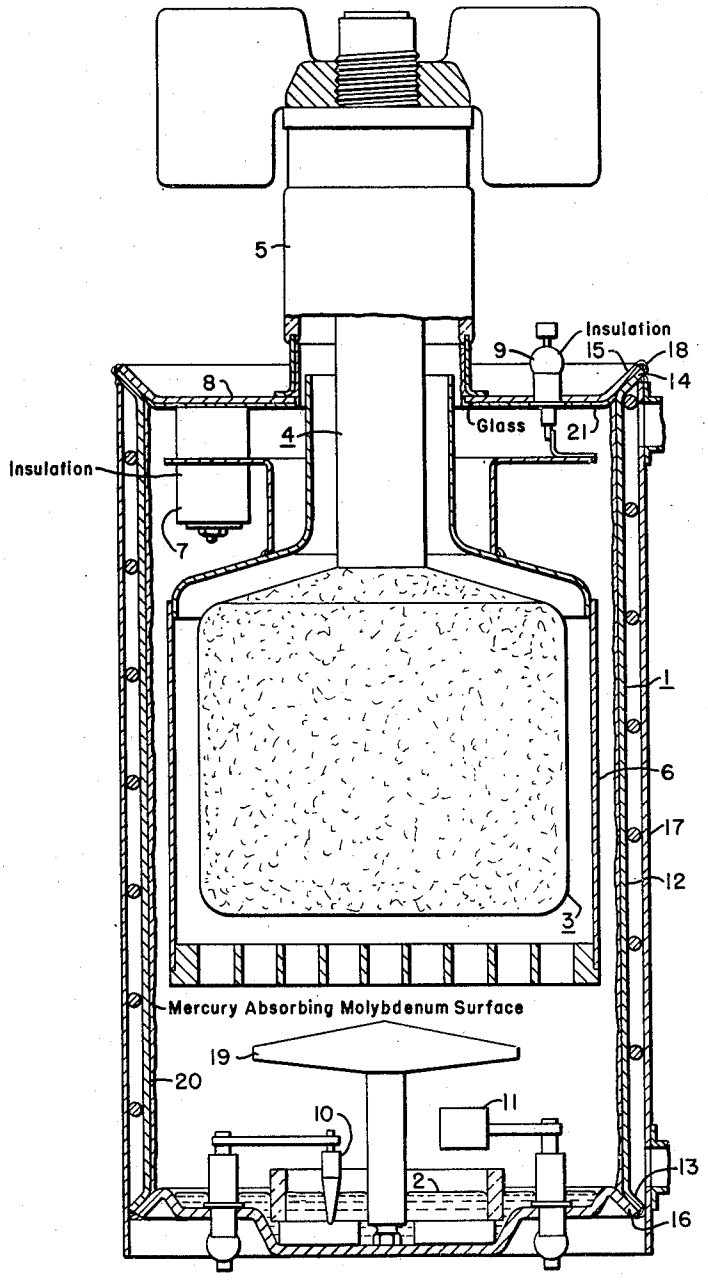
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VAPOR-ELECTRIC DEVICE

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WITNESSES:

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VAPOR-ELECTRIC DEVICE

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My invention relates to a vapor-electric device and particularly to means for preventing damage by attachment of the cathode spot to the wall of the container.

In the operation of vapor-electric devices, the cathode spot tends to wander from the surface of the cathode pool to the adjacent wall of the container. This trouble is particularly noticeable in continuously excited devices, but is also present in periodically excited devices, particularly during intervals of high current density. Heretofore, this difficulty has been prevented, if at all, by insulating the cathode container from the rest of the vessel, or by providing baffles between the arc space and the wall of the container. Both of these expedients are expensive, and in the case of the baffle, have a tendency to increase the temperature at which the device operates.

According to my invention, I eliminate this difficulty by providing a coating on the wall of the container which retains sufficient cathode material to momentarily support the arc terminal without damage to the container. Further, I propose to provide a coating of a high thermal conducting material having a high melting temperature which will withstand the attachment of the arc for a major interval without damage.

It is, accordingly, an object of my invention to provide a vapor-electric device having means for retaining cathode material on the condensing surface of the container.

It is a further object of my invention to provide a metallic liner of high thermal conducting material.

It is a further object of my invention to provide a container for a vapor-electric device in which the arc will not attach except to protected portions of the container.

It is a further object of my invention to provide a vapor-electric device in which the container will not be damaged by the attachment of an electric arc.

Other objects and advantages of my invention will be apparent from the following detailed description, taken in conjunction with the accompanying drawing, in which the figure is a sectional elevation of a vapor-electric device according to my invention.

In the exemplary embodiment of my invention, the vapor-electric device comprises a metallic container 1 usually composed of ferrous materials, and having in the bottom a pool 2 of vaporized reconstructing cathode material such as mercury, gallium, caesium, sodium or potassium. Cooperating with this cathode 2 is an anode 3

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supported in spaced insulated relation in the interior of the container 1 by means of a cathode stem 4 mounted in an insulating bushing 5. Usually, the anode 3 is surrounded by an anode shield 6 normally supported by insulating mountings 7 to one end 8 of the container 1. If desired, a lead-in bushing 9 is provided for applying control potentials to the anode shield 6. I prefer to provide a cathode shield 19 between the surface of the cathode pool 2 and the openings of the anode shield 6 so that there will be little tendency for droplets of cathode material to migrate from the cathode pool 2 through the openings of the shield 6 to the surface of the anode 3.

