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GAS TUBE NOISE GENERATOR

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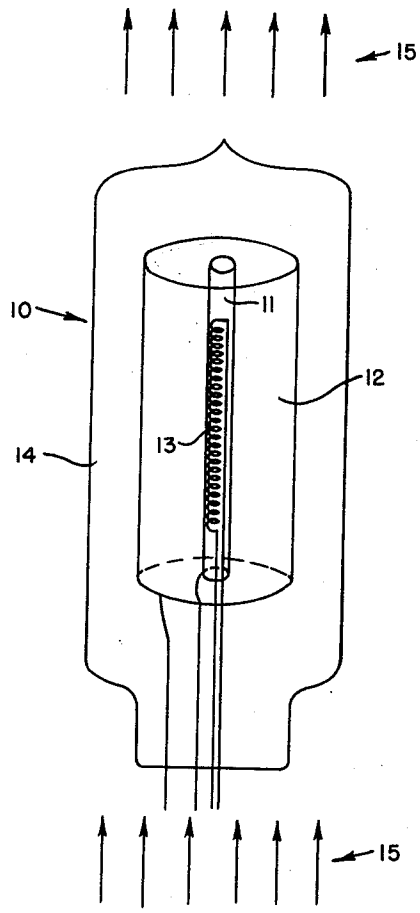
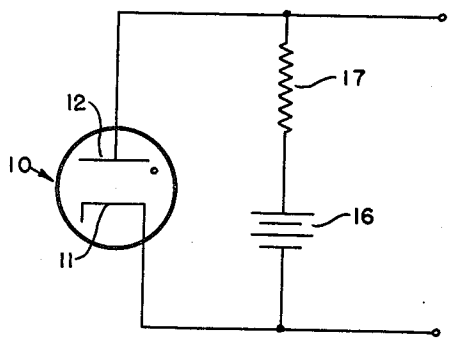


FIG. 1

FIG. 2



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GAS TUBE NOISE GENERATOR

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3 Claims. (Cl. 250—36)

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This invention relates generally to electrical apparatus and more particularly to a noise generator.

Often it is desirable to generate random noise voltages of a reasonably uniform amplitude throughout a wide frequency range. In the prior art such devices as the multistage electron multiplier photoelectric tube Type 931 has been used. A gaseous discharge tube such as a Type 6D4 in combination with a magnetic field applied transverse to the longitudinal axis of the tube has also been used as a noise voltage generator.

The applications of such devices have been limited due to the coexistence of electrical energy signals of prominent low frequency oscillations which are normally undesirable and by the narrow frequency spectrum in which the random noise electrical energy signals exists.

It is an object of the present invention to provide a high level noise voltage generator whose output consists of random noise voltages having a substantially flat energy distribution with respect to frequency, over a wide range of frequencies, extending from low audio frequencies to several megacycles.

The invention herein disclosed will produce a more uniform noise signal level over a wider band of frequencies than devices of the prior art.

A device embodying the principles of this invention includes a gas-filled diode in combination with a magnetic field. The diode consists of a cylindrical, oxide coated, indirectly heated cathode with a surrounding, concentric, cylindrical anode.

A magnetic field is applied to the tube and the magnetic field and tube are oriented in such a manner that the direction of the magnetic field is parallel to the common axis of the anode and cathode.

Other objects, features and advantages of this invention will suggest themselves to those skilled in the art and will become apparent from the following description of the invention taken in connection with the accompanying drawing in which:

Fig. 1 is a schematic diagram of a gas-filled diode with a magnetic field; and

Fig. 2 is a schematic diagram of a typical circuit in which a magnetron noise generator is used.

Referring now to Fig. 1 a magnetron noise voltage generator tube generally designated by the number 10 consists of an oxide coated, indirectly heated, cylindrical cathode 11, with a surrounding concentric cylindrical anode 12. A

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heater element 13 is contained within cathode 11, and a glass bulb 14 encloses all elements of the tube. Tube 10 is filled with a gas and magnetic field 15 is applied to tube 10 which is oriented in such a manner that the direction of the magnetic field 15 is parallel to the common axis of cathode 11 and anode 12.

As a specific example, a tube constructed substantially as shown in Fig. 1 was filled with argon gas to a pressure of 15 microns and subjected to a magnetic field having a strength of 830 gauss which was supplied by a coil wound axially about the tube. The aforementioned example is given solely for illustration and is not intended to limit the scope of the invention in any way.

Referring now to Fig. 2, a typical circuit utilizing a magnetron noise voltage generator is shown consisting of a diode 10 with a D. C. potential source 16 and a load 17 connected between its cathode 11 and anode 12. The magnetic field associated with the diode is not shown. The elements 10, 11 and 12 correspond to like numbered elements of Fig. 1.

In a combination of a gas discharge tube and a magnetic field as shown in Fig. 1, the magnetic field strength suitable for noise voltage generation is of such strength that no direct electrons from the cathode can reach the anode. The exact shape of the electron path cannot be predicted, since the presence of ions produces such large local variations in field that a simple calculation is not permissible. However, it is probable that the electrons from the cathode curve around and return to the cathode if they do not lose energy by collision and ionization.

The electrical energy noise signal output of this circuit is taken from the anode and cathode 12, 11 of the gas tube 10.

The extended and more uniform noise signal spectrum of a magnetron type noise generator in comparison with the noise signal spectrum of a gas discharge tube which does not utilize a magnetic field is attributed to the alteration of the electron paths due to the presence of the magnetic field.

It has been found that a gas discharge tube constructed as shown in Fig. 1 having the direction of the magnetic field transverse to the normal direction of flow of electrons has a noise signal spectrum whose energy distribution with respect to frequency is substantially more uniform than the spectrum of conventional gas discharge tubes or the combination of a gas discharge tube and a magnetic field as used in prior art. This advantage is due to the type of con-

struction of the anode and cathode and the particular orientation of the anode and cathode with respect to the magnetic field.

While what has been described is at present considered to be the preferred embodiment of the invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention.

What is claimed is:

1. A noise generator comprising a thermionic discharge device containing a rarified inert gas having a cylindrical cathode concentrically disposed within a hollow anode, a series circuit comprising a load means for deriving an electrical noise output from said discharge device and further comprising a power supply consisting solely of a source of direct current potential having its positive pole connected to said anode through said load means and having its negative pole connected directly to said cathode, means adjacent said cathode for producing a magnetic field of constant magnitude, said field being

transverse to the normal direction of flow of electrons and being of such strength that substantially no direct electrons from said cathode reach said anode.

2. A noise generator as set forth in claim 1, wherein said inert gas is argon at approximately 15 microns pressure.

3. A noise generator according to claim 1, wherein said inert gas is argon at approximately fifteen microns pressure and said magnetic field has a magnitude of approximately 830 gauss.

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