Aug. 30, 1932. J. JONAS 1,873,963

APPARATUS FOR THE IGNITION OF MERCURY VAPOR RECTIFIERS

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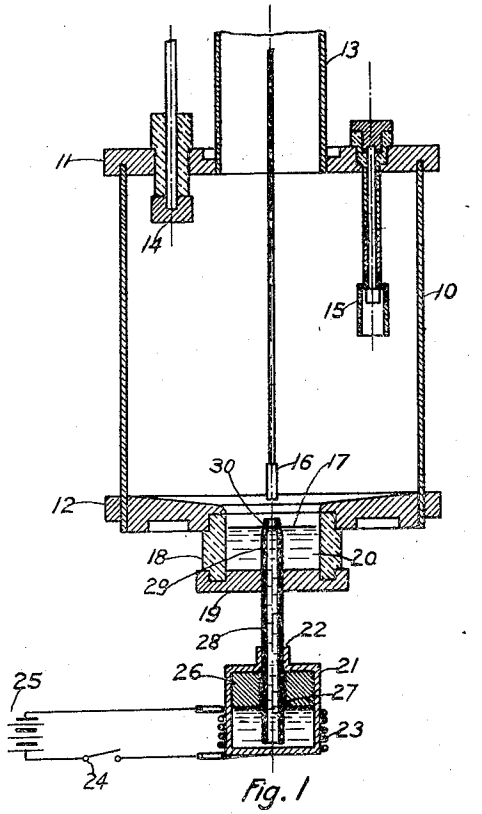


Fig. 1

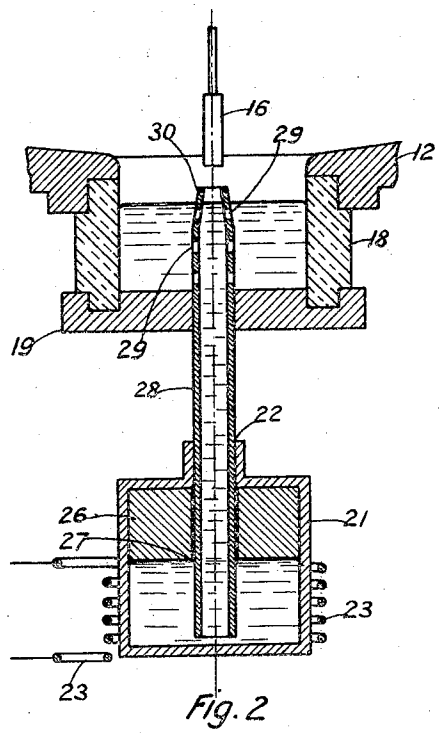


Fig. 2

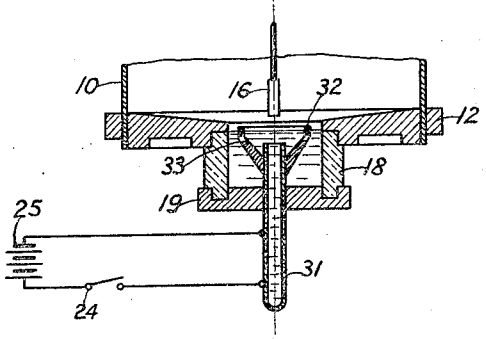


Fig. 3

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UNITED STATES PATENT OFFICE

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APPARATUS FOR THE IGNITION OF MERCURY VAPOR RECTIFIERS

Application filed August 1, 1928, Serial No. 296,698, and in Germany August 8, 1927.

This invention relates to improvements in devices for igniting or starting the operation of mercury-arc electric rectifiers.

The ignition of mercury-arc rectifiers is generally accomplished either by plunging a movable, electro-magnetically-controlled anode into the mercury cathode or, in smaller rectifiers having fixed ignition anodes, by tilting the entire device. All of the known igniting devices have disadvantages from the viewpoint of design or because they create obstacles in the operation of the rectifiers. Such disadvantages are obviated, in the present invention, by establishing a momentary contact between the ignition anode and the mercury cathode without movement of either the anode or of the entire device.

Among the objects of the present invention is the provision of an ignition device for mercury-arc rectifiers in which a jet of mercury is projected from the cathode to the ignition anode.

Another object of the invention is to provide an improved igniting device for rectifiers in which momentary contact is established between the cathode and an ignition anode supported in proximity thereto.

A further object of the invention is to provide an improved igniting device for rectifiers in which a jet of mercury, under pressure, is projected from the cathode into momentary contact with an ignition anode adjacent thereto.

Other objects and advantages will hereinafter appear.

For the purpose of illustrating the invention, several embodiments thereof are shown in the drawing, wherein

Figure 1 is a central vertical sectional view of a mercury-arc rectifier embodying the present improvements;

Fig. 2 is an enlarged detail sectional view taken from Fig. 1; and

Fig. 3 is a view similar to Fig. 2, illustrating a modification.

Referring more particularly to Fig. 1, the rectifier includes a wall 10, a top cover member 11 and a bottom 12.

The top 11 is provided with the usual condensing chamber 13 and with suitable anodes 14 and 15. An ignition anode 16 is disposed as shown and is supported in any suitable manner in proximity to a mercury cathode 20.

The bottom 12 is provided with a central aperture 17 which is surrounded by a wall 18 of insulating material which, in connection with a plate 19, forms a well arranged to receive the mercury cathode 20.

