

[54] **DEVICE FOR SEALED ELECTRODE MOUNTING**

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[57] **ABSTRACT**

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[58] Field of Search ..... **313/268, 306-308**

Sealed electrode mounting, in a spark discharge chamber, comprising a plane cathode and, parallel thereto, two lattice-shaped electrodes constituting an auxiliary electrode and anode enclosed in a space forming the spark discharge chamber, the electrodes being along its entire circumference in electrically conductive connection with an electrically conductive material surrounding the periphery of the respective electrodes and extending through sealing means, which run along said electrical material, and out from the spark discharge chamber.

[56] **References Cited**

**UNITED STATES PATENTS**

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**5 Claims, 2 Drawing Figures**

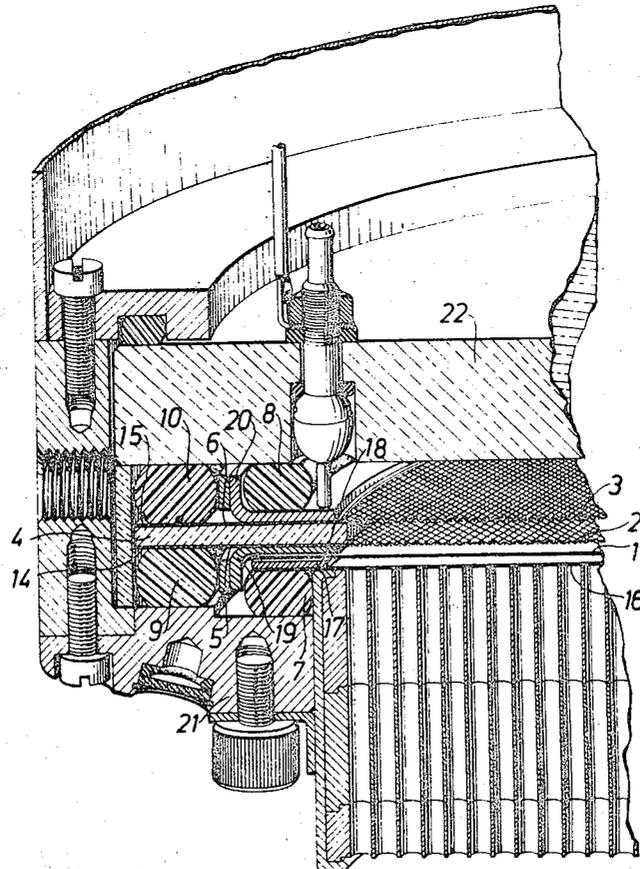


Fig. 1

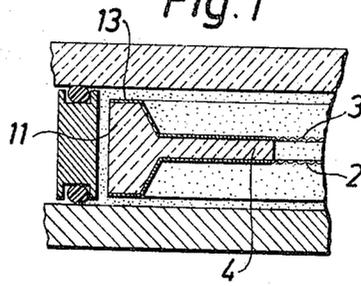
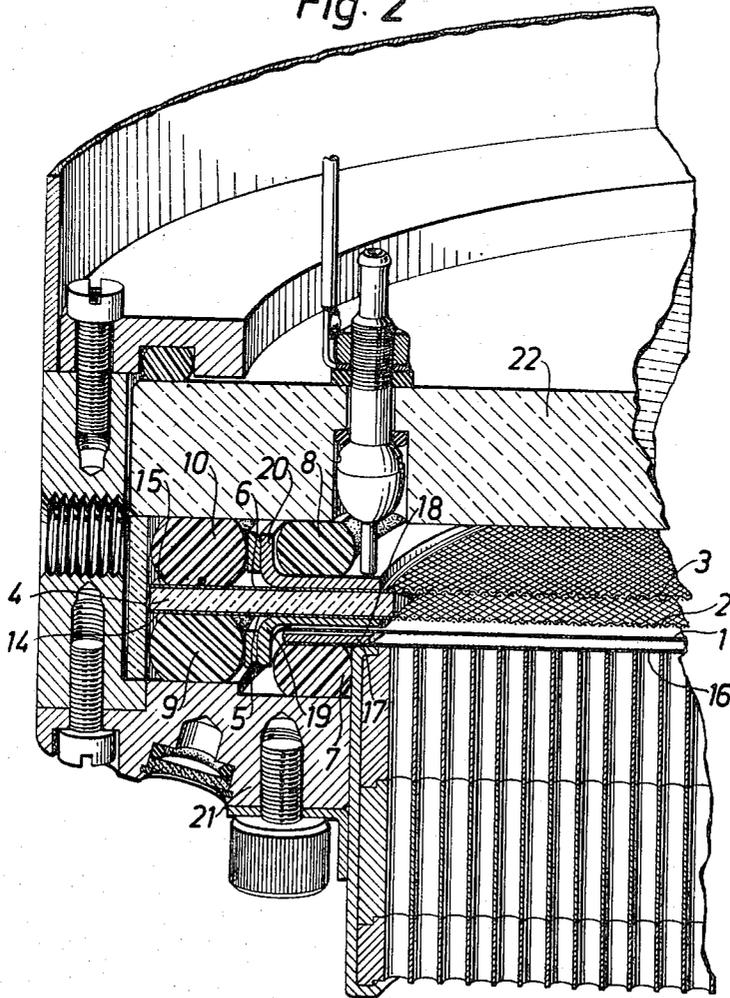


