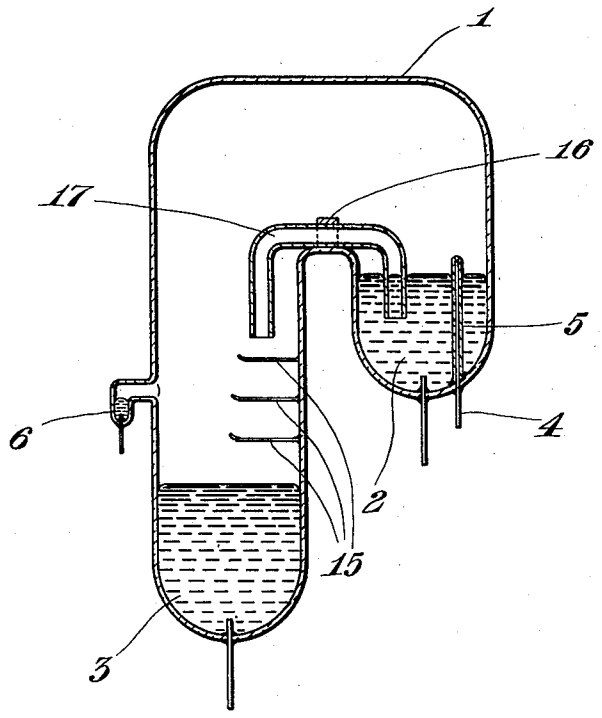
July 25, 1950 N. WARMOLTZ 2,516,736

DEVICE COMPRISING AN ELECTRIC DISCHARGE TUBE AND A SIPHON ARRANGEMENT WITHIN SAID TUBE

Filed March 1, 1948



NICOLAAS WARMOLTZ.
INVENTOR.

BY Fred W. Vogel

AGENT.

Patented July 25, 1950 2,516,736

UNITED STATES PATENT OFFICE

2,516,736

DEVICE COMPRISING AN ELECTRIC DISCHARGE TUBE AND A SIPHON ARRANGEMENT WITHIN SAID TUBE

Nicolaas Warmoltz, Eindhoven, Netherlands, assignor to Hartford National Bank and Trust Company, Hartford, Conn., as trustee

Application March 1, 1948, Serial No. 12,456
In the Netherlands March 25, 1947

6 Claims. (Cl. 250—27.5)

1

The invention relates to an arrangement comprising an electric discharge tube having two or more liquid electrodes, one of which contains a capacitative ignition electrode, and to a discharge tube for use in such an arrangement.

Capacitative ignition electrodes are constituted by a conductor which is insulated from the cathode liquid, for example by the tube wall, in which case the ignition electrode is constituted by a strip which is arranged to surround the discharge tube at the height of the cathode level. Ignition electrodes of this kind have already been suggested by Cooper Hewitt.

It has been found that the life of tubes comprising capacitative ignition electrodes is frequently greatly shortened by corrosion of the insulating wall of the igniter over a narrow zone of approximately 1 mm. at the height of the cathode level. Probably due to the combined effect of the ignition spark and the cathode spot of the discharge, the insulator is corroded for a certain depth, resulting in break-down of the insulator in the form of a crack or a fine hole, so that the ignition electrode can no longer be made to operate. A crack or a hole seldom occurs before corrosion has reached a certain depth.

It is known that with tubes comprising two or more liquid electrodes the anode(s), due to increased evolution of heat, generally volatilize(s) to a greater extent than the cathode. The electrode material condensing on the wall or on some cooling member is generally collected in the cathode, from which it is conducted back to the anode along a long path or other path preventing formation of a continuous jet of mercury or through a separate tank, the electrode material being conducted away from the cathode in a practically continuous manner, so that the cathode level is substantially constant. The cathode is generally arranged on a higher level than the anode.

According to the invention, in an arrangement comprising an electric discharge tube having at least two liquid electrodes, one of which is provided with a capacitative ignition electrode a siphon is provided within the cathode so as to empty the cathode in part before electrode liquid flows out of the cathode by another path, so that while the tube is in use the level of the cathode varies through a height which is preferably at least ten times the height for which the capacitative ignition electrode is corroded.

On the cathode being emptied to the given level, the siphon action ceases and the cathode is replenished with condensing liquid evaporating from the anode side. In order to prevent overflowing cathode material from forming a short-circuit between the electrodes, a few plates are arranged below the siphon to break up the liquid jet into drops or the jet may otherwise be split up into drops.

2

In order that the invention may be more clearly understood and readily carried into effect, it will now be described more fully with reference to the accompanying drawing, which shows a tube in which the cathode is provided with a siphon.

Referring to the drawing, 1 designates the glass wall of a discharge tube, 2 and 3 the cathode and anode constituted by mercury, each being provided with a supply conductor sealed in the wall. The cathode 2 is provided with a capacitative ignition electrode constituted by a metal rod 4 which is covered with a glass layer 5. On the anode side there is furthermore an auxiliary anode 6. That portion of the glass tube which forms a partition between the cathode 2 and the anode 3 has a support 16 arranged at the top which serves for mounting an inverted U-tube 17 with limbs of unequal lengths. The shorter limb extends downward into the cathode, the longer limb is arranged in the anode portion of the discharge tube, and it is so dimensioned that its opening will at all times remain well above the liquid level of the anode.

