

Jan. 8, 1935.

P. M. HAFFCKE

1,986,809

ELECTRODE FOR DISCHARGE DEVICES

Filed Aug. 26, 1931

Fig. 1

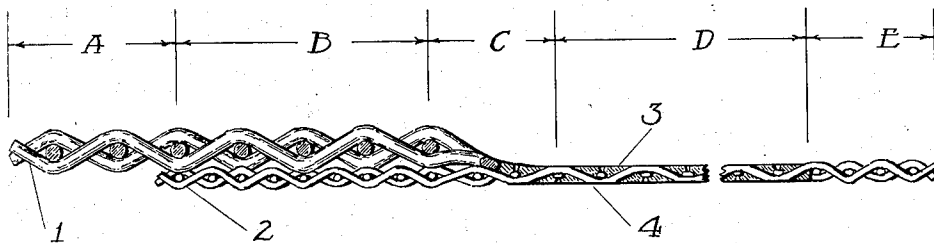


Fig. 2

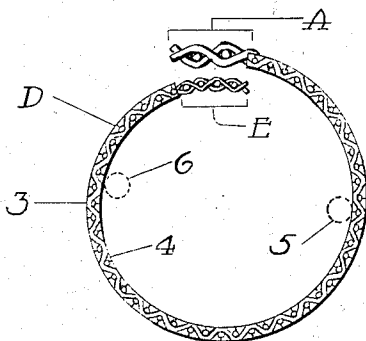


Fig. 3

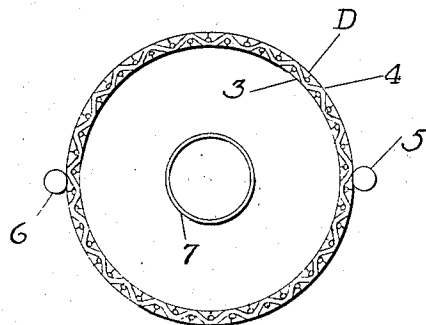
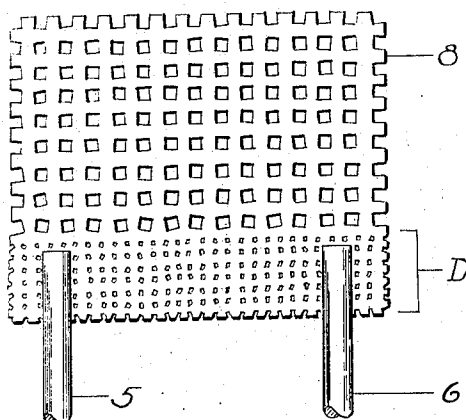


Fig. 4



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ELECTRODE FOR DISCHARGE DEVICES

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4 Claims. (Cl. 250—27.5)

This invention relates to improvements in electric discharge devices, particularly to improvements in electrodes, and has special reference to the provision of an electrode for tubes or cells operable at comparatively high voltages.

A principal object of my invention is to provide a non-sputtering, weldable electrode.

A further object of my invention is to provide a foraminous electrode having a plane surface whereby a discharge shall be of even value over the entire surface thereof.

Another object of my invention is to provide an electrode material capable of being formed into cylinders, or the like, and having a uniform thickness at all points.

Still another object of my invention is to make practical the use of unweldable, but otherwise useful, materials in high voltage electric discharge devices.

It is well known that where there is a discharge between an anode and a plurality of cathodes, unless the cathodes are equally distant from the anode, the discharges will be of unequal values, and, the voltage being sufficiently high, the cathode nearer the anode will sputter away, tending to become equally distant, with the further cathode, from the anode.

The undesirable conditions above set forth are inherent in ionic discharge devices using woven wire electrodes, where the undulate surface of the mesh, in effect, presents a group of minute electrode points rather than a smooth continuous surface.

I am aware that a plane surface may be obtained by rolling and compressing a metal fabric electrode, and that in the thermionic vacuum tube art certain advantages are claimed for electrodes of this type; however, in discharge tubes or cells of the high voltage type the plane surface presented to the discharge should be of a non-sputtering material and, as far as I am aware, it has not been practical to utilize electrodes of non-sputtering material such as aluminum or alloys thereof, because it is not practical to weld (for instance to support arms) material of this general nature.