Fig. 2



## DEVICE FOR SEALED ELECTRODE MOUNTING

The invention relates to a device for sealed mounting of electrodes, preferentially in a spark discharge chamber comprising a plane cathode and, parallel thereto, two lattice-shaped electrodes constituting an auxiliary electrode and anode, the electrodes being enclosed in a space sealed against the environment and forming the spark discharge chamber.

In order that sparks shall definitely be generated in spark discharge chambers, the latter are enclosed in a gas-tight manner in special gas-filled casings. This involves the necessity of arranging complicated bushings for high voltage in order that the electrodes may be held at the desired voltages, i.e., a voltage which, having regard to the electrode spacing, is close to the breakdown voltage for the gas, usually argon, with which the spark discharge chamber is filled.

The connection of electrical leads to the electrodes inside the spark discharge chamber is also complicated, as irregularities readily arise at the terminations in the form of projections at which undesired sparks may be generated.

Another problem in the connection of voltages to the electrodes inside the spark discharge chamber is associated with the fact that sparks more readily arise between two projections or edges than between two plane surfaces. It is thus necessary to arrange the electrical terminations and the electrode edges in such a way that they are at a greater distance from one another than the other parts of the electrodes.

This means that the spark discharge chamber has unnecessarily large dimensions, one disadvantage of which is that it takes a long time to fill the chamber with gas and that large quantities of gas are required.

The object of the present invention is to eliminate these disadvantages. It consists of a device for sealed electrode mounting, preferentially in spark discharge chambers comprising a plane cathode and, parallel thereto, two lattice-shaped electrodes constituting an auxiliary electrode and anode enclosed in a space forming the spark discharge chamber, and the invention is chiefly characterized in that each electrode, along the whole of its circumference, is in electrically conductive connection with an electrically conductive material surrounding the periphery of the respective electrodes and extending through sealing means, which run along the electrical material, and out from the spark discharge chamber.

The arrangement of the electrodes in this way so that no electrode edges are situated inside the spark discharge chamber thus implies that the electrical connections of the electrodes to the desired voltage can be made in a simple way and also that no undesired sparking along the edges of the electrodes can arise, as the breakdown voltage in air is far higher than the breakdown voltage in argon.

According to an advantageous further development of the invention the electrodes are arranged on annular carrier elements, preferably of electrically conductive material. These carrier elements can be stacked on one another and the electrodes are insulated from one another by means of annular spacers in cases when the electrodes are to be held at different voltages. In this way an electrode package is obtained, the interior of which can be simply sealed against the ambient atmosphere by means of sealing rings bearing against the

carrier elements and/or spacers, the sealing rings sealing also against a cover of the spark discharge chamber, and possibly a bottom.

The electrode serving as cathode may consist of a metal-coated foil. As the cathode does not permit the passage of gas, it can serve as bottom of the spark discharge chamber. It is, however, advisable to arrange the foil carrying the metallic cathode layer on one plane side of the annular carrier element and to arrange an extra foil on the opposite plane side-surface of the carrier element. In the carrier element channels are arranged for this purpose so that the space between the two foils communicates with the spark discharge chamber. The second foil thus serves as a sealing bottom, so ensuring that the same pressure prevails on both sides of the cathode. In this way the cathode remains plane even if there is a certain overpressure inside the spark discharge chamber. The cathode is also prevented in this way from vibrating as a result of pressure variations in the atmosphere surrounding the spark discharge chamber.

One embodiment of the invention will now be described with reference to the attached drawing, in which

FIG. 1 shows a section through a part of a conventional electrode arrangement in a spark discharge chamber, and

FIG. 2 a spark discharge chamber according to the invention.