When the liquid level of the cathode is caused to become flush with the connecting part between the two limbs of the U-tube, the siphon starts to operate and remains operative until the cathode level has dropped below the opening of the limb. Mercury is thereby carried over to the anode, where a number of baffle plates 15 are arranged on the tube wall above the anode level, so as to split into drops the jet of mercury discharged by the siphon limb.

As already mentioned, a cathode of varying level is thus provided instead of the conventional cathodes of constant level, so that corrosion near the rim of the cathode is avoided and the life of the tube considerably increased.

What I claim is:

1. A device comprising an electric discharge tube having a liquid cathode and a liquid anode, said anode having the surface thereof arranged at a level below the surface of said cathode, a capacitative ignition electrode arranged in cooperative relationship with said cathode, and an inverted U-shaped member within said tube, said member having a shorter tubular limb arranged in said cathode, a longer tubular limb outside of said cathode and a tubular connection between

said limbs, said member having a cross-section to effect siphoning of the cathode liquid from the cathode, and to provide a varying level of the cathode liquid during operation of said discharge tube by draining off part of the cathode liquid whenever the level thereof becomes flush with the connecting portion of the siphon between the two limbs.

2. A device comprising an electric discharge tube having a liquid cathode and a liquid anode, said anode having the surface thereof arranged at a level below the surface of said cathode, a capacitative ignition electrode arranged in said tube to cooperate with said liquid cathode and an inverted U-shaped member within said tube, said member having a shorter tubular limb extending into said cathode, a longer tubular limb arranged above the surface of the said liquid anode and a tubular connection between said limbs, said member having a cross-section to effect siphoning of the cathode liquid from the cathode and to provide a varying level of the cathode liquid during operation of said discharge tube by draining off part of the cathode liquid whenever the level thereof becomes flush with the connecting portion of the siphon between the two limbs.

3. A device comprising an electric discharge tube having a liquid cathode and at least one liquid anode said anode having the surface thereof arranged at a level below the surface of said cathode, a portion of the tube wall forming a connecting piece between said cathode and said anode, a capacitative ignition electrode arranged on the cathode side of said connecting piece to cooperate with said cathode electrode, and an inverted U-shaped member within said tube, said member having a shorter limb extending into the cathode, a longer limb above the anode, and a connection between the two limbs arranged on top of said connecting piece between said electrodes, said member having a cross-section to effect a siphoning action at intervals to convey liquid from the cathode to the anode side of said tube whenever the level of the liquid in the cathode reaches the height of said connection of the siphon, whereby a cathode of varying level is obtained.

4. A device comprising an electric discharge tube having a liquid cathode and a liquid anode, said anode having the surface thereof arranged at a level below the surface of said cathode, a capacitative ignition electrode arranged in said tube to cooperate with said liquid cathode, and an inverted U-shaped member within said tube, said member having a shorter tubular limb extending into said cathode, a longer tubular limb arranged above the surface of the said liquid anode, and a tubular connection between said limbs, said member having a cross-section to effect siphoning of the cathode liquid from the cathode and to provide a varying level of the cathode liquid during operation of said discharge tube by draining off part of the cathode liquid whenever the level thereof becomes flush with the connecting portion of the siphon between the two limbs, the shorter limb of the siphon having at least ten times the length of a zone of corrosion caused by a constant-level cathode in a device of equal dimensions.

5. A device comprising an electric discharge tube having a liquid cathode and at least one liquid anode said anode having the surface thereof arranged at a level below the surface of said cathode, a portion of the tube wall forming a connecting piece between said cathode and said anode, a capacitative ignition electrode arranged on the cathode side of said connecting plate to cooperate with said cathode, and an inverted U-shaped member within said tube, said member having a shorter limb extending into the cathode, a longer limb above the anode, and a connection between the two limbs arranged on top of said connecting piece between said electrodes, said shorter limb of the siphon having at least ten times the length of a zone of corrosion caused by a constant-level cathode in a device of equal dimensions said member having a cross-section to effect a siphoning action at intervals, to convey liquid from the cathode to the anode side of said tube whenever the level of the liquid in the cathode reaches the height of said connection of the siphon, whereby a cathode of varying level is obtained.

6. A device comprising an electric discharge tube having a liquid cathode and at least one liquid anode said anode having the surface thereof arranged at a level below the surface of said cathode, a portion of the tube wall forming a connecting piece between said cathode and said anode, a capacitative ignition electrode arranged on the cathode side of said connecting piece to cooperate with said cathode, and an inverted U-shaped member within said tube, said member having a shorter limb extending into the cathode, a longer limb above the anode, and a connection between the two limbs arranged on top of said connecting piece between said electrodes, said shorter limb having a length of the order of 10 millimeters said limbs and said connections having cross-sections to produce a siphoning action at intervals, to convey liquid from the cathode to the anode side of said tube whenever the level of the liquid in the cathode reaches the height of said connection of the siphon, whereby a cathode of varying level is obtained.

NICOLAAS WARMOLTZ.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
1,101,523	Conrad	June 30, 1914
1,101,665	Sakai	June 30, 1914
1,110,575	Von Recklinghausen	Sept. 15, 1914
1,697,210	Szilard	Jan. 1, 1929
1,739,443	Dunoyer et al.	Dec. 10, 1929
1,808,517	Berthold	June 2, 1931
1,971,891	Zecher	Aug. 28, 1934

FOREIGN PATENTS

Number	Country	Date
110,523	Austria	Sept. 10, 1928