

## UNITED STATES PATENT OFFICE

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## GEIGER COUNTER AND GAS ATMOSPHERE THEREFOR

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This invention relates, generally, to Geiger counters, and it has particular relation to the gas atmosphere therefor.

It has been the practice in the past to employ polyatomic organic gases or vapors for the filling in Geiger counters of the self-quenching type. For example, xylol, ethyl alcohol, alcohol, and amyl acetate have been used with argon in various proportions. Since these organic constituents are decomposed in the discharge process, counters in which they are employed have a limited useful counting life.

Halogen filled counters have been used. For example, chlorine has been mixed with neon and argon to provide a self-quenching counter. A disadvantage of such counters is that the highly reactive nature of the halogen filling can result in reaction of the gas with the cathode material and consequent deterioration of the counter.

Accordingly, among the objects of this invention are: To provide a self-quenching Geiger counter having a relatively long life; to accomplish this by employing relatively permanent non-corroding gases to provide the quenching effect in contrast to polyatomic gases and halogens previously used; and preferably to have the improved counter operate at a threshold voltage of 1500 volts or less even with filling pressures as high as one atmosphere.

Other objects of this invention will, in part, be obvious and in part appear hereinafter.

In accordance with this invention, oxygen, nitrogen, and xenon are admixed with argon to provide the gas atmosphere for a Geiger counter of either the flow type or the closed type having electrodes arranged conventionally in an envelope or tube. These gases are relatively stable as compared to the polyatomic organic gases referred to above and thus a Geiger counter in which they are used can have an indefinitely long life. Moreover, since none of them reacts readily with the cathode materials commonly used, they are not subject to the disadvantages of the halogens pointed out hereinbefore.

Excellent results have been obtained in a self-quenching Geiger counter having a threshold voltage of less than 1500 volts and using a gas atmosphere of argon admixed with oxygen, nitrogen, and xenon having the following partial pressures (expressed in mm. of mercury) with the balance of the total gas pressure of 740 mm. of mercury being provided by the argon:

O<sub>2</sub>—1  
N<sub>2</sub>—15  
Xe—15

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Another example is:

O<sub>2</sub>—1  
N<sub>2</sub>—15  
Xe— $\frac{1}{2}$  to 75

Tests have shown that satisfactory results are obtained when the oxygen varies from a trace to 30, the nitrogen varies from a trace to 30, and the xenon is at least  $\frac{1}{2}$ . There appears to be no upper limit to the xenon. However, the increase in its partial pressure from 15 to 75 does not appreciably improve the plateau characteristics. Because of the cost of the xenon, economy dictates that a minimum of this gas be used, particularly in the flow type of counter.

What is claimed as new is:

1. A self-quenching Geiger counter containing oxygen, nitrogen, xenon, and argon in such proportions that their partial pressures in mm. of mercury are as follows when the total gas pressure is about 740 mm. of mercury:

O<sub>2</sub>—trace to 30  
N<sub>2</sub>—trace to 30  
Xe—at least  $\frac{1}{2}$   
A—balance

2. A self-quenching Geiger counter containing oxygen, nitrogen, xenon, and argon in such proportions that their partial pressures in mm. of mercury are as follows when the total gas pressure is about 740 mm. of mercury:

O<sub>2</sub>—about 1  
N<sub>2</sub>—about 15  
Xe— $\frac{1}{2}$  to 75  
A—balance

3. A self-quenching Geiger counter containing oxygen, nitrogen, xenon, and argon in such proportions that their partial pressures in mm. of mercury are as follows when the total gas pressure is about 740 mm. of mercury:

O<sub>2</sub>—about 1  
N<sub>2</sub>—about 15  
Xe—about 15  
A—balance

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## REFERENCES CITED

The following references are of record in the file of this patent:

Brubaker and Pollard: Review of Scientific Instruments, July 1937, pp. 254-258.