A make-alive electrode or an ignitor 10 is provided for initiating a cathode spot on the surface of the cathode pool 2. This ignitor 10 may be used as a periodic ignitor, or it may be used merely as a starter to create a cathode spot at the beginning of a series of conducting intervals. Cooperating with the make-alive electrode 10 is a keep-alive electrode 11 which may be utilized either to produce continuous excitation after initiation of the cathode spot, or may be utilized to maintain the cathode spot for a predetermined interval for each conducting half-cycle.

For convenience, the main portion of the container 1 is provided as a cylindrical casing 12 having spun-out end portions 13 and 14 cooperating with the spun rims 15 and 16 of the top and bottom headers. Preferably the spun-out portion 13 at one end of the container, herein illustrated as the bottom end, is designed to fit the interior of a water jacket 17 which surrounds the main portion 12 of the container 1, while the spun-out portion 14 at the other end makes contact with the water jacket 17 so that it may readily be brazed or welded thereto to make a water-tight joint. Preferably the spun-out portion 14 attached to the top header 8 is of sufficient length so that the welding 18 may be ground off one or more times to permit reconstruction of the device.

In order to prevent damage by the attachment of the arc to the inner surface of the container 1, I provide a coating 20 which will absorb or contain a quantity of cathode material which will momentarily support a cathode spot in the event the arc should attach to the side 12 of the container 1. Various materials having a high thermal conductivity and affinity for mercury without being amalgamated thereby may be utilized. Such materials are molybdenum, tantalum and tungsten, and in the event a mercury cathode is utilized, graphite may also be used. Because of

the high thermal conductivity and the ease of operating, I prefer to use molybdenum as the cathode material retaining layer **20**. While this layer **20** may be constructed in any form, I prefer to use spongy metal which readily absorbs and retains the condensed cathode material. In order to prevent attachment of the arc to an unprotected portion such as the top **8** of the container **1**, I provide a coating **21** of insulating material, usually vitreous material, to that portion of the container **1** remote from the cathode **2** and from the condensing surfaces **20**.

In the operation of the device according to my invention, the attachment of the cathode to the walls **12** of the container **1** will be momentarily supported by means of the mercury or other cathode material held by the lining **20**, and usually after momentary attachment the cathode will wander away either to the cathode surface or to some other portion of the container wall. However, by using a high thermal conducting material such as molybdenum, the cathode spot may attach for a material interval without causing damage to the container. Further, the provision of an insulated surface **21** prevents any possible attachement of the arc to that portion of the container remote from the cathode area.

For purpose of illustration I have shown and described a particular embodiment of my invention, and described the same to the best of my present ability, but wish it to be understood that changes and modifications can be made therein without departing from the true spirit of my invention or the scope of the appended claims.

I claim as my invention:

1. A vapor-electric device comprising, a substantially closed metallic container, said container being composed of a metal melted by the attachment of the cathode of an electric arc, an anode in said container, a liquid cathode in said container, means for cooling a portion of the container wall to condense cathode vapor, a coating of sponge metal on said cooled portion for retaining condensed cathode material on said portion.

2. A vapor-electric device comprising, a substantially closed metallic container, said container being composed of a metal melted by the attachment of the cathode of an electric arc, an anode in said container, means for cooling a portion of the container wall to condense cathode vapor, a coating of sponge metal on said cooled portion for retaining condensed cathode material on said portion, and a coating of vitreous material on a portion of the container not covered by said coating of sponge metal.

3. A vapor-electric device comprising, a substantially closed container composed of a ferrous metal, an anode in said container, a mercury pool cathode in said container, means providing a cooled mercury condensing surface, a coating on said surface retaining condensed mercury on said surface.

4. A vapor-electric device comprising, a substantially closed container composed of a ferrous metal, an anode in said container, a mercury pool cathode in said container, means providing a cooled mercury condensing surface, a coating on said surface retaining condensed mercury on said surface, and a coating on another portion of said container preventing contact between condensed mercury and said container.

5. A vapor-electric device comprising, a metal container, an anode in spaced insulated relation in said container, a pool of vaporizable reconstructing cathode material in said container and a layer of sponge refractory metal in said container.

6. A vapor-electric device comprising, a metallic container, an anode supported in spaced insulated relation in said container, a pool of vaporizable cathode material in said container, means for circulating a coolant about a portion of the container providing a condensing surface, a coating of spongy refractory metal on said condensing surface.

7. A vapor-electric device comprising, a metallic container, an anode supported in spaced insulated relation in said container, a pool of vaporizable cathode material in said container, means for circulating a coolant about a portion of the container providing a condensing surface, a coating of spongy refractory metal on said condensing surface, and an insulating coating on the remaining surface of said container.

8. A vapor-electric device comprising, a substantially closed steel container, an anode in spaced insulated relation in said container, a mercury pool cathode in contact with said container, means for cooling a portion of said container adjacent the cathode to provide a condensing surface for mercury vapor, a coating of molybdenum on said cooled surface.

9. A vapor-electric device comprising, a substantially closed steel container, an anode in spaced insulated relation in said container, a mercury pool cathode in contact with said container, means for cooling a portion of said container adjacent the cathode to provide a condensing surface for mercury vapor, a coating of molybdenum on said cooled surface, and a vitreous coating on a portion of the container remote from the cathode.

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No references cited.

Disclaimer

2,490,087.—*William E. Pakala*, Pittsburgh, Pa. VAPOR-ELECTRIC DEVICE. Patent dated Dec. 6, 1949. Disclaimer filed Nov. 7, 1951, by the assignee, *Westinghouse Electric Corporation.*

Hereby enters this disclaimer to claim 5 of said patent.

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