March 28, 1939. H. LEMS 2,151,979

MERCURY CATHODE DISCHARGE TUBE

Filed Dec. 16, 1936

Fig. 1.

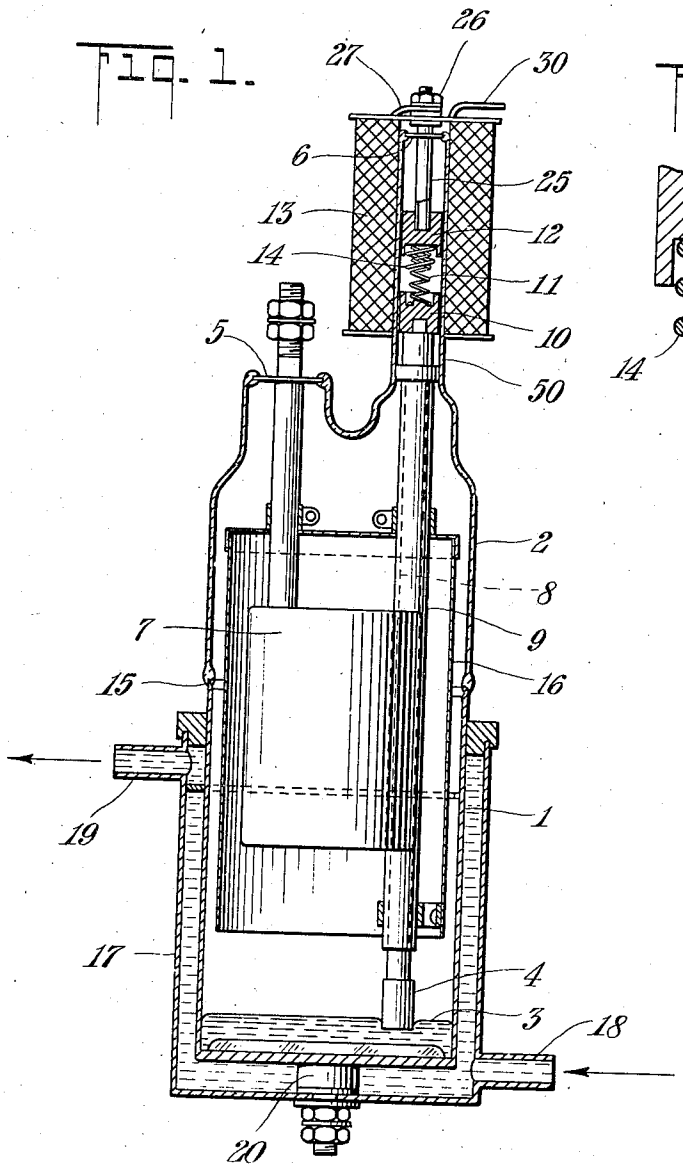
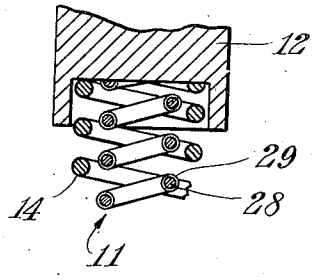


Fig. 2.



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MERCURY CATHODE DISCHARGE TUBE

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In Germany December 16, 1935

7 Claims. (Cl. 250—27.5)

My invention relates to mercury cathode discharge tubes, and more particularly to a resilient member for use in such tubes.

Mercury cathode discharge tubes such as the rectifiers described in the copending U. S. Patent application Ser. No. 67,155 to J. G. W. Mulder, filed March 4, 1936, comprise a movable member, for instance an ignition electrode, which is mechanically connected to a stationary body by a resilient member which also serves as an electrical connection between the movable member and a supply lead.

Such a resilient member must have the desired resiliency and also a low resistivity to allow for the passage of current, and it has been proposed to make same of heat-resistant material, such as molybdenum. However, when members of such material are given the small cross section necessary to obtain the required resiliency, they will have such a high electrical resistance that they may be permanently deformed by the heat produced by the passage of the currents normally used in such devices.

The main object of my invention is to provide a resilient member having the required resiliency while at the same time having a low resistivity.

A further object of my invention is to provide a resilient member which will not be affected by the mercury vapor.

In accordance with my invention I use as the resilient member, a body having a core of a material whose resistivity is substantially lower than that of the molybdenum, and I protect this core against the influence of the mercury by providing the same with a protective coating of a metal which amalgamates not at all or only to a slight extent with mercury.

To reduce the impact at the end of the stroke of the movable member, I provide a second resilient member, which however may be of a heat-resistant spring material as it does not carry current.

In order that my invention may be clearly understood and readily carried into effect, I shall descibe same more fully with reference to the accompanying drawing, in which:

Figure 1 is a sectionized view of a mercury vapor rectifier embodying the invention, and

Fig. 2 is a sectional view on an enlarged scale of a portion of Figure 1.

The rectifier shown in Figure 1 comprises an envelope having a cup-shaped metal portion 1 containing a mercury cathode 3, and a glass portion 2 hermetically sealed to the metal portion at 15 and forming a tubular protuberance 50. Hermetically sealed in the top of portion 2 are two metal discs 5 and 6, for instance of chrome iron. Supported from disc 5 is a main anode 7 surrounded by a cylindrical screen 16 of molybdenum which serves to protect the seal 15 from the discharge.

