the functions of a receiver absorber and light-shielding functions (ie, the functions of a beryllium plate in a well-known kilovoltmeter).

Kilovoltmeter Simplified Form



The figure shows a diagram of the proposed kilovoltmeter. The kilovoltmeter contains a detector - 1 through a switching device - 2 with keys K1 and K2, connected to the

recorder - 3. The detector - 1 is made in the form of two plates - 4 and - 5 of p-Si, and the plate - 4 is placed above the plate - 5 and both plates are facing the radiation source by the zones of the substrate - 6. When measuring high voltage on the tube of an X-ray machine, a detector - 1 kilovoltmeter is installed in the zone of the working (not filtered) beam along its central axis. The radiation is converted by the body of the p-Si plate - 4 (it is also attenuated by it from the side of the substrate) and is recorded by it.

Then it is converted by the body of the p-Si plate - 5 (it is also weakened by it from the side of the substrate) and recorded. To them. Radiation beams of unequal intensity, when exposed to p-Si plates - 5 and - 4, produce in them different values of photo-EMF, which are recorded and compared. In this case, the ratio and difference between the photo-emf values are unambiguously related to the high voltage on the tube.

The specific relationship between them is determined during the calibration of the device. In this kilovoltmeter, in comparison with the known one, there is no absorber in the form of two aluminum plates and a beryllium light-shielding plate, while the dimensions of the device fit significantly. The kilovoltmeter can be widely used in setting up and adjusting X-ray sources in flaw detection laboratories and X-ray workshops.

Conclusions

This kilo voltmeter for X-ray machines, containing two semiconductor silicon radiation receivers, a switching circuit and a recorder, characterized in that, in order to simplify, the receivers are placed in series one after the other and facing the radiation source with substrate zones that are not sensitive to light.

References

1. Хараджа.Ф.Н Общий курс рентгенотехники, М-Л. 1966; с 317-364.
2.Патент США № 3766383; 250-51.5. 1973
3.Акаткин О.А., Поздняков и др. Киловольтметр для рентгеновских аппаратов. - “Измерительная техника”, 1978, №9, с 78-79 (патент).