Sept. 25, 1956 O. T. McILVAINE 2,764,709

ELECTRONIC NOISE GENERATOR

Filed Nov. 10, 1952

Fig. 1.

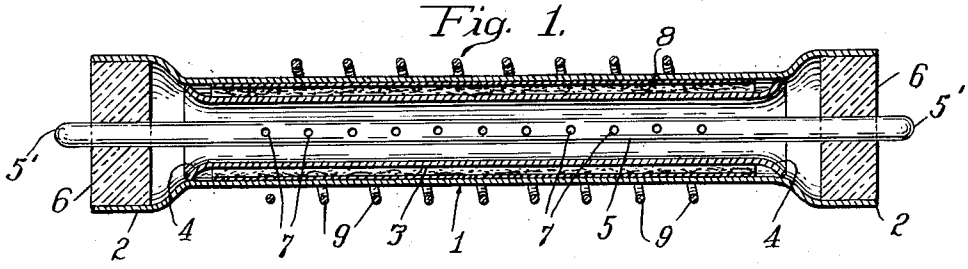


Fig. 2.

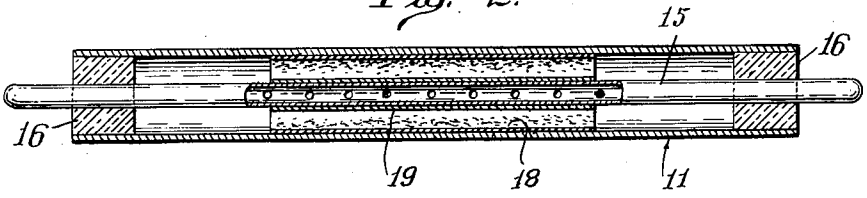


Fig. 3.

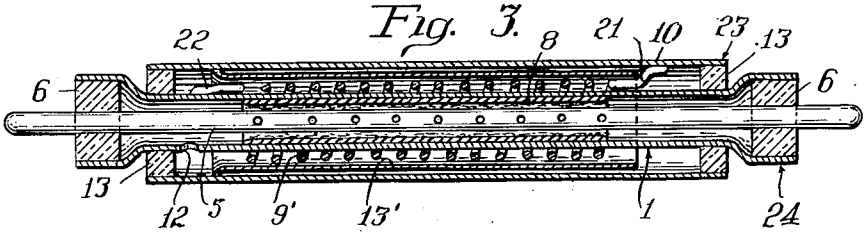
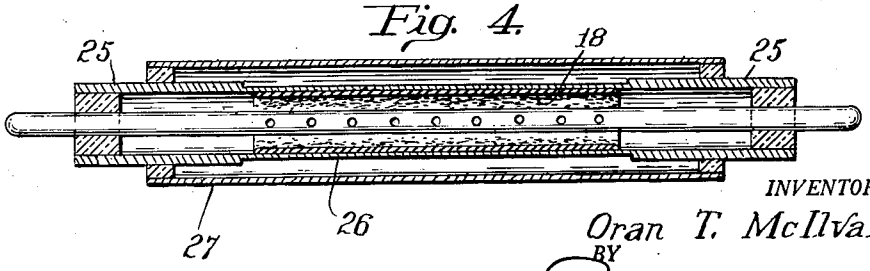


Fig. 4.



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ELECTRONIC NOISE GENERATOR

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Application November 10, 1952, Serial No. 319,667

7 Claims. (Cl. 313—247)

This application is a continuation in part of my prior application for Electron Generating Tubes for Pilot Flame Safety Controls, Serial No. 205,334, filed January 10, 1951 (now abandoned).

This invention relates to improvements in noise generators of the character used for testing radio or radar receiving equipment and tubes.

Such devices as have been used heretofore for creating noise in the testing of radio equipment and tubes have not been satisfactory because of the low amount of power involved; they are not stable and vary materially in the amount of noise produced; and it is frequently impossible to determine how much noise is produced thereby.

One object of this invention is to overcome these objections to noise generators of the character described, as used heretofore.

Another object of the invention is to improve the construction of noise generators for testing radio or radar equipment and tubes, and the like, by providing for the effective control of the noise output and which is capable of building up a substantial amount of power.

Still another object of the invention is to provide a noise generator of the character described, which may be connected directly in a coaxial line to provide any desired noise output at any given time and frequency, and with a control of the amount of power which may be built up therein to a substantial amount.