Arranged in suitable position, exteriorly of the rectifier and adjacent to the cathode 20, is a cylinder 21 formed of non-magnetic material which is unaffected by mercury. The cylinder 21 is provided with an aperture 22 in the portion adjacent the cathode 20 and is arranged to receive mercury therefrom.

The cylinder 21 is surrounded by a coil 23 arranged about one end thereof and connected through a switch 24 with a suitable source of current 25.

A piston or plunger 26 floats upon the mercury within cylinder 21 and is guided in its movement by the wall of the cylinder. The plunger 26 is provided with a central aperture 27 and is formed of magnetic material to permit actuation thereof upon excitation of coil 23. A tubular connection 28 extends from closely adjacent the bottom of cylinder 21 through plate 19 into cathode 20. The tube 28 extends through aperture 22 of the cylinder 21 and aperture 27 of the plunger 26 which is guided thereby. The tube 28 may be formed from tantalium, tungsten, molybdenum or some other fusion-resisting material in case it is found that desirable results are secured by extending the tube beyond the surface of cathode 20 to serve as a point of attachment for the arc when the rectifier is in operation.

The tube is provided with apertures 29, and the end thereof extending into the rectifier is constructed to form a nozzle portion 30.

The operation of the device is as follows: The switch 24 is closed to effect energization of coil 23. Current flowing through the coil 23 attracts and depresses the plunger or operating member 26 which is accordingly moved downwardly to displace the mercury in cylinder 21 and force the same upwardly through connection 28, the mercury previously in connection 28 being thereby ejected

from nozzle 30 into contacting relation with ignition anode 16. As the mercury jet falls back into cathode 20, an arc is struck and a portion of the mercury volatilized. The mercury vapor thus formed provides a current path between anodes 14 and 15 and cathode 20 which permits current impressed on the anodes to flow to the cathode. After the mercury has been ejected from cylinder 21, switch 24 is opened. A portion of the cathode mercury will drain through apertures 29 into tube 28 from which mercury will flow into cylinder 21 and float plunger 26 into its original position.

In the modification illustrated in Fig. 3, a tube 31 extends into the mercury cathode. The lower exterior end of tube 31 is connected in circuit with the heating current 25 by the switch 24. The upper end of tube 31 is provided with a funnel-shaped exhaust nozzle 32 which is preferably formed of fusion-resisting materials and is provided with apertures 33 for a purpose which will hereinafter appear.

In operation, switch 24 is closed and the mercury in tube 31 heated to the point of vaporization, at which time some of the mercury is ejected from nozzle 32 into contact with ignition anode 16, whereupon the rectifier it put into operation as above set forth. The apertures 33 in the nozzle provide for return flow of the mercury into tube 31.

While only two embodiments of the invention have been shown and described, it will be understood that changes in shape, size and arrangement of the parts may be made without departing from the spirit of the invention or the scope of the appended claims.

What I claim is:

1. In an igniting device for mercury-arc rectifiers, a rectifier, means for enclosing a body of mercury, said means having a discharge orifice and refilling apertures, an anode adjacent the discharge orifice of said enclosing means, a floating plunger within said enclosing means for producing pressure to expel mercury into contact with said anode.

2. In an igniting device for mercury-arc rectifiers, a rectifier, means of non-magnetic material enclosing a body of mercury and provided with a discharge orifice and refilling apertures, an anode adjacent the discharge orifice of said enclosing means, an electrically-operated plunger of magnetic material within said enclosing means for producing pressure to expel mercury into contact with said anode.

3. In an igniting device for mercury-arc rectifiers, a rectifier, means for enclosing a body of mercury, said means having a discharge orifice and refilling apertures, an anode adjacent the discharge orifice of said enclosing means, a plunger within said enclosing means, and a coil arranged to depress said plunger to produce pressure to expel mercury into contact with said anode.

4. In an igniting device for mercury-arc rectifiers, a rectifier, means for enclosing a body of mercury, said means having a discharge orifice and refilling apertures, an anode adjacent the discharge orifice of said enclosing means, a coil surrounding said enclosing means, and a plunger forming a movable core for said coil, said plunger being controlled by actuation of said coil to produce pressure within said enclosing means to expel mercury therefrom into contact with said anode.

5. In an electric current rectifier comprising a mercury cathode, an ignition anode, means supported partly above and partly below the surface level of the said cathode in fixed position with respect to the said anode, the said means having a channel extending therethrough and terminating in an exhaust nozzle above the surface level of the said cathode, means for expelling a portion of the said mercury through the said channel and nozzle into contact with the said anode, and apertures in the first said means below the surface level of the said cathode for automatically returning a portion of said mercury into the said channel following expulsions of mercury therefrom.

6. In an electric current rectifier comprising a mercury cathode, an ignition anode, means supported within the said cathode in a fixed position with respect to the said anode, the said means extending partly above and partly below the surface level of the said cathode, a channel extending through the said means and terminating in a nozzle above the surface level of the said cathode, pressure means for forcing portions of said mercury through said channel and said nozzle to initiate an arc between said anode and said cathode, and apertures within the first said means below the surface level of the said cathode for automatically returning a portion of said mercury to said channel following expulsion of mercury therefrom.

In testimony whereof I have hereunto subscribed my name this 13th day of July A. D. 1928.

JULIUS JONAS.