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COAXIAL SPARK GAP

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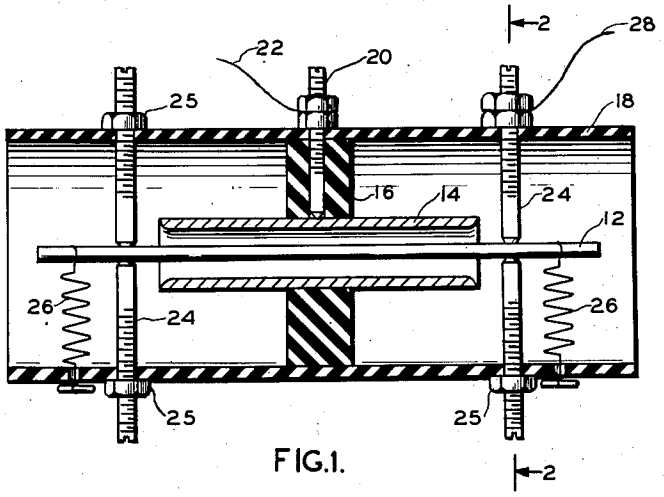

FIG.1.

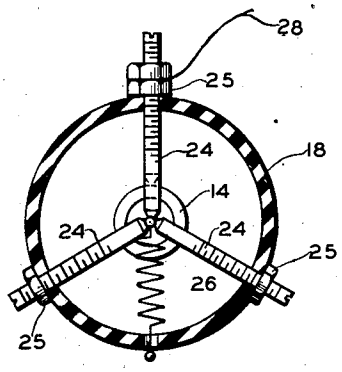

FIG.2.

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COAXIAL SPARK GAP

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6 Claims. (Cl. 250—38)

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The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

This invention relates to spark gaps, and more particularly to spark gaps for use in spark gap modulators for pulse-echo systems.

The primary object of this invention is to generally improve spark gaps, and more particularly open air spark gaps for pulse modulation. In accordance with the present invention, the gap consists of a metal rod passing through and disposed coaxially in an open-ended metal tube, said rod and tube being made of high temperature metal. The spark jumps radially across the gap between the outside of the rod and the inside of the tube.

To accomplish the foregoing general object, and such other more detailed objects as will hereinafter appear, my invention resides in the spark gap elements and their relation one to the other as hereinafter are more particularly described in the specification and sought to be defined in the claims. The specification is accompanied by a drawing in which

Figure 1 is a vertical section taken longitudinally through the structure of a spark gap embodying the present invention, with the lower screws shown (according to conventional mechanical drafting practice) in the same plane as the upper screws for clarity; and

Figure 2 is a transverse section taken approximately in the plane of the line 2—2 of Figure 1, wherein the screws are shown in their actual relative positions.

Referring to the drawing, the electrodes of the spark gap are the rod 12 and the open-ended tube 14. The tube 14 is preferably used as the cathode or consumed electrode, because it is of larger area. It is received in a support, specifically an insulation disk 16, which in turn is fitted into an insulation cylinder 18. The tube 14 is locked in position, as by means of a long set screw 20, which acts also to provide an external electrical connection, as by means of a lead 22 received between two nuts on screw 20.

The rod 12 is longer than tube 14, and is supported at both ends, outside the ends of the tube. In the present case each end of the rod is supported by three radially disposed screws 24, threadedly received in the insulation tube 18. The adjustment of these screws may be locked by appropriate lock nuts 25. By properly adjusting the screws, the rod 12 may be centered accurately in tube 14. Relatively light tension

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springs 26 may be provided to hold the rod in position during adjustment of the screws. Electrical connection to the anode may be made at one of the screws, as for example by means of a lead 28 held between two nuts, received in this case on the upper right hand screw.

In the particular case illustrated, the anode 12 is made of tungsten, and the cathode 14 is made of tantalum, but other high temperature metals may be used. No difficulty arises with sputtering or cobweb-like formation of metal between the electrodes. These form in a sealed envelope of inert gas, but do not form in open air. The insulation tube 18 is preferably made of "Mycalex" or equivalent insulation.