Referring to the accompanying drawing in which certain particular preferred forms of the invention are shown by way of illustration, but without limiting the invention thereto;

Fig. 1 is an end view of the electrode material.

Fig. 2 is a plan view of Fig. 1.

Fig. 3 is a plan view of a completed electrode structure in Figs. 1 and 2.

Fig. 4 is another embodiment of my invention.

My invention contemplates a composite foraminous electrode material comprising a plurality of intimately joined laminations of alternate composition. In Fig. 1, 1 is a piece of woven aluminum mesh; 2 is a piece of woven nickel fabric, which may be of somewhat finer mesh than the aluminum 1. The metallic sheets 1 and 2 are arranged face to face and compressed together so that their warp and weft strands are intimately intermeshed, and the finished surfaces 3, 4 rendered substantially smooth.

Sections "A" and "E" are unrolled pieces of aluminum and nickel fabric. Section "B" shows two layers in position for rolling. Section "C" shows how the warp and weft strands become mechanically intimately intermeshed in the finished electrode material shown in section "D".

Referring to Fig. 2, where it is desired to form my composite material into cylindrical shape I am able to form an electrode of uniform thickness by avoiding rolling the selvage until the material is shaped; that is to say, in compressing the laminations I permit section A of the fabric 1 to overlap fabric 2, while the opposite edge, section E, of fabric 2 overlaps fabric 1, I then shape the electrode and roll the edges together, thereby forming an electrode of the same thickness at the joint as throughout the rest of the material.

The surface 3 of the finished perforate material D is preferably the side to be presented to the electric discharge, for, although the aluminum strands of fabric 1 being of softer density than those of nickel 2 will enmesh and surround the strands of nickel, nevertheless the nickel is not always completely "lost" in the aluminum in which case surface 4 may not be as smooth or as free from sputtering action as surface 3. Surface 4, formerly nickel fabric 2, serves not alone to take a weld, but serves also to strengthen and support surface 3, obviating the use of support arms running the entire length of the electrode—all of which will more fully appear in connection with Fig. 4.

Electrode supports 5 and 6 are preferably, although not necessarily, on the side opposite to that presented to the electrical discharge.

Fig. 3 is enough of a gas discharge tube, for instance of the rectifier type, to show my new electrode in position. 7 is an anode which may, or may not, be of the composite material of this invention. The outer electrode designated "D" is of a material within my invention. Surface 3, as previously set forth, being the smooth perforate aluminum facing presented to the discharge between electrodes 7 and electrode "D". Electrode

supports 5 and 6 may be conveniently welded to surface 4.

Referring now to Fig. 4 in cases where the additional strengthening and supporting properties of the nickel are not essential, or where ease of welding is the only quality required, it is merely necessary to confine the nickel lamination to the region of the weld as at D, in which case section 8 may be a single layer of a rolled aluminum or other suitable material.

As substitutions of material and other modifications of my invention will suggest themselves to those skilled in the art to which my invention pertains, it is to be understood that the foregoing is to be interpreted as illustrative and not in limiting sense except as required by the appended claims and by the prior art.

What is claimed is:

1. A composite electrode for electric discharge devices comprising a plurality of intimately compressed foraminous metallic laminae, at least one

of said laminae being composed substantially of aluminum and another of a weldable material.

2. A composite foraminous electrode for electric discharge devices comprising a fabric of aluminum intimately compressed to a fabric of nickel.

3. A non-sputtering weldable electrode for electric discharge devices comprising a sheet of woven nickel fabric and a sheet of woven aluminum fabric arranged face to face, and compressed together with their warp and weft strands intimately intermeshed.

4. An electrode for electric discharge devices comprising a composite cylindrical structure of foraminous laminae compressed together, one of said laminae being composed substantially of aluminum and another of nickel, the linear edge of the aluminum overlapping the nickel at the point of jointure whereby the jointed selvage is rendered integral with the plane of the body of said structure.

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