FIG. 1 shows an electrode arrangement with which undesirable sparking at the edge-lines of the electrodes is eliminated in the conventional manner. A lattice-shaped auxiliary electrode 2 and a likewise lattice-shaped electrode 3 serving as anode are arranged on an annular spacer 4, 11. The annular spacer has a thinner inner portion 4 and a considerably thicker outer portion 11. The electrodes 2 and 3 are connected electrically along their entire circumferences with electrically conductive layers 13 on the outer portion 11. The distance between the edges of the electrodes is in this way considerably greater than the distance between the other parts of the electrodes, so eliminating undesirable sparking at the edges of the electrodes. As already noted, however, with this conventional electrode arrangement the dimensions of the spark discharge chamber are unnecessarily large.

FIG. 2 shows a device for sealed electrode mounting in a spark discharge chamber according to the invention, comprising a plane cathode 1 and parallel thereto, two lattice-shaped electrodes 2, 3, of which electrode 2 serves as auxiliary electrode and electrode 3 as anode. The cathode 1 is carried by an annular carrier element 17 and consists of a gold coating on a thin foil. The two lattice-shaped electrodes are arranged on annular carrier elements 19, 20 and fitted each on its side of an electrically insulating spacer 4. On the plane opposing surfaces of the latter there are electrically conductive layers 5, 6. The electrodes 2 and 3 are thus in electrically conductive connection with these metallic layers 5, 6.

The spark discharge chamber, the roof of which is constituted by disc 22, and part of the bottom of which is constituted by annular element 21, is sealed against the environment by means of sealing rings 7, 8, 9, 10 running along the annular carrier elements 19, 20 and spacer 4. The metallic layers 5, 6, as shown at 14, 15, are extended into the zone outside the outermost seal-

ing rings 9, 10. There are therefore no electrode edges inside the spark discharge chamber, but they are situated in the medium surrounding the spark chamber, the which medium is air with a breakdown voltage about four times as high as the breakdown voltage of, for example, argon.

The cathode 1 is carried on the plane side-surface of the carrier element 17 facing the interior of the spark discharge chamber, and on the plane outer side-surface facing this side-surface there is an additional foil 16. The space between this foil 16 and the cathode 1 communicates via channels 18 with the spark discharge chamber. The lower foil thus seals the interior of the chamber against the ambient atmosphere and there is always the same pressure on both sides of the cathode, so that the cathode is prevented from bulging out in either direction or from vibrating.

Through the fact that the lattice-shaped electrodes extend electrically to the space outside the spark discharge chamber, the advantage is gained not only that undesirable sparking at the edges of the electrodes is avoided, but also that the connection of the electrodes to a voltage source can be done more simply than if the connection is to be arranged inside the spark discharge chamber.

Although the invention has been described with reference to one of its embodiments, it can nevertheless be arbitrarily varied within the scope of the subsequent claims.

What is claimed is:

1. In a sealed electrode mounting arrangement, in a spark discharge chamber, comprising a plane cathode 1 and, parallel thereto, two lattice-shaped electrodes 2, 3 constituting, respectively, an auxiliary electrode 2

and an anode 3 enclosed in a space forming the spark discharge chamber, the improvement wherein each of the electrodes along its entire circumference is in electrically conductive connection with an electrically conductive material 5, 6, 14, 15 surrounding the periphery of the respective electrodes and extending through sealing means, which run along the electrical material, and out from the spark discharge chamber thus placing the edges of the electrodes outside the spark chamber, and wherein the lattice-shaped electrodes are electrically insulated from one another by means of an annular spacer 4 arranged between them adjacent their peripheries; said spacer being coated with a metallic layer 5, 6, 14, 15 on plane opposing surfaces, said metallic layers comprising said electrically conductive material.

2. Device according to claim 1, in which the sealing means are arranged so as to provide a seal both against a disc constituting the roof of the spark discharge chamber and against an annular element constituting at least part of the bottom of the spark discharge chamber.

3. Device according to claim 1 in which the cathode and the electrodes are arranged on annular carrier elements.

4. Device according to claim 1 in which the sealing means consist of sealing strips arranged along the carrier elements and the spacer.

5. Device according to claim 3, in which on the carrier element carrying the cathode, there is a gastight foil on the plane confining surface remote from the cathode, the space between the cathode and said foil communicating via channels in the carrier element with the spark discharge chamber.

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