The spacing of the electrodes has been exaggerated in the drawing for the sake of clarity, and in practice the diameter of the tube 14, relative to the diameter of the anode rod 12, may be made much smaller than indicated in the present drawing.

While air cooling is not essential, it may be provided very conveniently with the present tubular structure, because an air stream may be blown into one end of tube 18 and will then flow longitudinally through the tube 14.

It is believed that the construction and operation of my improved spark gap, as well as the advantages thereof, will be apparent from the foregoing description. The electrodes have large surface area, thereby prolonging the operating life of the gap. While an air blast is not essential, the structure of the gap makes it ideally suited for use with an air blast, should special circumstances make it necessary, either for extinguishing the spark, or for cooling the electrodes.

It will be apparent that while I have shown and described my invention in a preferred form, changes and modifications may be made in the particular structure disclosed without departing from the spirit of the invention as sought to be defined in the following claims.

I claim:

1. A spark gap comprising a rod and an open ended tube, said rod being disposed coaxially within said tube, and passing all the way through the same so as to extend beyond said tube at both ends thereof, and means to support said rod relative to said tube at points along said rod beyond the ends of said tube so as not to interfere with the flow of a cooling medium flowing longitudinally through said tube.

2. A spark gap comprising a rod and an open ended tube, said rod being disposed coaxially

within said tube, means to support said rod at points beyond the ends of said tube, said rod and tube being made of high temperature metal, and separate electrical connections to the rod and tube, the arrangement being such that when the gap breaks down a spark jumps radially from the rod to the tube.

3. A spark gap comprising a metal tube, a metal rod coaxially disposed in said tube, said rod being longer than said tube and projecting therefrom at both ends, an insulation tube substantially larger in diameter than the metal tube surrounding said metal tube, means in said insulation tube receiving and supporting said metal tube, and supports near the ends of the rod beyond the ends of the metal tube, said supports extending between said insulation tube and said rod.

4. A spark gap comprising a metal tube, a metal rod coaxially disposed in said tube, said rod being longer than said tube and projecting therefrom at both ends, an insulation tube substantially larger in diameter than the metal tube surrounding said metal tube, means in said insulation tube receiving and supporting said metal tube, and at least three radially-disposed, adjustable support screws bearing against the rod near its ends and beyond the ends of the metal tube, said screws passing through said insulation tube and being radially adjustable to center the rod within the metal tube.

5. A spark gap comprising a tube made of high temperature metal, a rod made of high temperature metal and coaxially disposed in said tube, said rod being longer than said tube and projecting therefrom at both ends, an insulation tube substantially larger in diameter than the metal tube surrounding said metal tube, said insulation tube being substantially longer than the metal tube and having the same order of length as the rod, means including an insulation disk within said insulation tube and receiving and supporting said metal tube, a relatively long set screw bearing against said metal tube and forming a connection terminal therefor, and at least three radially-disposed, adjustable support screws bearing against the rod near its ends and beyond the ends of the metal tube, said screws passing through said insulation tube and being radially adjustable to center the rod within the metal tube.

6. A spark gap comprising a metal tube, a metal rod coaxially disposed in said tube, said rod being longer than said tube and projecting therefrom at both ends, an insulation tube substantially larger in diameter than the metal tube surrounding said metal tube, means in said insulation tube receiving and supporting said metal tube, at least three radially-disposed, adjustable support screws bearing against each end of the rod beyond the ends of the metal tube, said screws passing through said insulation tube and being radially adjustable to center the rod within the metal tube, and relatively light pull springs extending from the ends of said rod to the insulation tube in order to help hold the rod in position during adjustment of the adjustable support screws.

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REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
745,114	Nicholas	Nov. 24, 1903
1,101,728	Craft	June 30, 1914
1,132,589	Kroger	Mar. 23, 1915
1,256,270	Seibt	Feb. 12, 1918