These objects may be accomplished according to certain embodiments of the invention in which an outside shell is adapted to be connected directly in the coaxial line and is provided with a central tube which may be used as an additional electrode and for exhausting the outside shell. An emitter is provided on the outside shell, or on the central electrode, or both. These parts can be connected directly in the coaxial line and derive their voltage from the line for testing equipment when desired. Noise in the equipment is a function of the current whereby a control of the current is a control of the noise output. The emitter can be applied either directly on the inner wall of the shell or on the central electrode, or both, according to whether the device is used for full wave or only for half wave operation. One of these parts acts as an anode and the other as a cathode, which then reverse on every half wave or full wave cycle according to the operation thereon.

These embodiments are illustrated in the accompanying drawings in which:

Fig. 1 is a longitudinal section through a noise generator, as one embodiment of this invention; and

Figs. 2, 3 and 4 are similar views showing modifications thereof.

Referring to Fig. 1, the noise generator illustrated therein comprises an elongated shell, generally designated by the numeral 1, which is shown as having expanded opposite ends, or coupling portions 2, which can be made of a size and shape adapted to fit in a coaxial cable and may be provided with suitable couplings or fittings for attachment therein.

Telescoped within the shell 1 is a cylindrical base 3, spaced from the latter a suitable distance, and joined thereto at its opposite ends, as indicated at 4.

Extending through the shell 1 and base 3 is a tube 5 forming a central electrode which projects out from the opposite ends of the device. This tube 5 is mounted in plugs 6 formed of glass, or other suitable non-conductive material and inserted into the coupling portions 2 of the shell 1. These plugs 6 should be sealed effectively both to the shell 1 and to the tube 5. A suitable metal-to-glass seal may be provided therebetween.

The central tube 5 has perforations 7 in the sides thereof, preferably spaced along the length thereof, for the purpose of evacuating the inside of the shell 1 through this tube, at one or both opposite ends of the latter, which ends then are sealed off at 5'. The degree of evacuation will vary as found desirable.

The shell 1 preferably is formed of metal. Any suitable electrical conducting material may be used for this purpose and also for the cylindrical base 3 and tube 5. Nickel, copper and other metals, are suitable for these elements of the device.

An emitter generally designated at 8 is provided within the shell 1, or upon the base 3. Barium, caesium, thorium, and other materials of similar character may be used to form the emitter. An electric coil generally indicated at 9 may be provided around the device for the purpose of heating the emitter, although any other suitable heating means may be provided for this purpose, such as a flame or other source of external heat applied thereto.

Voltage for operating the device may be obtained from the testing equipment. The shell 1 and central tube 5 may be connected as electrodes directly in a coaxial cable, or otherwise suitably connected with the radio or radar receiving apparatus or tubes to be tested thereby. Upon the application of heat to the emitter 8, an electronic bombardment from the latter will pass through the nickel, or other metallic base 3, to the central electrode 5. This device functions either for full wave or half wave operation, one of these members 1 and 5 acting as an anode, and then they reverse and the same part acts as a cathode to produce the desired noise for testing the radio receiving equipment or tubes.

The emitter 8 may be painted or otherwise applied directly to the inner wall of the shell 1. The base 3 acts as a diffuser for the electronic emission. Instead of using a metal sleeve for this purpose, it is possible to use pressed powder as a sleeve to vary the diffusion rate.

The invention as illustrated in Fig. 2 uses a shell 11 of uniform diameter throughout its length, and the base 3 has been omitted therefrom. However, a central electrode indicated at 15 extends through the shell 11, and is mounted at opposite ends in plugs 16 of glass, ceramic, or other suitable nonconductor. These plugs 16 are sealed to the metal shell 11 and tube 15, substantially as described above. The tube 15 also acts for evacuating the interior of the shell, as also described above.

In this instance, the emitter is generally at 18, applied to the inner wall of the shell 11, and an emitter is also shown at 19, applied to the external surface of the central electrode 15, to be used when full wave operation is desired. However, if only half wave operation is needed, the emitter would be applied only to the shell 11 according to the illustration in Fig. 1.

This form of the invention functions substantially in the same manner as described above with respect to Fig. 1, and similar materials may be used, as described therein.

It is also possible, where the tube is heated by electrical means, to enclose the heater within the device, preferably in a vacuum or gas filled atmosphere. This is important where the conservation of power is desirable. Examples thereof are illustrated in Figs. 3 and 4.