The rectifier is artificially cooled and for this purpose a jacket 17 surrounds the metal portion 1 and is provided with an inlet passageway 18 and an outlet passageway 19 for the passage of a suitable cooling medium such as water. A stud 20 passes through the bottom of the cooling jacket 17 in a liquid-tight manner and serives to secure same to the metal portion 1 and also as a supply lead for the mercury cathode 3.

Supported by screen 16 is a guide tube 9 in which is slidably disposed a rod 8 of conductive material carrying on its lower end an ignition electrode 4. The upper portion of rod 8 is guided in the upper protuberance of glass portion 2 and carries a cylindrical plunger 10 of magnetic material, such as soft iron, which plunger is mechanically and electrically connected to a stationary core 12 by a helical spring 11. Surrounding the spring 11 and secured to the core 12 is a second helical spring 14.

The core 12 is secured to the lower end of a conductive member 25 whose upper end is secured to disc 6 and connected therethrough to terminal 26. For moving the anode 4 in a vertical direction a coil 13 surrounds the protuberance 50. The coil 13 has a lead 27 connected to terminal 26, and a lead 30 to be connected to a supply of ignition voltage (not shown).

As shown more clearly in Fig. 2, the helical spring 11 comprises a core 28 of a material whose resistivity is less than that of molybdenum; for instance copper, silver or an alloy consisting substantially of one of these metals. Such materials which have a resistivity less than 0.04 ohm per meter for a cross section of 1 square millimeter, have a comparatively low resiliency and are capable of withstanding only a small amount of heat. However, their resistivity is so low that the heat produced by the passage therethrough of currents of the normal value, is so small as not to affect the resiliency. On the other hand, the spring 11 is so arranged in the tube that its resiliency will not be deleteriously affected by the heat produced in other ways, such as by the heat of the arc.

As the metals of low resistivity such as used for the core 28 would be attacked if disposed within the envelope, the core 28 is provided with a coating 29 of a material which amalgamates not at

all or only to a very small extent with mercury, for example chromium or nickel. Thus it is seen that by using a core of a material of low resistivity and by protecting this core by a coating, the resiliency of the spring 11 will not be affected during the operation of the rectifier.

The spring 14 serves to reduce the impact which might occur at the end of the stroke of the plunger 10, and as no current passes through this spring it may be made of a much more resilient material than that used for the spring 11, for instance a heat-proof spring material, such as molybdenum.

While I have described my invention in connection with specific examples and applications, I do not wish to be limited thereto but desire the appended claims to be construed as broadly as permissible in view of the prior art.

What I claim is:

1. A discharge tube comprising an envelope, a mercury cathode and a movable member within said envelope, and means to move said movable member comprising a resilient member within said envelope and serving as a current supply conductor to said movable member, said resilient member comprising a resilient core of a metal having a resistivity less than that of molybdenum, and a thin coating of a metal substantially unaffected by mercury, said coating serving solely to protect the core against the influence of the mercury.

2. A discharge tube comprising an envelope, a mercury cathode, a main anode and a movable ignition electrode within said envelope, and means to move said ignition electrode comprising a resilient member within said envelope and serving as a current supply conductor to said electrode, said member comprising a resilient core of a metal having a resistivity less than that of molybdenum, and a thin coating of a metal substantially unaffected by mercury, said coating serving solely to protect the core against the influence of the mercury.

3. A discharge tube comprising an envelope, a mercury cathode and a movable member within said envelope, and means to move said member comprising a resilient member within said envelope and serving as a current supply conductor for said movable member, said resilient member comprising a resilient core of a metal having a resistivity less than that of molybdenum, and a thin coating of a metal substantially unaffected by mercury, said coating serving solely to protect the core against the influence of the mercury, and a second resilient member of heat-resistant spring metal acting upon said movable member only during a portion of its movement.

4. A discharge tube comprising an envelope, a mercury cathode and a movable member within said envelope, and means to move said movable member comprising a resilient member within said envelope and serving as a current supply conductor for said movable member, said resilient member comprising a core of a metal having a resistivity less than that of molybdenum, and a thin coating of nickel, said coating serving solely to protect the core against the influence of the mercury.

5. A discharge tube comprising an envelope, a mercury cathode and a movable member within said envelope, and means to move said movable member comprising a resilient member within said envelope and serving as a current supply conductor for said movable member, said resilient member comprising a core of a metal having a resistivity less than that of molybdenum, and a thin coating of chromium, said coating serving solely to protect the core against the influence of the mercury.

6. A discharge tube comprising an envelope, a mercury cathode and a movable member within said envelope, and means to move said movable member comprising a resilient member within said envelope and serving as a current supply conductor to said movable member, said resilient member comprising a core of a metallic substance whose resistivity is less than that of a molybdenum, said substance having silver as its major constituent, and a thin coating of a metal substantially unaffected by mercury, said coating serving solely to protect the core against the influence of the mercury.

7. A discharge tube comprising an envelope, a mercury cathode and a movable member within said envelope, and means to move said movable member comprising a resilient member within said envelope and serving as a current supply conductor for said movable member, said resilient member comprising a core of a metallic substance having a resistivity less than that of molybdenum, said substance having copper as its major constituent, and a thin coating of a metal substantially unaffected by mercury, said coating serving solely to protect the core against the influence of the mercury.

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