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A. C. WALL

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SPARK GAP

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Fig. 1

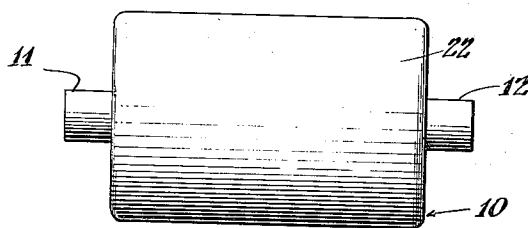
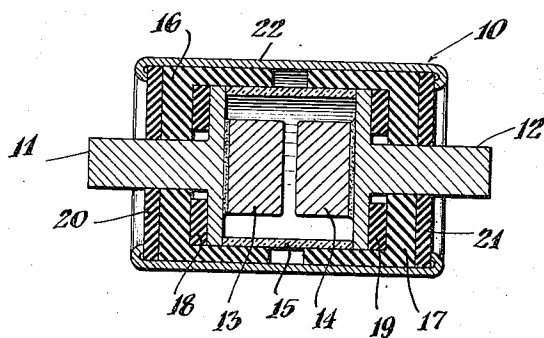


Fig. 2



INVENTOR.

Alexander C. Wall

BY

Robbin & Carlson

ATTORNEYS

UNITED STATES PATENT OFFICE

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SPARK GAP

Alexander C. Wall, Indianapolis, Ind., assignor to
P. R. Mallory & Co., Inc., Indianapolis, Ind., a
corporation of Delaware

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4 Claims. (Cl. 250—27.5)

This invention relates to spark gaps or impulse gaps.

An object of the invention is to improve spark gaps, particularly to improve their stability.

Other objects of the invention will be apparent from the description and claims.

In the drawing:

Figure 1 is a side view of a hermetically sealed impulse gap; and

Figure 2 is a longitudinal section through the gap structure.

Spark gaps or impulse gaps find application for various uses, one of the principal ones of which is their use in ignition systems. Such gaps comprise two spaced electrodes which are connected in an electric circuit capable of building up a high voltage between the electrodes so as to produce a spark discharge between them. The spark discharge may be used to produce high frequency oscillation in a work circuit or for other purposes.

Heretofore such spark gaps or impulse gaps have been subject to a certain amount of instability and irregularity in operation. For example, the voltage necessary to produce a discharge will vary as much as plus or minus 10 or 15% of the breakdown voltage of the gap. This is believed to be due in a great measure to the variations in the conditions of ionization of the gas between the electrodes.

According to the present invention, the spark gap or impulse gap is improved by the use of a radioactive substance. Moreover, the gap is hermetically sealed to maintain an ionized atmosphere between the electrodes and to permit the radio active substance to generate radon gas which is retained in the space in the gap and especially between the electrodes.

While the specific construction of the spark gap may be varied, it is of considerable importance that the gap be hermetically sealed to prevent the escape of the radon gas. Referring to the drawing, a suitable gap construction is illustrated for use with the invention.

The gap structure 10 comprises a pair of electrode members 11 and 12 formed of metal rivets having working electrode faces 13 and 14 formed of tungsten discs brazed to the heads of the rivet-shaped members. The tungsten discs 13 and 14 are of smaller diameter than the rivet heads and are centered on the heads. The tungsten faces are held in spaced face-to-face relation by a glass spacing tube 15 whose ends engage the flanges of the rivet heads near their outer edges. By making glass tube 15 of the proper length, the

spacing between the tungsten faces can be adjusted very accurately.

The assembly of electrodes and glass tubes are enclosed in two insulating cups 16 and 17 formed of Bakelite, ceramic or other suitable insulating material and a pair of Neoprene washers 18 and 19 are interposed between the backs of the rivet heads and the bottoms of the insulating cups to form hermetic seals at these points. A second pair of Neoprene washers 20 and 21 are placed against the outer ends of the Bakelite cups. The shanks of the electrode rivets extend out through the bottoms of the insulating cups and through the centers of the Neoprene washers.

The entire assembly so far described is enclosed in a metal tube 22 which may be of brass, for example, and the ends of the tube are spun over the outer faces of the Neoprene washers 20 and 21 to press them tightly against the bottoms of the insulating cups forming a second hermetic seal at these points. The rivet shanks provide the external terminals for the spark gap.

The radioactive substance is preferably introduced as follows during assembly of the gap:

A drop of water containing a trace of a soluble radium salt such as radium bromide in solution is placed inside the gap before sealing. The gap is then placed in a chamber which is evacuated to withdraw gases and water vapor. After all the water has been drawn off, a small deposit of the radium salt remains inside the gap. An inert gas such as nitrogen is then introduced into the chamber filling the gap, and the gap is then hermetically sealed.

Due to the normal disintegration of the radium salt, radon gas is generated and in approximately four days it reaches 80% of its final value. Equilibrium is established in approximately one month after which the amount of radon present is substantially constant, releasing at all times a constant number of ions directly between the electrodes.

This makes the voltage breakdown condition substantially constant. It has been found that gaps constructed in this manner and provided with radon gas exhibit an irregularity of not more than plus or minus 5% while, as previously stated, gaps without radon exhibit an irregularity of plus or minus 10 to 15%. It is believed that the explanation of this rests in the presence of a constant number of ions between the electrodes at all times where radon is present while without the presence of radon the breakdown voltage is dependent upon random electrons or the establishment of corona conditions.

While specific embodiments of the invention have been described, it is intended to cover the invention broadly within the spirit and scope of the appended claims.

What is claimed is:

1. A spark gap structure comprising a pair of rivet-shaped electrodes having flanges and heads of smaller diameter than said flanges on the faces of said flanges, a refractory insulating tube having its ends engaging the faces of said flanges and surrounding said heads, insulating cups receiving said rivet-shaped electrodes with the shanks of said electrodes projecting through the bottoms of said cups, a sheath enclosing the cylindrical outer surfaces of said cups and clamped over their bottom edges and urging them together, and deformable sealing washers between said sheath and said cups to hermetically seal said gap.

2. A spark gap structure comprising a pair of rivet-shaped electrodes having flanges and heads of smaller diameter than said flanges on the faces of said flanges, a refractory insulating tube having its ends engaging the faces of said flanges and

surrounding said heads, insulating cups receiving said rivet-shaped electrodes with the shanks of said electrodes projecting through the bottoms of said cups, a sheath enclosing the cylindrical outer surfaces of said cups and clamped over their bottom edges and urging them together, and deformable sealing washers between said sheath and said cups to hermetically seal said gap, and radium sealed inside said gap structure.

3. A spark gap structure comprising a pair of rivet-shaped electrodes having flanges and heads of smaller diameter than said flanges on the faces of said flanges, a refractory insulating tube having its ends engaging the faces of said flanges and surrounding said heads, and means securing said parts together.

4. A spark gap structure comprising a pair of circular electrodes having flanges and heads of smaller diameter than said flanges on the faces of said flanges, a refractory insulating tube having its ends engaging the faces of said flanges and surrounding said heads, and means securing said parts together.

ALEXANDER C. WALL.