The structure shown in Fig. 3 is similar to that shown in Fig. 1, except that an outer metal or glass envelope **10** is applied over the shell **1'** and sealed thereto at its opposite ends at **13**. The sealing members **13** can be in the nature of radiation shields, and additional radiation shields may be applied at **13'** extending lengthwise within the envelope **10**, externally of the heating coil **9'** that is enclosed within the envelope.

One end of the electric coil **9'** is secured at **21** to the envelope **10**, while the opposite end of the coil is secured at **22** to the shell **1'**. In this example, the shell **1'** and the envelope **10** are made of metal and electrical connections therewith may be provided at **23** and **24**.

The envelope **10** may be exhausted through an opening **12** provided in the shell **1'**, the exhaust being provided by the central tube **5**, which is evacuated as described above in connection with Fig. 1. However, a separate exhaust tube may be provided for the outer envelope, in the usual manner, if preferred.

Otherwise the structure and manner of operation of the device shown in Fig. 3 are substantially the same as described above in connection with Fig. 1.

A further modification is shown in Fig. 4 in which the heater is made a part of the tube **25**, which latter has heavy end sections, with relatively thick walls, while the middle section **26** is made of a thin section, and formed of nickel, thoriated tungsten, or the like, to form an effective heater. Current is passed through the tube at either end. If desired, this metal section can take the form of a coil of wire, if a higher voltage lower current heater be desired.

The shell **25** is enclosed within an envelope **27** which may be evacuated, as described above in connection with Fig. 3. In other respects Fig. 4 is formed with an emitter **18** on the shell **25** and functions substantially as described in connection with Fig. 2 and the other forms disclosed.

The electronic bombardment of the central electrode, or the outside shell, as the case may be, creates noise which is useful in testing radio or radar receiving equipment and tubes. The amount of noise produced thereby is a function of the current supply, and it is possible to control the rate of current according to this invention, and thereby control the amount of noise. It is possible to build up a very substantial amount of noise, even such as several thousand milli-amperes due to the high power output of this device.

The device may be connected directly in a coaxial line so that a testing may be provided therein whenever desired merely upon the application of heat to the emitter or emitters, and to an extent depending upon the amount of current supplied. Where the device has to be connected in a coaxial line, fittings or couplings may be applied to opposite ends thereof, according to the construction of the line, although other installations may require a fitting or coupling on one end only.

While the invention has been illustrated and described in certain embodiments, it is recognized that variations and changes may be made therein without departing from the invention set forth in the claims.

I claim:

1. A noise generator comprising an elongated tubular shell of electrically conductive material, said shell having sleeve-like opposite end portions adapted for electrical connections therewith and with a co-axial cable, non-conductor sealing members in said sleeve-like end portions in sealing relation with the shell, a central cylindrical electrode having lateral openings therein for the evacuation of the space within the shell, said electrode extending through the shell from end to end thereof and through said sealing members for connection externally thereof to form a coaxial tube, said shell and central electrode having an electronic discharge space therebetween, said space being evacuated, means forming an electron emitter of large area around the central electrode within the shell and spaced from one of said elements, means for diffusing the electron emission from said electron emitting means, said diffusion means comprising a metallic sleeve between the emitter and the shell and spaced therefrom.

2. A noise generator as claimed in claim 1, comprising heating means including a coil formed externally to the shell and in close proximity thereto.

3. A noise generator as claimed in claim 2, comprising a second shell enclosing said heating means and having the end portions thereof sealed to said first shell.

4. A noise generator as claimed in claim 3, comprising means to evacuate the space between the shells.

5. A noise generator as claimed in claim 2, comprising a heating element integral to the surface of the first shell.

6. A noise generator as claimed in claim 1, in which the electron emitter is placed on the inner surface of said shell.

7. A noise generator as claimed in claim 1, comprising electron emitters on the outer surface of said central electrode and on the inner surface of said shell.

References Cited in the file of this patent

UNITED STATES PATENTS

1,955,335	Knowles	Apr. 17, 1934
1,957,423	Freeman	May 1, 1934
1,994,904	Wilson	Mar. 19, 1935
2,259,451	Bennett	Oct. 21, 1941
2,444,968	Washburn	July 13, 1948
2,466,063	Varian	Apr. 5, 1949
2,477,348	Postal	July 26, 1949
2,568,291	Bender	Feb. 19, 1952